The physical nature of the basic concepts of physics

10. Dark Matter [(i)]

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Abstract

In the 1930's and the 1970's astronomers discovered that the outer regions of spiral galaxy clusters moved much faster than their combined mass could explain. This led to the supposition that there must be a huge amount of dark, invisible, 'dark' matter which represents 85% of all matter.
After thirty years of searching, we haven't however found any trace of dark matter. On the contrary, irregularities among galaxies have been found, that even particle dark matter cannot explain!
In section 6 "The physical nature of photons" of his paper Part 8 on the physical nature of velocity, the author has demonstrated that photons have mass characteristics such as gravitational interaction, in a plane perpendicular to their invariable speed. This allows the author to demonstrate in this paper that the missing gravitational interaction is supplied by the high energy photons of the galaxy clusters.
This explains not only the high speed circulation of spiral galaxy clusters, but it also explains the irregularities among galaxies that even dark matter cannot explain, like:

- the Tully-Fisher relation between the brightness of a galaxy and the velocity of its outermost stars,
- the strange gamma ray signals from the center of the milky way,
- and it also explains why galaxies almost lie in a plane.

1. The stubborn elusiveness of "Dark" Matter

In the early 1930's astronomer Fritz Zwicky discovered that the outer regions of the Coma cluster moved much faster than their combined mass could explain! He concluded that the cluster had to contain some invisible mass, that he called "dark matter".
In the early 1970's Vera Rubin studied the motion of spiral galaxy clusters and noticed that:

- The galaxies outer arms were rotating too fast for the conceivable matter,
- Clusters of galaxies bend light more than their visible mass accounts for,
- The fluctuations of the cosmic microwave background fit the data only when we add supplementary matter. Without it, the density variations couldn't have grown fast enough to form the galaxies,
- Dark matter is also needed to make the formation of galactic structures match the observations

(i) Updated edition of the paper "Velocity, Mass and Time" April 1991 by the same author.

This confirmed Zwicky's conclusion that there must a huge amount of dark, invisible matter.

In her book "Lost in Math" [1], Sabine Hossenfelder, a research fellow at the Frankfurt Institute for Advanced Studies, concludes that one possibility was that these galaxies contain huge amounts of some kind of undetectable mass, like mini black holes or ultra-compact heavy objects. But these should cause gravitational lensing, which isn't observed!

- So most scientists began to believe that dark matter, which represents 85% of all matter, might consist of some yet unknown particles, called WIMP's (Weakly Interacting Massive Particles).
- Another serious candidate for dark matter were Axions.

After thirty years of searching, we haven't however found any proof of these suppositions. On the contrary: irregularities among galaxies have been found, that even particle dark matter cannot explain:

- Dark matter offers no explanation for why the galaxies we observe almost lie in a plane
- Dark matter doesn't explain the Tully-Fisher relation between the brightness of a galaxy and the velocity of its outermost stars
- The galactic centers aren't coming out correctly with particle dark matter. The matter density should be higher in the centers we observe!

This leads Katherine (Katie) Mack conclude [2] that we probably need new physics!

In his recent paper "What is Dark Matter" [3] Dan Hooper, head of FERMILAB and professor of Astronomy and Astrophysics at the university of Chicago, writes "*We see its effects in how stars move within galaxies, and how galaxies move within galaxy clusters. Without it, we can't explain how such large collections of matter came to exist, and certainly not how they hang together today. There is only one problem: We don't know what it is"*!

We see dark matter's presence in many ways e.g. in how the brevity of a galaxy cluster deflects light as it passes. All possible solutions have been ruled out:

- Huge underground experiments have detected nothing,
- Particle-smashing experiments at the LHC haven't created any dark matter.

Our efforts have nevertheless learned us that dark matter:

- isn't atomic matter or any of the exotic forms of matter created by the LHC
- doesn't interact with itself or with ordinary matter, except via gravity
- doesn't emit, absorb or reflect any easily measurable quantity of light

According to professor Hooper, the best evidence for Dark Matter comes from the temperature patterns of the cosmic microwave background radiation. These patterns tell us that shortly after the Big Bang, our universe was very uniform. Without the help of Dark Matter, there is no way that these density variations could have frown fast enough to form galaxies!

If dark matter consists of WIMP's, we can estimate how much it should interact with ordinary matter. But these experiments have failed to turn up WIMP's!

According to Dan Hooper, Dark Matter must surely exist, because alternative explanations, such as e.g. Modified Gravity – MOND, don't seem to work.

The only other possibility we have for WIMP's comes from a strange gamma-ray signal seen emanating from the center of the Milky Way.

2. The qualitative problem of mathematical physics

In the former survey of the intangible problem of the invisible nature of Dark Matter, two remarks strike the attention:

- According to Dan Hooper, we haven't seen particles because Dark Matter is probably different from what we expected.
- According to Katherine Mack, we need new physics to explain the observed velocities, and

In the present physics, the basic concepts, such as 'velocity' and 'mass', are mathematically defined in function of one another. And these mathematical equations, when formulated in spoken words, are considered as 'physical laws'. This procedure, known as the scientific method, has the incredible benefit that it allows us to predict the result of physical phenomena with mathematical precision.
The problem is however that this quantitative approach doesn't allow us to understand the physical nature of the basic concepts of physics, such as e.g. 'mass' and 'velocity'. And if we don't know what 'mass' is and we don't know what 'velocity' is, we cannot in any way know why 'masses' proceed to each other with increasing 'velocities'.
So, when in that kind of 'quantitative' physics, we are suddenly confronted with a peculiar behavior of matter, that considerably deviates from our quantitative gravitational laws, we can only have two possible reactions:
- we 'imagine' some invisible matter (Dark Matter), or
- we 'adapt' our quantitative equations, according to the observations (MOND).

But neither one of these remedies will lead to a fundamental understanding of the physical nature of gravitation.
So, by means of my former papers on the physical nature of the basic concepts of physics, I will come to a clear description of the physical nature of the so-called Dark Matter.
But therefore I will first recall my physical definition of "velocity" (Part 8).

3. The physical nature of the variable velocity of mass particles

In section 4.4 "A new kinematic speed equation" of my paper Part 8 on the physical nature of velocity, I have demonstrated that a particle system, consisting of massless particles moving about each other at the speed of light, can gradually increase its congruent bulk velocity from zero to the speed of light, by increasing the degree of congruence of the motions of its massless components. This allowed me to represent the variable velocity of a mass particle-system, as a complex number:

- in which the real number 'v' indicates the total amount of congruent, bulk velocity of which the particle system moves as a whole in a given (x-)direction, and
- in which the imaginary number 'q' indicates the total amount of internal, repetitive, isotropic motion, represented by its RMS-speed 'q'.

In that way the total velocity of each massless component of a mass particle system remains equal to the speed of light: $v^2 + q^2 = c^2$ (Fig. 11.1).
The congruent velocity 'v' of such a particle system can be expressed as "the degree of rectification (or congruence)" of the velocities of its massless components, which is expressed as the sinus the angle of rectification (α): $v/c = \sin\alpha$.
The variable speed of such a mass particle, consisting of massless components moving around each other, is the an absolute physical state of that system, that can be expressed by the degree of congruence of the motions of its massless components:

$$v = c.\sin\alpha$$

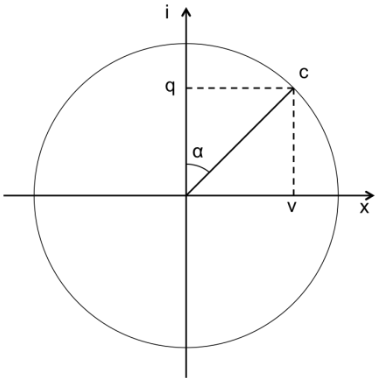

Fig. 11.1

In my paper Part 8 on the physical nature of velocity , I have also demonstrated that in a general way, the size of a particle system is the area that is repeatedly covered by the motions of its basic components. This means that a particle system that is a perfect sphere when at rest, will undergo an anisotropic deformation in its (x) direction of motion, while it remains unchanged in the (yz) directions perpendicular to its direction of motion, so that the originally spherical form of such a particle cloud will deform into an ellipsoid, exactly as this was described by Hendrik Lorentz (ii).

It follows from this, that the proportion of the size in the direction of motion (l_v) of this ellipsoid to its size at rest (l_0) will be equal to the proportion of the internal speed (q) in its direction of motion to the internal speed at rest (c), so that: $l_v/l_o = 1/\gamma = q/c = \cos\alpha$

Which can also be written as: $l_v/l_o = (1-\sin^2\alpha)^{1/2}$

Which, since $\sin\alpha = v/c$, gives us the equation of the Lorentz-Fitzgerald length contraction of moving mass particles: $L_v = L_o\sqrt{1 - v^2/c^2}$

In that way, this equation of the length contraction of a particle system moving at a velocity 'v, expresses the proportion of its size in its direction of motion, to its size when at rest.

4. The mass characteristics of photons

In section 6 "The physical nature of photons" of my paper Part 8, this allowed me to conclude that it follows automatically from the length contraction $L_v = L_o\sqrt{1 - v^2/c^2}$

that when a mass particle system approaches the speed of light 'c', its internal isotropic motion and consequently its size 'l_v' in its direction of motion, will have virtually become zero, which means that a particle system that moves at the speed of light has only internal vibrational-rotational wavelike motion, in a plane perpendicular to its (invariable) velocity.

This allowed me to conclude that 'massless' particles that are moving at the invariable speed of light, such as photons (iii) have spin that is aligned with their velocity vector (Fig. 11.2).

(ii) The dynamic aspects of this deformation (such as the length contraction and the mass increase) will, for propelled velocity, be analyzed in my paper on the physical nature of mass and will, for gravitational velocity, be analyzed in my paper on the physical nature of gravitation.

(iii) The concept of photons was introduced by Einstein in his paper on the photoelectric effect, for which he received the Nobel Prize in 1921.

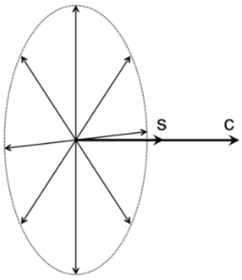

Fig. 11.2

This led me to conclude in my paper Part 8, that photons have mass characteristics, such as gravitational attraction, in the plane perpendicular to their invariable speed (iv)!
This simply means that when a mass particle is accelerated to the speed of light, it simply becomes light. And I concluded in my paper Part 8 that this is the real physical explanation of Einstein's energy equation for the rest mass: $E = m_0c^2$!
In that way, the apparent 'mystery', namely that the speed of a light beam cannot be affected by the motion of the source becomes self-evident and explains the curved trajectory of light rays passing near the sun, by means of their transverse mass characteristics (v).

5. The physical nature of the so-called "Dark" matter

In section 4.3 "The massless origin of mass particles" of my paper Part 8 on the physical nature of velocity, I demonstrated that since the impact velocity of a black hole is equal to the speed of light, mass particles accelerating to a black hole, must necessarily disintegrate into high energy photons, such as γ-rays.
It follows automatically from my former conclusion, that high energy photons such as gamma rays, have significant mass characteristics, such as linear momentum and gravitational acceleration, in a plane perpendicular to their invariable speed (vi). This means that the so-called "Dark Matter" is nothing but gamma ray radiation!
This gives a simple, obvious explanation for the so-called dark matter:
- the galaxies outer arms were rotating too fast for the conceivable matter,
- clusters of galaxies bend light more than their visible mass accounts for,
- the fluctuations of the cosmic microwave background fit the data only when we add supplementary matter. Without it, the density variations couldn't have grown fast enough to form the galaxies,
- dark matter is also needed to make the formation of galactic structures match the observations

And it also explains the irregularities among galaxies that particle dark matter cannot explain:
- The strange gamma ray signals from the center of the Milky Way
- The Tully-Fisher relation between the brightness of a galaxy and the velocity of its outermost stars, which is a normal characteristic of photons
- And the two-dimensional mass characteristics of photons explains why galaxies almost lie in a plane.

It is this, rather illogical conclusion, that the invisible mass created by dark matter is produced by the light of photons that are considered 'massless'!

(iv) This will be analyzed in my paper on the physical nature of mass.
(v) The transverse mass characteristics of photons will be further analyzed in my papers on the physical nature of gravitation.
(vi) This will be analyzed in my paper on the physical nature of mass.

My view, that photons have mass characteristics in the directions perpendicular to their invariable speed, gives thereby a simple explanation for the fact that photons have linear momentum (in plane perpendicular to their invariable speed), which hasn't however been properly explained in the present physics!

6. The emission of light by colliding neutron stars

In my paper Part 8 on the physical nature of velocity, I have demonstrated that when mass particles are falling into a black hole at the speed of light, they simply become light! Which according to my velocity concept, means that while they are accelerating to the speed of light, they are gradually dismantled into their constituent, photons.
And that this is the real physical explanation of Einstein's energy equation for the rest mass:
$E = m_0c^2$, which demonstrates that the rest mass of a mass particles is in fact the rotational energy of its basic photons!

This led me to conclude in my paper Part 8, that photons have mass characteristics, such as gravitational attraction, in the plane perpendicular to their speed.
This view explains the gravitational signal GW170817 detected by LIGO in august 2017, of the merger of two neutron stars that were rapidly spiraling around each other. That collision was characterized by the detection of incoming gravity waves that were immediately followed by a fireball of γ-ray radiation! This means that in this gigantic collision between these two neutron stars that created a black hole, the neutrons were dismantled into their basic (high energy) photons.

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[1] Sabine Hossenfelder "Lost in Math" p 199-208, Basic Books (2018).

[2] Sabine Hossenfelder "Lost in Math" p 206, Basic Books (2018).

[3] Dan Hooper "What is dark matter?" New Scientist, 16 November 2019, p 34-37.