*Everyone can have one's own opinion, but numbers are numbers and there's no question of them!*
*The closest thing to intelligence is simplicity.*

# GETTING RID OF DARK MATTER AND FOURTH DIMENSION

(Gravity from Electromagnetism)

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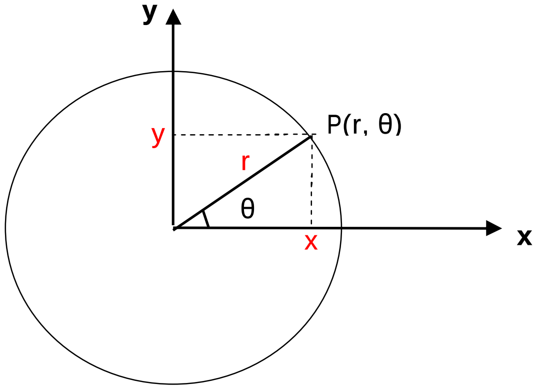
**Abstract:** The mysterious dark matter is a totally unknown and unjustifiable object which has been introduced to make theoretical and measured data match. The fourth dimension in the Theory of Relativity has no support from the real Universe.
The fourth axis introduced in relativity through the 4-vectorial formulation of the quantities is just the falling axis of the matter towards the center of mass of the Universe, with speed c! And this axis is, of course, located in the 3-dimensional context of the Universe itself.
Moreover, forget the tens of dimensions, rolled up over themselves, coming from the String Theory!

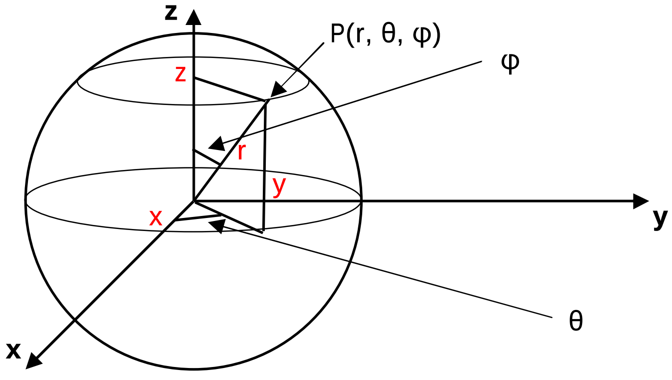
**On the fourth dimension:**
When at the school they taught us the Pythagorean Theorem, they told us that in a right-angled triangle the sum of the squared catheti is equal to the squared hypotenuse:

$$(r)^2 = (x)^2 + (y)^2$$




Then, by studying the geometry in three dimensions, a new version of the Pythagorean Theorem comes out:

$$(r)^2 = (x)^2 + (y)^2 + (z)^2$$




If now we want to go on towards a mysterious 4-dimensional situation, then we would expect a version like the following one:

$(r)^2 = (x)^2 + (y)^2 + (z)^2 + (x_4)^2$

On the contrary, in the Special Relativity, the squared "length" of the 4-vector position is like this:

$(\underline{\Delta x})^2 = (\Delta x_1)^2 + (\Delta x_2)^2 + (\Delta x_3)^2 - (\Delta x_4)^2$ , that is:

$$(r)^2 = (x)^2 + (y)^2 + (z)^2 - (x_4)^2 \qquad (1)$$

But then, for the 4-dimensional component, do we have to use the + sign, as per the Pythagorean Theorem, or the – sign, as required by Einstein in (1)?

Or better, as I think, the time has nothing to do with any mysterious fourth dimension and the Universe goes on being three dimensional?
All in all, the Universe looks three dimensional to all of us and if anybody asked us to show him the fourth dimension, at least about me, we would find difficult to show it.

That – sign in the (1) just tells us that time has nothing to do with a fourth dimension. On the contrary, all the 4-components which appear in the 4-quantities of the Theory of Relativity, more wisely refer to the physical quantities on the falling of all the matter in the Universe, with speed c, toward the center of mass of the Universe itself.

In fact, the fourth component of the 4-vector position is really ct, and the fourth component of the energy is really $mc^2$.

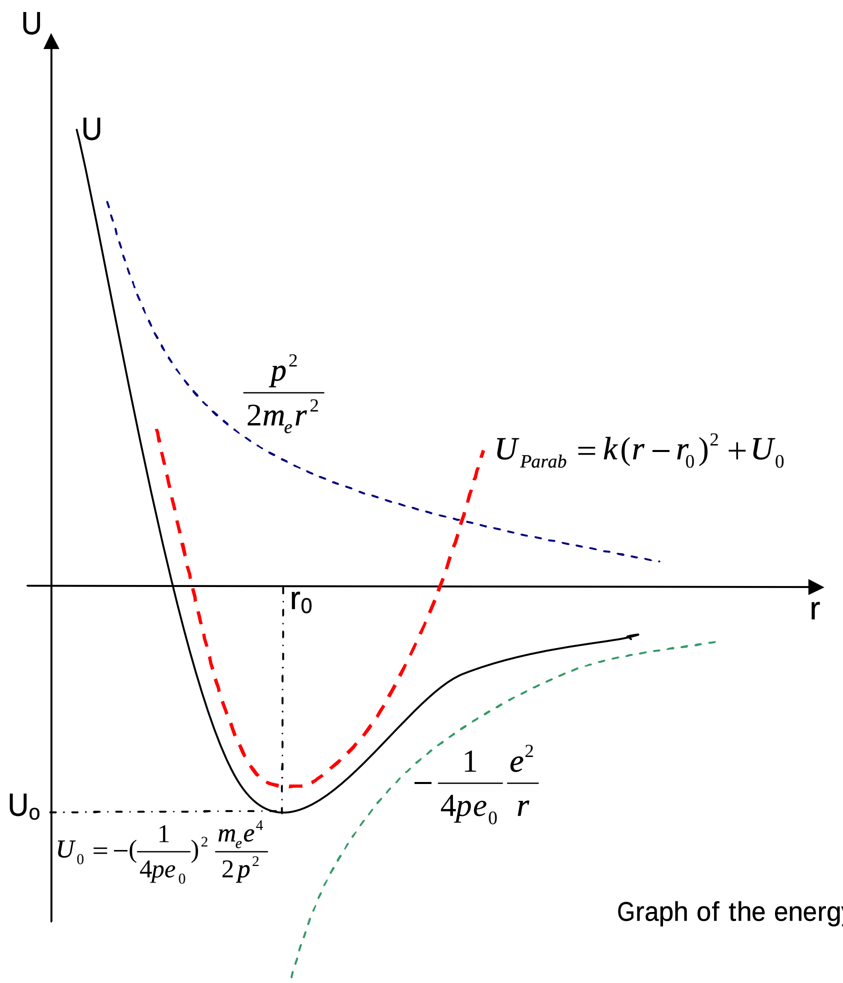
Time is just the name which has been assigned to a mathematical ratio relation between two different spaces; when I say that in order to go from home to my job place it takes half an hour, I just say that the <u>space</u> from home to my job place corresponds to the <u>space</u> of half a clock circumference run by the hand of minutes. In my own opinion, no mysterious or spatially four-dimensional stuff, as proposed by the STR (Special Theory of Relativity). On the contrary, on a mathematical basis, time can be considered as the fourth dimension, as well as temperature can be the fifth and so on. The speed of light (c=299.792,458 km/s) is an upper speed limit, but neither by an unexplainable mystery, nor by a principle, as asserted in the STR and also by Einstein himself, but rather because (and still in my opinion) a body cannot move randomly in the Universe where it's free falling with speed c, as it's linked to all the Universe around, as if the Universe were a spider's web that when the trapped fly tries to move, the web affects that movement and as much as those movements are wide (v~c), that is, just to stick to the web example, if the trapped fly just wants to move a wing, it can do that almost freely (v<<c), while, on the contrary, if it really wants to fly widely from one side to the other on the web (v~c), the spider's web resistance becomes high (mass which tends to infinite etc).

A system made of a particle and an anti-particle, as well as a Hydrogen atom, and as well as a gravitational system, as the whole Universe is, behave as springs which follow the Hooke's Law.
Proof:
in polar coordinates, for an electron orbiting around a proton, there is a balancing between the electrostatic attraction and the centrifugal force:

$F_r = -\frac{1}{4pe_0}\frac{e^2}{r^2} + m_e(\frac{dj}{dt})^2 r = -\frac{1}{4pe_0}\frac{e^2}{r^2} + \frac{p^2}{m_e r^3}$ , where $\frac{dj}{dt} = w$ and $p = m_e v \cdot r = m_e wrr = m_e wr^2$

Let's figure out the corresponding energy by integrating such a force over the space:

$$U = -\int F_r dr = -\frac{1}{4pe_0}\frac{e^2}{r} + \frac{p^2}{2m_e r^2} . \qquad (2)$$

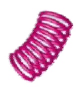



Graph of the energy.

The point of minimum in ($r_0$,$U_0$) is a balance and stability point ($F_r$=0) and can be calculated by zeroing the first derivative of (2) (i.e. setting $F_r$=0 indeed).

Moreover, around $r_0$, the curve for U is visibly replaceable by a parabola $U_{Parab}$, so, in that neighbourhood, we can write:

$U_{Parab} = k(r-r_0)^2 + U_0$ , and the relevant force is: $F_r = -\partial U_{Parab} / \partial r = -2k(r-r_0)$

which is, as chance would have it, an elastic force ( $F = -kx$ - Hooke's Law). 

Now we prove that the Theory of Relativity is just an interpretation of the oscillating Universe just described, contracting with speed c:

if in our reference system I, where we (the observers) are at rest, there is a body whose mass is m and it's at rest, we can say:

$v_1 = 0$ and $E_1 = \frac{1}{2}mv_1^2 = 0$ . If now I give kinetic energy to it, it will jump to speed $v_2$, so that, obviously:

$E_2 = \frac{1}{2}mv_2^2$ and its delta energy of GAINED energy $\Delta_{\uparrow}E$ (delta up) is:

$\Delta_{\uparrow}E = E_2 - E_1 = \frac{1}{2}mv_2^2 - 0 = \frac{1}{2}m(v_2 - 0)^2 = \frac{1}{2}m(\Delta v)^2$ , with $\Delta v = v_2 - v_1$.

Now, we've obtained a $\Delta v$ which is simply $v_2 - v_1$ , but this is a PARTICULAR situation and it's true only when it starts from rest, that is, when $v_1$ = 0.

On the contrary: $\Delta_{\uparrow}E = E_2 - E_1 = \frac{1}{2}mv_2^2 - \frac{1}{2}mv_1^2 = \frac{1}{2}m(v_2^2 - v_1^2) = \frac{1}{2}m(\Delta_V v)^2$, where $\Delta_V$ is a vectorial delta: $\Delta_V v = \sqrt{(v_2^2 - v_1^2)}$ ; therefore, we can say that, apart from the particular case when we start from rest ($v_1$ = 0), if we are still moving, we won't have a simple delta, but a vectorial one; this is simple base physics.

Now, in our reference system I, where we (the observers) are at rest, if we want to make a body, whose mass is $m_0$ and originally at rest, get speed V, we have to give it a delta v indeed, but for all what has been said so far, as we are already moving in the Universe, (and with speed c), such a delta v must withstand the following (vectorial) equality:

$$V = \Delta_V v = \sqrt{(c^2 - v_{New-Abs-Univ-Speed}^2)}\,, \qquad (3)$$

where $v_{New-Abs-Univ-Speed}$ is the new absolute speed the body ($m_0$) looks to have, not with respect to us, but with respect to the Universe and its center of mass.

As a matter of fact, a body is inexorably linked to the Universe where it is, in which, as chance would have it, it already moves with speed c and therefore has got an intrinsic energy $m_0c^2$ .

In more details, as we want to give the body ($m_0$) a kinetic energy $E_k$ , in order to make it gain speed V (with respect to us), and considering that, for instance, in a spring which has a mass on one of its ends, for the harmonic motion law, the speed follows a harmonic law like:

$$v = (wX_{Max})\sin a = V_{Max}\sin a \quad (v_{New-Abs-Univ-Speed} = c\sin a \text{ , in our case}),$$

and for the harmonic energy we have a harmonic law like:

$$E = E_{Max}\sin a \quad (m_0c^2 = (m_0c^2 + E_K)\sin a \text{ , in our case}),$$

we get $\sin a$ from the two previous equations and equal them, so getting:

$$v_{New-Abs-Univ-Speed} = c\frac{m_0c^2}{m_0c^2 + E_K}\,,$$

now we put this expression for $v_{New-Abs-Univ-Speed}$ in (3) and get:

$$V = \Delta_V v = \sqrt{(c^2 - v_{New-Abs-Univ-Speed}^2)} = \sqrt{[c^2 - (c\frac{m_0c^2}{m_0c^2 + E_K})^2]} = V \text{ , and we report it below:}$$

$$V = \sqrt{[c^2 - (c\frac{m_0c^2}{m_0c^2 + E_K})^2]} \qquad (4)$$

If now we get $E_K$ from (4), we have:

$$E_K = m_0c^2(\frac{1}{\sqrt{1 - \frac{V^2}{c^2}}} - 1)$$ ! which is exactly the Einstein's relativistic kinetic energy!

If now we add to $E_K$ such an intrinsic kinetic energy of $m_0$ (which also stands "at rest" – rest with respect to us, not with respect to the center of mass of the Universe), we get the total energy:

$$E = E_K + m_0c^2 = m_0c^2 + m_0c^2(\frac{1}{\sqrt{1 - \frac{V^2}{c^2}}} - 1) = \frac{1}{\sqrt{1 - \frac{V^2}{c^2}}}m_0c^2 = g \cdot m_0c^2$$ , that is the well known

$E = g \cdot m_0 c^2$ (of the Special Theory of Relativity).
All this after that we supposed to bring kinetic energy to a body at rest (with respect to us).
In case of lost energies (further phase of the harmonic motion), the following one must be used:

$$E = \frac{1}{g} \cdot m_0 c^2 \quad \text{(Rubino)} \qquad (5)$$

which is intuitive just for the simple reason that, with the increase of the speed, the coefficient $1/g$ lowers $m_0$ in favour of the radiation, that is of the lost of energy; unfortunately, this is not provided for by the Theory of Relativity, like in (5).
For a convincing proof of (5) and of some of its implications, I have further files about.

**On the Universe, the dark matter and the unification of forces:**
a particle-antiparticle pair, which corresponds to an energy ΔE, is legitimated to appear anyhow, unless it lasts less than Δt, in such a way that $\Delta E \cdot \Delta t \leq \mathbf{h}/2$ (from the Heisenberg Indetermination Principle); in other words, it can appear provided that the observer doesn't have enough time, in comparison to his means of measure, to figure it out, so coming to the ascertainment of a violation of the Principle of Conservation of Energy.
In fact, the Universe seems to vanish towards a singularity, after its collapsing, or taking place from nothing, during its inverse Big Bang-like process, and so doing, it would be a violation of such a conservation principle, if not supported by the above Indetermination Principle.
The full releasing of every single small spring which stands for the electron-positron pair, is nothing but the annihilation, with turning into photons of those two particles. In such a way, that pair wouldn't be represented anymore by a pointed wave, pointed in certain place and time, (for instance $\sin(x-vt)/(x-vt)$, or the similar $d(x-vt)$ of Dirac), where the pointed part would stand for the charge of the spring, but it will be represented by a function like $\sin(x-ct)$, omogeneous along all its trajectory, and this is what a photon is. This will happen when the collapsing of the Universe in its center of mass will be accomplished.
The appearing and the annihilation correspond to the expansion and collapsing of the Universe. Therefore, if we were in an expanding Universe, we wouldn't have any gravitational force, or it were opposite to how it is now, and it's not true that just the electric force can be repulsive, but the gravitational force, too, can be so (in an expanding Universe); now it's not so, but it was!
The most immediate philosophical consideration which could be made, in such a scenario, is that, how to say, anything can be born (can appear), provided that it dies, and quick enough; so the violation is avoided, or better, it's not proved/provable, and the Principle of Conservation of Energy is so preserved, and the contradiction due to the appearing of energy from nothing is gone around, or better, it is contradicting itself.
The proton, then, plays the role of a positron, with respect to the electron and it's heavier than it because of the possibility to exist that the fate couldn't deny to it, around the Anthropical Cosmological Principle, as such a proton brings to atoms and cells for life which investigate over it.
When the collapse of the Univers will happen, the proton will irradiate all its mass and become a positron, ready to annihilate with the electron. And through all this, we also answer the question on the unexplained prevailing of matter over the antimatter: in fact, that's not true; if we consider the proton, that is a future and ex positron, as the antimatter of the electron, and vice versa, the balance is perfect.
Well, we have to admit that if matter shows mutual attraction as gravitation, then we are in a harmonic and oscillating Universe in contraction towards a common point, that is the center of mass of all the Universe. As a matter of fact, the acceleration towards the center of mass of the Universe and the gravitational attractive properties are two faces of the same medal. Moreover, all the matter around us shows it want to collapse: if I have a pen in my hand and I leave it, it drops, so showing me it wants to collapse; then, the Moon wants to collapse into the Earth, the Earth wants to collapse into the Sun, the Sun into the centre of the Milky Way, the Milky Way into the centre of the cluster and so on; therefore, all the Universe is collapsing. Isn't it?
So why do we see far matter around us getting farther and not closer? Easy. If three parachutists jump in succession from a certain altitude, all of them are falling towards the center of the Earth, where they would ideally meet, but if parachutist n. 2, that is the middle one, looks ahead, he sees n. 1 getting farther, as he jumped earlier and so he has a higher speed, and if he looks back at n. 3, he still sees him getting farther as n. 2, who is making observations, jumped before n. 3 and so he has a higher speed. Therefore, although all

the three are accelerating towards a common point, they see each other getting farther. Hubble was somehow like parachutist n. 2 who is making observations here, but he didn't realize of the collapsing background acceleration.
At last, I remind you of the fact that recent measurements on far supernovae, used as standard candles, have shown an accelerating Universe; this fact is against the theory of our supposed current post Big Bang expansion, as, after that an explosion has ceased its effect, chips spread out in expansion, ok, but they must obviously do that while slowing down, not while accelerating.

Moreover, on abundances of $U^{235}$ and $U^{238}$ we see now (trans-CNO elements created during the explosion of the primary supernova), we see that (maybe) the Earth and the solar system are just (approximately) five or six billion years old, but all this is not against all what we are going to say on the real age of the Universe, as there could have been sub-cycles from which galaxies and solar systems originated, whose duration is likely less than the age of the whole Universe.

Moreover, I remind ourselves of the fact that the prevailing astrophysics and cosmology lead to data which totally disagree with those from the observations on the Universe; from this came the search for the mysterious dark matter etc:

astrophysicists measure a ρ value of the visible Universe which is around: $r \cong 2 \cdot 10^{-30} kg/m^3$.

Prevailing cosmology nowadays gives the following value of ρ:

$$r_{Wrong} = M_{Univ} / (\frac{4}{3} p R_{Univ}^3) = (c^3 / GH) \Big/ [\frac{4}{3} p (\frac{c}{H})^3] = H^2 / (\frac{4}{3} p G) \cong 2 \cdot 10^{-26} kg/m^3 \quad \text{(too high!)}$$

$(H \cong 75 km/(s \cdot Mpc) \cong 2{,}338 \cdot 10^{-18} [(\frac{m}{s}) \Big/ m]$ Hubble's constant)

If now we say the Universe is 100 times bigger and heavier:

$$R_{Univ-New} \cong 100 R_{Univ} \cong 1{,}17908 \cdot 10^{28} m$$

$$M_{Univ-New} \cong 100 M_{Univ} \cong 1{,}59486 \cdot 10^{55} kg$$

then we get:

$$r = M_{Univ-New} / (\frac{4}{3} p \cdot R_{Univ-New}^3) = 2.32273 \cdot 10^{-30} kg/m^3 \quad !$$

which is the right measured density!

By these new bigger values, we also realize that:

$$c^2 = \frac{GM_{Univ}}{R_{Univ}} \quad ! \qquad (6)$$

About the new $T_{Univ}$ of the Universe, we know from physics that: v=ωR and $w = 2p / T$ , and, for the whole Universe: c=ω$R_{Univ}$ and $w = 2p / T_{Univ}$ , from which:

$$T_{Univ} = \frac{2pR_{Univ}}{c} = 2{,}47118 \cdot 10^{20} s \qquad \text{(100 times longer)}$$

Moreover, we define the classic radius of the electron in the following way:

$$m_e \cdot c^2 = \frac{1}{4pe_0} \frac{e^2}{r_e} \ , \qquad (7)$$

so: $r_e = \frac{1}{4pe_0} \frac{e^2}{m_e \cdot c^2} \cong 2{,}8179 \cdot 10^{-15} m$.

Now, if we use the (6) in the (7) we get:

$$\frac{1}{4pe_0} \cdot \frac{e^2}{r_e} = \frac{GM_{Univ} m_e}{R_{Univ}} \quad ! \qquad (8)$$

As an alternative, we know that the Fine Structure Constant is 1 divided by 137 and it's given by the following equation:

$a = \frac{1}{137} = \frac{\frac{1}{4pe_0}e^2}{\frac{h}{2p}c}$ , but we also see that $\frac{1}{137}$ is given by the following equation, which can be considered suitable, as well, as the Fine Structure Constant:

$a = \frac{1}{137} = \frac{\frac{Gm_e^2}{r_e}}{hn_{Univ}}$ , where $n_{Univ} = \frac{1}{T_{Univ}}$ ($T_{Univ}$ is the new one, just obtained!)

So, we could set the following equation and deduce the relevant consequences:

$(a = \frac{1}{137}) = \frac{\frac{1}{4pe_0}e^2}{\frac{h}{2p}c} = \frac{\frac{Gm_e^2}{r_e}}{hn_{Univ}}$ , from which: $\frac{1}{4pe_0}e^2 = \frac{c}{2pn_{Univ}}\frac{Gm_e^2}{r_e} = R_{Univ}\frac{Gm_e^2}{r_e}$

Therefore, we can write: $\frac{1}{4pe_0}\frac{e^2}{R_{Univ}} = \frac{Gm_e^2}{r_e}$ .

Now, if we temporarily imagine, out of simplicity, that the mass of the Universe is made of N electrons $e^-$ and positrons $e^+$ , we could write:

$M_{Univ} = N \cdot m_e$ , from which: $\frac{1}{4pe_0}\frac{e^2}{R_{Univ}} = \frac{GM_{Univ}m_e}{\sqrt{N}\sqrt{N}r_e}$ , or also:

$$\frac{1}{4pe_0} \cdot \frac{e^2}{(R_{Univ}/\sqrt{N})} = \frac{GM_{Univ}m_e}{\sqrt{N}r_e} \quad . \qquad (9)$$

If now we suppose that $R_{Univ} = \sqrt{N}r_e$ (10)

or, by the same token, $r_e = R_{Univ}/\sqrt{N}$ , then (9) becomes: $\frac{1}{4pe_0} \cdot \frac{e^2}{r_e} = \frac{GM_{Univ}m_e}{R_{Univ}}$ ! that is (8) again.

Now, first of all, we see that the supposition $R_{Univ} = \sqrt{N}r_e$ is very right, as from the definition of N above given, we have:

$N = \frac{M_{Univ}}{m_e} \cong 1{,}75 \cdot 10^{85}$ , from which: $\sqrt{N} \cong 4{,}13 \cdot 10^{42}$ and $R_{Univ} = \sqrt{N}r_e \cong 1{,}18 \cdot 10^{28} m$ , that is the very $R_{Univ}$ value.

Equation (8) is of a paramount importance and has got a very clear meaning, as it tells us that the electrostatic energy of an electron in an electron-positron pair ($e^+e^-$ adjacent) is exactly the gravitational energy given to this pair by the whole Universe $M_{Univ}$ at an $R_{Univ}$ distance! (and vice versa)

Therefore, an electron gravitationally cast by an enormous mass $M_{Univ}$ for a very long time $T_{Univ}$ and through a long travel $R_{Univ}$ , gains a gravitationally originated kinetic energy so that, if later it has to release it all together, in a short time, through a collision, for instance, and so through an oscillation of the $e^+e^-$ pair - spring, it must transfer a so huge gravitational energy indeed, stored in billion of years that if this energy were to be due just to the gravitational potential energy of the so small mass of the electron itself, it should fall short by many orders of size. Therefore, the effect due to the immediate release of a big stored energy, by $e^-$ , which is known to be $\frac{GM_{Univ}m_e}{R_{Univ}}$ , makes the electron “appear”, in the very moment, and in a narrow range ($r_e$), to be able to release energies coming from forces stronger than the gravitational one.

I also remark here, that the energy represented by (8), as chance would have it, is really $m_e c^2$ !, that is a sort of run taking kinetic energy, had by the free falling electron-positron pair, and that Einstein assigned to the rest matter, unfortunately without telling us that such a matter is never at rest with respect to the center of mass of the Universe, as we all are inexorably free falling, even though we see one another at rest; from which is its essence of gravitationally originated kinetic energy $m_e c^2$:

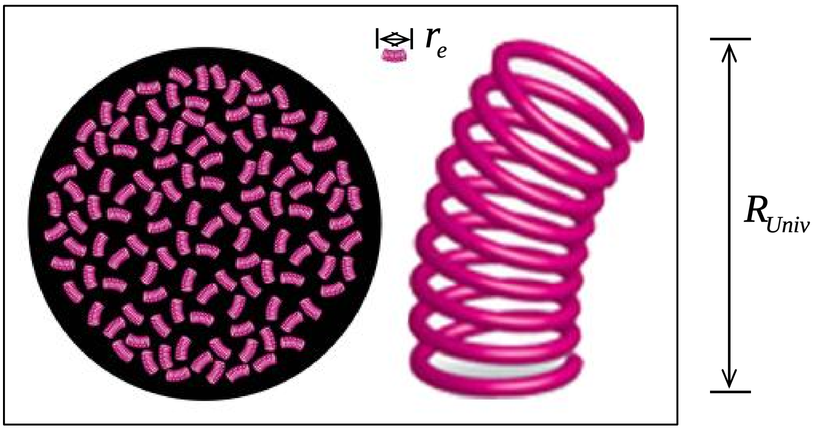
$$m_e c^2 = \frac{1}{4\pi\varepsilon_0} \cdot \frac{e^2}{r_e} = \frac{GM_{Univ} m_e}{R_{Univ}} .$$

Finally, we directly prove the equation (10) $R_{Univ} = \sqrt{N} r_e$ (proof by Leonardo Rubino):

the radius of the Universe is equal to the classic radius of the electron multiplied by the square root of the number of electrons (and positrons) N in which the Universe can be thought as made of. (We know that in reality almost all the matter in the Universe is not made of $e^+e^-$ pairs, but rather of $p^+e^-$ pairs of hydrogen atoms H, but we are now interested in considering the Universe as made of basic bricks, or in fundamental harmonics, if you like, and we know that electrons and positrons are basic bricks, as they are stable, while the proton doesn't seem so, and then it's neither a fundamental harmonic, and so nor a basic brick).

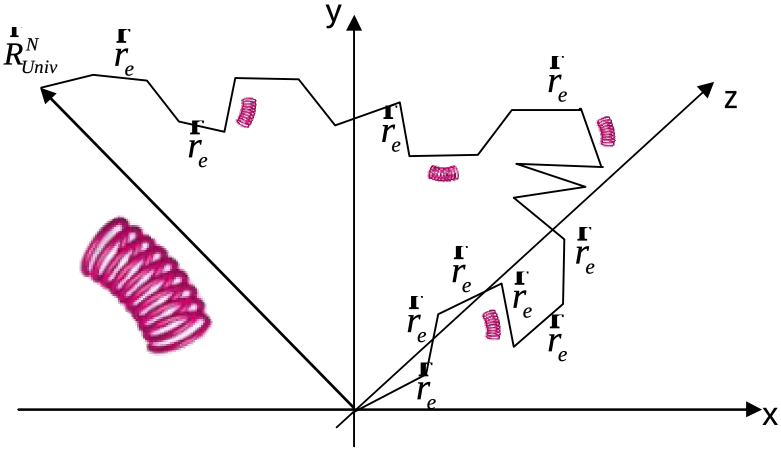
Suppose that every pair $e^+e^-$ (or, for the moment, also $p^+e^-$ (H), if you like) is a small spring (in fact all the matter follows the Hooke's Law), and that, for the same reason, the Universe is a big oscillating spring (now contracting towards its center of mass) with an oscillation amplitude obviously equal to $R_{Univ}$ , which is made of all microoscillations of $e^+e^-$ pairs.

And, at last, we confirm that those micro springs are all randomly spread out in the Universe, as it must be; therefore, one is oscillating to the right, another to the left, another one upwards and another downwards, and so on. Moreover $e^+$ and $e^-$ components of each pair are not fixed, so we will not consider N/2 pairs oscillating with an amplitude $2r_e$, but N electrons/positrons oscillating with an amplitude $r_e$.




The Universe represented as a set of many (N) small springs, oscillating on <u>random</u> directions, or as a single big oscillating spring.

Now, as those micro oscillations are randomly oriented, their random composition can be shown as in the figure below.




Composition of N micro oscillations $\vec{r}_e$ randomly spread out, so forming the global oscillation $R_{Univ}$.

We can obviously write that: $\vec{R}^N_{Univ} = \vec{R}^{N-1}_{Univ} + \vec{r}_e$ and the scalar product $\vec{R}^N_{Univ}$ with itself yields: $\vec{R}^N_{Univ} \cdot \vec{R}^N_{Univ} = (R^N_{Univ})^2 = (R^{N-1}_{Univ})^2 + 2\vec{R}^{N-1}_{Univ} \cdot \vec{r}_e + r_e^2$ ; we now take the mean value:

$$\left\langle (R^N_{Univ})^2 \right\rangle = \left\langle (R^{N-1}_{Univ})^2 \right\rangle + \left\langle 2\vec{R}^{N-1}_{Univ} \cdot \vec{r}_e \right\rangle + \left\langle r_e^2 \right\rangle = \left\langle (R^{N-1}_{Univ})^2 \right\rangle + \left\langle r_e^2 \right\rangle , \quad (11)$$

as $\left\langle 2\vec{R}^{N-1}_{Univ} \cdot \vec{r}_e \right\rangle = 0$, because $\vec{r}_e$ can be oriented randomly over 360° (or over $4\pi$ sr, if you like), so a vector averaging with it, as in the previous equation, yields zero.
We so rewrite (11): $\left\langle (R^N_{Univ})^2 \right\rangle = \left\langle (R^{N-1}_{Univ})^2 \right\rangle + \left\langle r_e^2 \right\rangle$ and proceeding, on it, by induction:
(by replacing N with N-1 and so on):

$\left\langle (R^{N-1}_{Univ})^2 \right\rangle = \left\langle (R^{N-2}_{Univ})^2 \right\rangle + \left\langle r_e^2 \right\rangle$ , and then: $\left\langle (R^{N-2}_{Univ})^2 \right\rangle = \left\langle (R^{N-3}_{Univ})^2 \right\rangle + \left\langle r_e^2 \right\rangle$ etc, we get:

$\left\langle (R^N_{Univ})^2 \right\rangle = \left\langle (R^{N-1}_{Univ})^2 \right\rangle + \left\langle r_e^2 \right\rangle = \left\langle (R^{N-2}_{Univ})^2 \right\rangle + 2\left\langle r_e^2 \right\rangle = .......... = 0 + N\left\langle r_e^2 \right\rangle = N\left\langle r_e^2 \right\rangle$ , that is:

$\left\langle (R^N_{Univ})^2 \right\rangle = N\left\langle r_e^2 \right\rangle$ , from which, by taking the square roots of both sides:

$\sqrt{\left\langle (R^N_{Univ})^2 \right\rangle} = R_{Univ} = \sqrt{N}\sqrt{\left\langle r_e^2 \right\rangle} = \sqrt{N} \cdot r_e$ , that is:

$R_{Univ} = \sqrt{N} \cdot r_e$ ! (proof by Leonardo Rubino)

At last, according to Stephan-Boltzmann's law: $\varepsilon = \sigma T^4$ [W/m$^2$], (where $\sigma = 5,67 \cdot 10^{-8} W/(m^2K^4)$) it's very interesting to notice that if we imagine an electron ("<u>stable</u>" and base particle in our Universe!) irradiating all energy it's made of in time $T_{Univ}$ we get a power which is exactly ½ of Planck's constants, expressed in watt!
In fact:

$$L_e = \frac{m_e c^2}{T_{Univ}} = \frac{1}{2} h_W = 3,316 \cdot 10^{-34} W$$

And we also notice that an electron and the Universe have got the same luminosity-mass ratio; in fact:

$L_{Univ} = \frac{M_{Univ}c^2}{T_{Univ}} = 5,80 \cdot 10^{51} W$ (by definition) and it's so true that:

$\frac{L_{Univ}}{M_{Univ}} = \frac{\frac{M_{Univ}c^2}{T_{Univ}}}{M_{Univ}} = \frac{c^2}{T_{Univ}} = \frac{L_e}{m_e} = \frac{\frac{m_e c^2}{T_{Univ}}}{m_e} = \frac{c^2}{T_{Univ}} = \frac{\frac{1}{2}h_W}{m_e}$ and, according to Stephan-Boltzmann's law, we can consider that both an "electron" and the Universe have got the same temperature, the cosmic microwave background one:

$\frac{L}{4\pi R^2} = \sigma T^4$ , so: $T = (\frac{L}{4\pi R^2 \sigma})^{1/4} = (\frac{L_{Univ}}{4\pi R_{Univ}^2 \sigma})^{1/4} = (\frac{L_e}{4\pi r_e^2 \sigma})^{1/4} = (\frac{\frac{1}{2}h}{4\pi r_e^2 \sigma})^{1/4} = 2,73K$ !

And all this is no more true if we use old Universe data from the prevailing cosmology!

Then, let's remind ourselves of the classic radius of an electron ("<u>stable</u>" and base particle in our Universe!), which is defined by the equality of its energy $E=m_ec^2$ ant its electrostatic one, imagined on its surface ( in a classic sense):

$m_e \cdot c^2 = \frac{1}{4\pi\varepsilon_0} \frac{e^2}{r_e}$ , so:

$$r_e = \frac{1}{4pe_0}\frac{e^2}{m_e \cdot c^2} \cong 2{,}8179 \cdot 10^{-15}\, m$$

Now, still in a classic sense, if we imagine, for instance, to figure out the gravitational acceleration on an electron, as if it were a small planet, we must easily conclude that: $m_x \cdot g_e = G\frac{m_x \cdot m_e}{r_e^2}$ , so:

$$g_e = G\frac{m_e}{r_e^2} = 8p^2 e_0^2 \frac{G m_e^3 c^4}{e^4} = a_{Univ} = 7{,}62 \cdot 10^{-12}\ m/s^2 \ !$$

so getting the collapsing cosmic acceleration, which can be obtained directly also from the new values for the radius and mass of the Universe, shown on page 6; in fact:

$a_{Univ} = \frac{c^2}{R_{Univ-New}} = 7{,}62 \cdot 10^{-12}\ m/s^2$ , (as we know, from physics, that $a = \frac{v^2}{r}$ ), and also:

$a_{Univ} = G \cdot M_{Univ-New} / R_{Univ-New}^2 = 7{,}62 \cdot 10^{-12}\ m/s^2$ (from the Newton's Universal Law of Gravitation)

and the same value can be obtained also from the Coma galaxy cluster data:

$a_{Univ} = \frac{\Delta v}{\Delta t} = \frac{\Delta v}{\frac{2 \cdot \Delta x}{\Delta v}} = \frac{(\Delta v)^2}{2 \cdot \Delta x} = a_{Univ} \cong 7{,}62 \cdot 10^{-12} m/s^2$ (Δx=100 Mpc = 3,26 $10^8$ l.y. = 3,09 $10^{24}$ m; Δv=6870 km/s=6,87 $10^6$ m/s)

And the Heisenberg Uncertainty Principle is a consequence of the essence of the macroscopic and $a_{Univ}$ accelerating Universe:

according to this principle, the product Δx Δp must keep above $\mathbf{h}/2$, and with the equal sign, when Δx is at a maximum, Δp must be at a minimum, and vice versa:

$\Delta p \cdot \Delta x \geq \mathbf{h}/2$ and $\Delta p_{\max} \cdot \Delta x_{\min} = \mathbf{h}/2$ ( $\mathbf{h} = h/2p$ )

Now, as $\Delta p_{\max}$ we take, for the electron ("<u>stable</u>" and base particle in our Universe!), $\Delta p_{\max} = (m_e \cdot c)$ and as $\Delta x_{\min}$ for the electron, as it is a harmonic of the Universe in which it is (just like a sound can be considered as made of its harmonics), we have: $\Delta x_{\min} = a_{Univ} / (2p)^2$ , as a direct consequence of the characteristics of the Universe in which it is; in fact, $R_{Univ} = a_{Univ} / w_{Univ}^2$ , as we know from physics that $a = w^2 R$ , and then $w_{Univ} = 2p / T_{Univ} = 2p n_{Univ}$ , and as $w_e$ of the electron (which is a harmonic of the Universe) we therefore take the "$n_{Univ}$–th" part of $w_{Univ}$ , that is:

$|w_e| = |w_{Univ}/n_{Univ}|$ like if the electron of the electron-positron pairs can make oscillations similar to those of the Universe, but through a speed-amplitude ratio which is not the (global) Hubble Constant, but through $H_{Global}$ divided by $n_{Univ}$ , and so, if for the whole Universe: $R_{Univ} = a_{Univ} / w_{Univ}^2$ , then, for the electron:

$\Delta x_{\min} = \frac{a_{Univ}}{(w_e)^2} = \frac{a_{Univ}}{(|w_{Univ}/n_{Univ}|)^2} = \frac{a_{Univ}}{(2p)^2}$ , from which:

$\Delta p_{\max} \cdot \Delta x_{\min} = m_e c \frac{a_{Univ}}{(2p)^2} = 0{,}527 \cdot 10^{-34}$ [Js] and such a number ( $0{,}527 \cdot 10^{-34}$ Js), as chance would have it, is really $\mathbf{h}/2$ !!

On discrepancies between calculated and observed rotation speeds of galaxies:

Andromeda galaxy (M31):

Distance: 740 kpc; $R_{Gal}$=30 kpc;
Visible Mass $M_{Gal}$ = 3 $10^{11}M_{Sun}$;
Suspect Mass (+Dark) $M_{+Dark}$ = 1,23 $10^{12}M_{Sun}$;
$M_{Sun}$=2 $10^{30}$ kg; 1 pc= 3,086 $10^{16}$ m;

Andromeda galaxy (M31).

By balancing centrifugal and gravitational forces for a star at the edge of a galaxy:

$m_{star}\frac{v^2}{R_{Gal}} = G\frac{m_{star}M_{Gal}}{R_{Gal}^2}$ , from which: $v = \sqrt{\frac{GM_{Gal}}{R_{Gal}}}$

On the contrary, if we also consider the tidal contribution due to $a_{Univ}$ , i.e. the one due to all the Universe around, we get:

$v = \sqrt{\frac{GM_{Gal}}{R_{Gal}} + a_{Univ}R_{Gal}}$ ; let's figure out, for instance, in M31, how many $R_{Gal}$ (how many k times) far away from the center of the galaxy the contribution from $a_{Univ}$ can save us from supposing the existence of dark matter:

$\sqrt{\frac{GM_{+Dark}}{kR_{Gal}}} = \sqrt{\frac{GM_{Gal}}{kR_{Gal}} + a_{Univ}kR_{Gal}}$ , so: $k = \sqrt{\frac{G(M_{+Dark} - M_{Gal})}{a_{Univ}R_{Gal}^2}} \cong 4$ , therefore, at 4$R_{Gal}$ far away, the existence of $a_{Univ}$ makes us obtain the same high speeds observed, without any dark matter. Moreover, at 4$R_{Gal}$ far away, the contribution due to $a_{Univ}$ is dominant.

At last, we notice that $a_{Univ}$ has no significant effect on objects as small as the solar system; in fact:

$G\frac{M_{Sun}}{R_{Earth-Sun}} \cong 8{,}92 \cdot 10^8 >> a_{Univ}R_{Earth-Sun} \cong 1{,}14$ .

All these considerations on the link between $a_{Univ}$ and the rotation speed of galaxies are widely open to further speculations and the equation through which one can take into account the tidal effects of $a_{Univ}$ in the galaxies can have a somewhat different and more difficult look, with respect to the above one, but the fact that practically all galaxies have dimensions in a somewhat narrow range (3 – 4 $R_{Milky\ Way}$ or not so much more) doesn't seem to be like that just by chance, and, in any case, none of them have radii as big as tents or hundreds of $R_{Milky\ Way}$ , but rather by just some times. In fact, the part due to the cosmic acceleration, by zeroing the centripetal acceleration in some phases of the revolution of galaxies, would fringe the galaxies themselves, and, for instance, in M31, it equals the gravitational part at a radius equal to:

$\frac{GM_{M31}}{R_{Gal-Max}} = a_{Univ}R_{Gal-Max}$ , from which: $R_{Gal-Max} = \sqrt{\frac{GM_{M31}}{a_{Univ}}} \cong 2{,}5R_{M31}$; in fact, maximum radii ever observed in galaxies are roughly this size.

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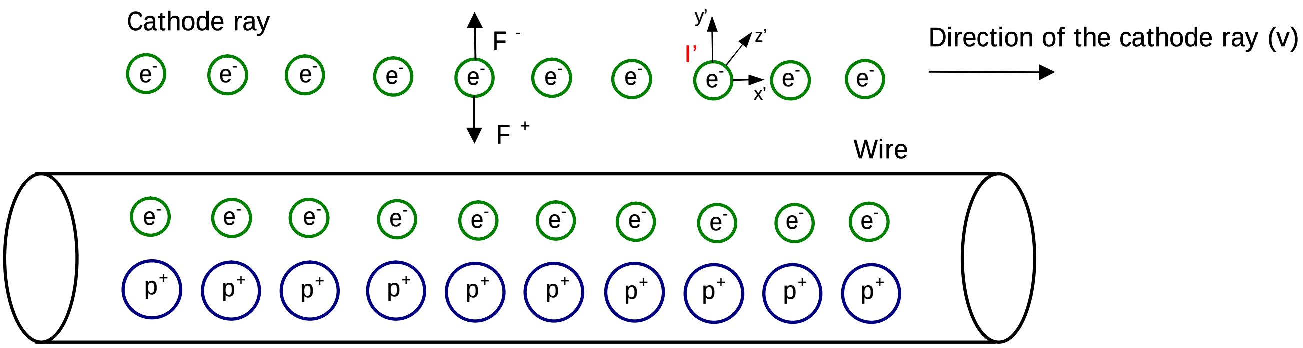
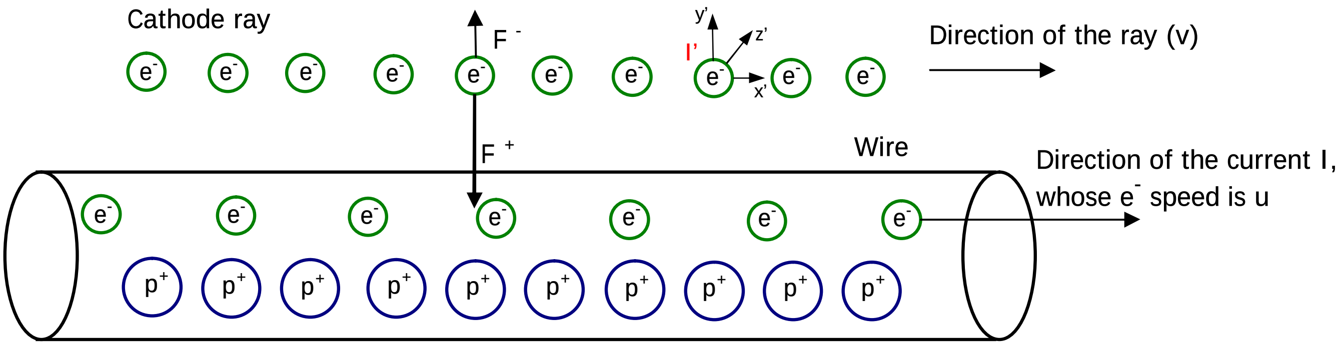
At last, I remind you of the common essence of the electric and the magnetic forces:
Concerning this, let's examine the following situation, where we have a wire, of course made of positive nuclei and electrons, and also a cathode ray (of electrons) flowing parallel to the wire:



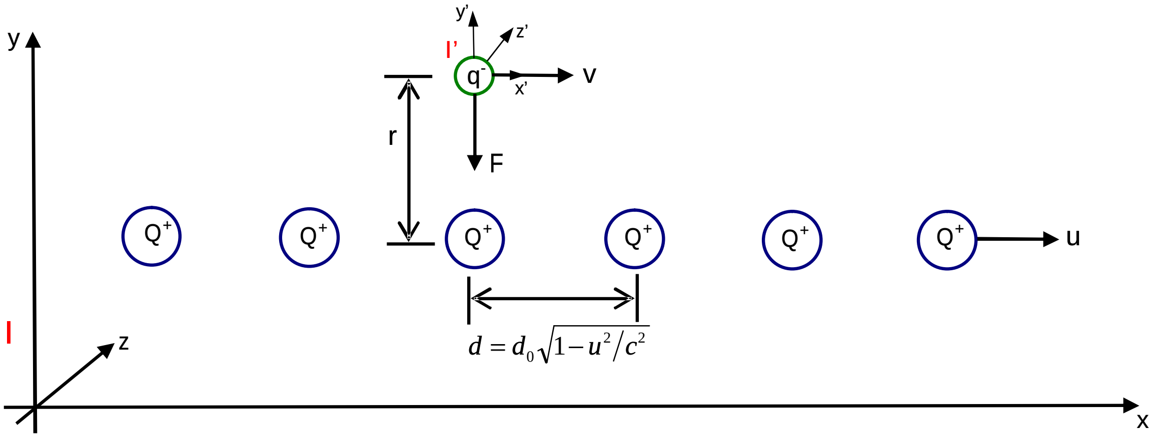

Wire not flown by any current, seen from the cathode ray steady ref. system I' (x', y', z').

We know from magnetism that the cathode ray will not be bent towards the wire, as there isn't any current in it. This is the interpretation of the phenomenon on a magnetic basis;
on an electric basis, we can say that every single electron in the ray is rejected away from the electrons in the wire, through a force $F^-$ identical to that $F^+$ through which it's attracted from positive nuclei in the wire.
Now, let's examine the situation in which we have a current in the wire ($e^-$ with speed u)




Wire flown by a current (with $e^-$ speed=u), seen from the cathode ray steady ref. system I' (x', y', z').

In this case we know from magnetism that the cathode ray must bend towards the wire, as we are in the well known case of parallel currents in the same direction, which must attract each other.
This is the interpretation of this phenomenon on a magnetic basis; on an electric basis, we can say that as the electrons in the wire follow those in the ray, they will have a speed lower than that of the positive nuclei, in the system I', as such nuclei are still in the wire.
As a consequence of that, spaces among the electrons in the wire will undergo a lighter relativistic Lorentz contraction, if compared to that of the nuclei's, so there will be a lower negative charge density, if compared to the positive one, so electrons in the ray will be electrically attracted by the wire.
This is the interpretation of the magnetic field on an electric basis. Now, although the speed of electrons in an electric current is very low (centimeters per second), if compared to the relativistic speed of light, we must also acknowledge that the electrons are billions and billions...., so a small Lorentz contraction on so many spaces among charges, makes a substantial magnetic force to appear.
But now let's see if mathematics can prove we're quantitatively right on what asserted so far, by showing that the magnetic force is an electric one itself, but seen on a relativistic basis.
On the basis of that, let's consider a simplified situation in which an electron $e^-$, whose charge is q, moves with speed v and parallel to a nuclei current whose charge is $Q^+$ each (and speed u):




Current of positive charge (speed u) and an electron whose speed is v, in the reader's steady system I.

a) Evaluation of F on an electromagnetic basis, in the system I :
First of all, we remind ourselves of the fact that if we have N charges Q in line and d spaced (as per the above figure), then the linear charge density λ will be:

$$l = N\cdot Q/N\cdot d = Q/d \quad .$$

Now, still with reference to the figure, in the system I, for the electromagnetics the electron will undergo the Lorentz force $F_l = q(E + v\times B)$ which is made of an originally electrical component and of a magnetic one:

$F_{el} = E\cdot q = (\frac{1}{e_0}\frac{l}{2pr})q = (\frac{1}{e_0}\frac{Q/d}{2pr})q$ due to the electric attraction from a linear distribution of charges Q, and:

$F_{magn} = m_0\frac{I}{2pr} = m_0\frac{Q/t}{2pr} = m_0\frac{Q/(d/u)}{2pr} = m_0\frac{uQ/d}{2pr}$ (Biot and Savart).

So: $F_l = q(\frac{1}{e_0}\frac{Q/d}{2pr} - vm_0\frac{uQ/d}{2pr}) = q\frac{Q/d_0}{2pr}(\frac{1}{e_0} - m_0uv)\frac{1}{\sqrt{1-u^2/c^2}}$ , (12)

where the negative sign tells us the magnetic force is repulsive, in that case, because of the real directions of those currents, and where the steady distance $d_0$ is contracted to d, according to Lorentz, in the system I where charges Q have got speed u ( $d = d_0\sqrt{1-u^2/c^2}$ ).

b) Evaluation of F on an electric base, in the steady system I' of q:

in the system I' the charge q is still and so it doesn't represent any electric current, and so there will be only a Coulomb electric force towards charges Q:

$$F'_{el} = E'q = (\frac{1}{e_0}\frac{l'}{2pr})q = (\frac{1}{e_0}\frac{Q/d'}{2pr})q = q(\frac{1}{e_0}\frac{Q/d_0}{2pr})\frac{1}{\sqrt{1-u'^2/c^2}} \quad , \qquad (13)$$

where u' is the speed of the charge distribution Q in the system I', which is due to u and v by means of the well known relativistic theorem of composition of speeds:

$$u' = (u - v)/(1 - uv/c^2) \quad , \qquad (14)$$

and $d_0$, this time, is contracted indie according to u': $d' = d_0\sqrt{1-u'^2/c^2}$ .
We now note that, through some algebraic calculations, the following equality holds (see (14)):

$1-u'^2/c^2 = \frac{(1-u^2/c^2)(1-v^2/c^2)}{(1-uv/c^2)^2}$ , which, if replacing the radicand in (13), yields:

$$F'_{el} = E' \cdot q = (\frac{1}{e_0}\frac{l'}{2pr})q = (\frac{1}{e_0}\frac{Q/d'}{2pr})q = q(\frac{1}{e_0}\frac{Q/d_0}{2pr})\frac{(1-uv/c^2)}{\sqrt{1-u^2/c^2}\sqrt{1-v^2/c^2}} \qquad (15)$$

We now want to compare (12) with (15), but we still cannot, as one is about I and the other is about I'; so, let's scale $F'_{el}$ in (15), to I, too, and in order to do that, we see that, by definition of the force itself, in I':

$F'_{el}(in\_I') = \frac{\Delta p_{I'}}{\Delta t_{I'}} = \frac{\Delta p_I}{\Delta t_I \sqrt{1-v^2/c^2}} = \frac{F_{el}(in\_I)}{\sqrt{1-v^2/c^2}}$ , where $\Delta p_{I'} = \Delta p_I$, as $\Delta p$ extends along y, and not along the direction of the relative motion, so, according to the Lorentz transformations, it doesn't change, while $\Delta t$, of course, does.

So:

$$F_{el}(in\_I) = F'_{el}(in\_I')\sqrt{1-v^2/c^2} = q(\frac{1}{e_0}\frac{Q/d_0}{2pr})\frac{(1-uv/c^2)}{\sqrt{1-u^2/c^2}\sqrt{1-v^2/c^2}}\sqrt{1-v^2/c^2} =$$

$$= q(\frac{1}{e_0}\frac{Q/d_0}{2pr})\frac{(1-uv/c^2)}{\sqrt{1-u^2/c^2}} = F_{el}(in\_I) \qquad (16)$$

Now we can compare (12) with (16), as now both are related to the I system.

Let's write them one over another:

| |
|---|
| $F_l(in\_I) = q(\frac{1}{e_0}\frac{Q/d}{2pr} - vm_0\frac{uQ/d}{2pr}) = q\frac{Q/d_0}{2pr}(\frac{1}{e_0} - m_0uv)\frac{1}{\sqrt{1-u^2/c^2}}$ |
| $F_{el}(in\_I) = q(\frac{1}{e_0}\frac{Q/d_0}{2pr})\frac{(1-uv/c^2)}{\sqrt{1-u^2/c^2}} = q\frac{Q/d_0}{2pr}(\frac{1}{e_0} - \frac{uv}{e_0c^2})\frac{1}{\sqrt{1-u^2/c^2}}$ |

Therefore we can state that these two equations are identical if the following identity holds: $c = 1/\sqrt{e_0 m_0}$ , and this identity is known since 1856. As these two equations are identical, the magnetic force has been traced back to the Coulomb's electric force, so the unification of electric and magnetic fields has been accomplished!!

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Thank you for your attention.

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