Hydrodynamic Gravitation as Cause of Earth Expansion and Red-Shift

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***Abstract*:** From Earth Sciences come clues converging on an important role of the aether in the geological evolution of Earth and planets, as well as all the structures of the universe. Paleogeographic reconstructions allow a rough quantitative evaluation of the amount of new ordinary matter that is added to the planet in the unity of time, and the consequent statement of some cosmological consequences and inferences on the inner energy balance of the Earth. The concept of central flow of aether is defended here. Its antique origin can be found in Isaac Newton (1643-1727) and less vaguely in John Bernoulli (1667-1748). With the help of astrophysical phenomena the aether's density, flow rate, and velocity are computed. An intimal interrelation of these aether parameters with the actually known cosmological parameters (H_0, G, c) is found.

Keywords: *Aether flow, Expanding Earth, Earth's inner Energy, Gravitation, Cosmology.*

Introduction

From the Earth Sciences and the evidence of planet expansion (Egyed, 1961; Hilgenberg, 1967, 1974; Carey, 1976; Owen, 1976; Ollier & Pain; 2000; Maxlow, 2002; Cwojdziński, 2003; Scalera, 1990, 1993, 2001, 2010, 2012, 2020), corroborated today by the experiments of revelation of terrestrial neutrinos of radiogenic origin (Borexino collaboration, 2017; Shimizu, 2017; Scalera, 2020), comes the awareness that the cause of the expansion is a flow of constitutive matter, or aether, which converges towards the center of the planet, transforming itself into ordinary matter during the surface-geocenter journey. In this work we will adopt this concept of "central stream", dating back to Johann Bernoulli, and we will attempt a first step towards the knowledge of the parameters characterizing the aether: density, speed, flow rate.

An Unknown Source of Heat

The problem of the energy balance of the Earth has long been debated (Fiorentini 2007; Anderson 2009; among many others) without having had a definitive solution. Today we can reexamine it from the new perspective provided by a central flow of constitutive matter.

At the beginning of 2017 the results were published of the two experiments – Borexino and KamLAND – set up to measure the radiogenic heat of the Earth (Borexino collaboration 2017; Shimizu 2017). Against a total value of the terrestrial heat flux of 45-47 TW (Terawatt = 10^{12} Watt) the three main models of heat prediction produced by the decay of radioactive elements provide the values shown in Table 1.

TABLE 1		
Cosmochemical approach	**The composition of the Earth is based on the enstatite chondrites, which show a closer isotopic similarity with the mantle and an iron content high enough to explain the terrestrial metallic core.**	**11±02 TW**
Geochemical approach	**For the relative abundances of the lithophile refractory elements it adopts a chondritic composition, then placing limits on the absolute abundances from terrestrial samples.**	**20±04 TW**
Geodynamical approach	**It is based on the hypothetical energetics of mantle convection and on the observed heat flux on the surface.**	**33±04 TW**

To reach 45-47 TW of the superficial heat flux we must add to the radiogenic the primordial heat created by the formation of the planet (in a non-expanding Earth scenario), which has slowly dissipated until it reaches the modern residue estimated to be between 5 TW and 15 TW. Obviously, the geodynamic approach, for its hypothesis of the existence of convective motions in the mantle, would estimate a faster dissipation of the primordial heat, preferring for it today's values below the average of ≈10 TW. If the geodynamic model (33 TW) had been verified by experiments, by adding conservatively 10 TW of primordial, we would be below but very close to the total measured flux on the surface.

To the three radiogenic heat flux values predicted by the models respond the KamLAND and Borexino experiments with results of 8-16 TW (best value) and 18-28 TW (best value) respectively. With these values, the sum of radiogenic (average KamLAND-Borexino ≈18 TW, average Borexino ≈24 TW, maximum Borexino ≈28 TW) and primordial (mean ≈10 TW) is more distant from the surface heat flux value. Some geophysicists (Anderson 2009; among others) invoke the possibility of counting the highest values allowed by standard deviations, but the problem should not be underestimated.

It is important to consider that the feedback of Expanding Earth with the primeval heath evaluation would lead to a primitive heath reevaluation much less than 5-15 TW, making the lack of a plausible heat source more dramatic.

The missing heat could be provided by at least two exothermic processes:

i) an hypothesized nuclear fission in a reactor generated by the migration by gravity of the radioactive elements towards the region near the Earth's center (Herndon 1993). It would produce no more than 5-7 TW, but some researchers would reject it on the basis of various arguments, including geochemical ones (Degueldre & Fiorina 2016). The same difficoulties exist for nuclear reactor eventually located in the layer D", a shell enclosing the liquid core. These nuclear fission reactors hypotheses both suffer of the strong difficulty of the lack of an efficient mechanism of eliminination of the nuclear fission waste that inexorably poison and stop the reaction.

ii) The second possibility is that a transformation of constitutive matter into ordinary one is active in the Earth's core, a process inverse to the already said fission: an exothermic "*fusion*" that increases the degree of aggregation of the constituents of the aether up to ordinary particles and atoms. This flow of aether is a process of which today we cannot but have vague ideas, but seen together with other problems related to the Earth's core (thermal conductivity, heat fluxes, convective motions maintenance, etc.; a synthesis in Sumner 2015) assumes importance as a field of investigation.

Can We Quantify the Incoming Aether?

The mass in the added spherical shell to an expanding Earth body is evaluated using paleogeography, and it is thus possible to calculate the rate of transformation of the constitutive matter into ordinary one as energy transferred to the planet in the unit of time (averaging from the Triassic to today, 250 My) (Scalera, 1993, 2001, 2020). In the Triassic, the Earth's radius can be assumed to be about $R_{Trias}\approx$3000 km. The volume of the Earth (today V_T) was then $V_{Trias}\approx 0.1\cdot V_T$. Therefore the volume acquired in 250 My would be $V_{acq}\approx 0.9\cdot V_T$.

This does not ensure that the acquired mass was $M_{acq}= 0.9\cdot M_T$ (with M_T = current Earth mass), because a poorly known process of differentiation of materials may have been taking place in the deep planet with an increase in volume. Therefore, assuming very crudely that the acquired mass is $M_{acq}= 0.75\cdot (0.9\cdot M_T)$ and a linear increase, while in fact it is exponential, it is possible to evaluate the approximate quantity of energy per second absorbed at the expense of the constituent matter:

$$E_{\epsilon s} = (M_{acq}\cdot c^2) / (2.5\cdot 10^8 \text{ y} \cdot 3.1557\cdot 10^7 \text{ s}) = 4.599\cdot 10^{25} \text{ J/s}$$

with $c = 2.9979\cdot 10^8$ m/s, and number of seconds per year = $3.1557\cdot 10^7$ s.

A Dissipative Term in Gravity and Inertia

Assuming an incompressible perfect fluid aether, and starting from the known relationship for the force exerted by a fluid current of uniform flow with velocity $\boldsymbol{v}$ on a sink singularity of flow rate Q (Buffoni, 2015; and many others. It is called a dissipative term because a static fluid tends to slow down the motion of sinks or sources singularities):

$$\boldsymbol{f} = \rho Q \boldsymbol{v} \ , \qquad (\rho = \text{density of the fluid})$$

we arrive at the expression of the attractive force between two sinkss (or even between two sources):

$$\boldsymbol{f} = \frac{\rho}{4\pi}\frac{Q_1 Q_2}{r^2},$$

which can be compared with the expression of the force of gravity between two masses:

$$\boldsymbol{F} = G\frac{m_1 m_2}{r^2}.$$

But dimensional problems do not allow to identify G with $\rho/4\pi$.

Furthermore, although the quantity of energy absorbed by our planet in the unit of time is estimated through the Earth Sciences, we are unable to know in this way the fundamental quantity ρ, the density of the aether, nor the flow rates Q_i of the aether nor its velocity field $\boldsymbol{v}$ around sinks and sources. The value of $\boldsymbol{v}$(x, y, z) is necessary to provide sense to the hydrogravimetric equations. A given value of force of attraction would be obtained both with high flow rates Q_i and low density

ρ, and by lowering the flow rates Q_i and raising ρ, and the velocity field also plays its part. There are only serious indications that the density of aether is extremely low (Buffoni, 2015; Scalera, 2017, 2021) otherwise the dissipative term $\boldsymbol{f} = \rho Q \boldsymbol{v}$ would be important, and the founding fathers of modern science could not have put the principle of inertia, the concept of conservative field, and not even create the concept of escape velocity,… etc. Earth sciences are not sufficient to solve the problem univocally. Perhaps this prevented Bernoulli's conception of gravity from spreading into the scientific community.

Asking for Help to Astrophysics

To get to fix an at least approximate value of ρ, we ask for help from astrophysics and we hypothesize that the dissipative hydrodynamic term dependent on the velocity $\boldsymbol{f} = \rho q \boldsymbol{v}$ is responsible for the phenomenon of the red shift $z = (\nu_0 - \nu_1)/\nu_1$ of the electromagnetic radiation coming from celestial bodies, which gives rise to Hubble's law $z = \frac{H_0 D}{c}$. In our hypothesis, the variation in frequency and energy E of each photon emitted with frequency ν_0 and received with ν_1

$$\Delta E = h(\nu_0 - \nu_1) \tag{1}$$

is the result of the work L done by the dissipative term $\boldsymbol{f}$ on the motion of a sink of flow rate q (the photon) over the distance D that separates the emitting celestial body from the observer:

$$L = \Delta E = \boldsymbol{f} \cdot D = \rho q \boldsymbol{v} \cdot D. \tag{2}$$

The speed of the sink that constitutes the photon is the speed of light c. So we can write:

$$\boldsymbol{f} = \frac{\Delta E}{D} = \rho q \boldsymbol{c} \ ; \qquad \text{from which we obtain:} \qquad \rho q = \frac{\Delta E}{D \cdot c}. \tag{3}$$

The same quantity ρq can be obtained from the hydrodynamic force $\boldsymbol{f_I}$ (equal to the Newtonian one $\boldsymbol{F}$) between a black hole of flow rate Q_{BH} and a photon of flow rate q forced to orbit around it circularly at a distance set by us R:

$$\boldsymbol{F} = \boldsymbol{f_I} = \frac{\rho}{4\pi} \cdot \frac{Q_{BH} \cdot q}{R^2}; \qquad \text{from which we get:} \qquad \rho q = \boldsymbol{F} \frac{4\pi \cdot \boldsymbol{R^2}}{Q_{BH}}. \tag{4}$$

By combining (3) and (4), known in them all the other quantities, we can know the aether flow rate of the black hole:

$$Q_{BH} = \boldsymbol{F} \cdot \frac{4\pi \cdot \boldsymbol{R^2}}{\Delta E} \cdot D \cdot c. \tag{5}$$

Knowing that the circular orbital velocity for negligible masses with respect to the central one is

$$\boldsymbol{v_0} = \sqrt{\frac{G \cdot M}{\boldsymbol{r}}}, \tag{6}$$

we can obtain the mass of the black hole that causes the photon to orbit around itself at speed $\boldsymbol{v_0} = c$ at a distance R fixed by us:

$$\mathrm{M_{BH}} = \frac{\mathrm{c}^2 R}{\mathrm{G}}, \qquad \text{and} \qquad \boldsymbol{F} = G \cdot \frac{M_{BH} \cdot m}{R^2} = G \cdot \frac{M_{BH} \cdot h\nu}{R^2 c^2} = \frac{h\nu}{R}. \tag{7}$$

From (5), (7) and from Hubble's law we obtain the constant ratio between any Q and its associated mass M (in this case between Q_{BH} e M_{BH}):

$$\frac{Q_{BH}}{M_{BH}} = G\boldsymbol{F} \cdot \frac{4\pi \cdot \boldsymbol{R}}{\Delta E \cdot c} \cdot D = 4\pi \cdot G \cdot \frac{h\nu}{R} \cdot \frac{R}{h\Delta\nu \cdot c} \cdot \frac{z \cdot c}{H_0} = 4\pi \cdot \frac{G}{H_0} = l = 3.6 \cdot 10^8 \qquad \mathrm{m^3/(kg \cdot s)} \tag{8}$$

with l a constant of "transfer" from the phenomenological world of the masses to the real hydrodynamic one of the flow rates.

Finally We Know ρ to the Present Epoch

Now we can derive the value of ρ. Starting from:

$$\frac{Q_{BH}}{M_{BH}} = \frac{q}{m}, \qquad \text{from which} \qquad q = \frac{Q_{BH}}{M_{BH}} m = 4\pi \cdot \frac{G}{H_0} \frac{h\nu}{c^2} = \frac{k}{c^2} \cdot \nu \tag{9}$$

with $k=(4\pi Gh)/(H_0)= l \cdot h$. From which and from (7) we have:

$$\boldsymbol{F} = G \cdot \frac{M_{BH}}{\boldsymbol{R^2}} \cdot m, \quad \text{and we obtain} \qquad m = \boldsymbol{F} \cdot \frac{\boldsymbol{R^2}}{\boldsymbol{G} \cdot M_{BH}}. \tag{10}$$

By inserting (10) into (9) we obtain the flow rate of the photon q:

$$q = F \cdot \frac{Q_{BH}}{G \cdot M_{BH}^2} \cdot \boldsymbol{R^2} \tag{11}$$

With the value of (11), remembering (3), (7) and Hubble's law, we finally obtain the fundamental parameter sought:

$$\rho = \frac{\Delta E}{q \cdot D \cdot c} = \frac{1}{4\pi} \cdot \frac{H_0^2}{G} = \quad 0.647 \cdot 10^{-24} \quad \text{kg/m}^3 \ . \tag{12}$$

The Two Roads That Converge

With (12) we can define the speed field (which appears in Table 2) point by point. The hydrodynamic force $\boldsymbol{f_T}$ experienced by a unit flow rate q positioned at the Earth's surface is:

$\boldsymbol{f_T} = \frac{\rho}{4\pi} \cdot \frac{Q_T \cdot q}{{R_T}^2} = \rho q \boldsymbol{v}$, (with Q_T = Earth's flow rate); from which simplifying and rearranging:

$$\boldsymbol{v} = \frac{Q_T}{4\pi {R_T}^2} = \frac{M_T \cdot l}{4\pi {R_T}^2} = \frac{M_T \cdot G}{H_0 \cdot {R_T}^2} = 4.2 \cdot 10^{18} \quad \text{m/s} \tag{13}$$

at the Earth's surface, 10 orders of magnitude greater than c (as forecasted by other considerations by Laplace, 1805; Lorentz, 1900; VanFlandern, 1998; Carlip, 2000). Above the solid and liquid Earth the velocity field of the constituent matter fluid therefore decreases as $1/r^2$ showing a trend correspondence with the classical gravity field g.

The previous result (13) is obtained from astrophysical considerations, but it is important to verify whether the obtained value of v is compatible with that obtained from the initial evaluation, with paleogeographic reconstructions, of the energy in the unit of time injected into the Earth by the aether and transformed into mass. As we have seen, the energy content of the central torrent has a crossing rate per second of the Earth's surface $E_{\epsilon s} = 4.599 \cdot 10^{25}$ J/s, from which - with R_T the terrestrial radius ($6.373 \cdot 10^6$ m) - we obtain:

$$\rho \frac{dV}{dt} = \rho 4\pi R_T^2 \frac{dx}{dt} = \frac{E_{\epsilon s}}{c^2}, \qquad \text{and then:} \qquad v = \frac{dx}{dt} = \frac{E_{\epsilon s}}{\rho 4\pi R_T^2 c^2} = \quad 1.545 \cdot 10^{18} \quad \text{m/s} \tag{14}$$

to the Earth's surface. Although they are different, the values in (13) and (14) are in the same order of magnitude (with no reason to be so if terrestrial expansion, hydrodynamic gravitation or both were false), confirming the validity of the assumptions, their link with physical reality and the awareness that the mass gradually acquired by the Earth starting from the Triassic must be calculated more accurately, by better evaluating phase changes, errors in the estimation of Earth's paleo-radius, accretion periods with external masses, and errors in the estimation of the geological time. Even a partial conversion of the aether into ordinary matter can be the cause of the discrepancy. The value found in (13) should be closer to true, with H_0 being the most uncertain parameter.

Speed Trend Below the Terrestrial Surface

Now Since this analogy exists between the $1/r^2$ trend of the Newtonian gravity field and the hydrodynamic velocity moving away from the surface of the Earth, and since it is precisely the velocities of the fluid that produce forces identifiable with the gravitational ones, the same analogy must be posed for the Earth's interior.

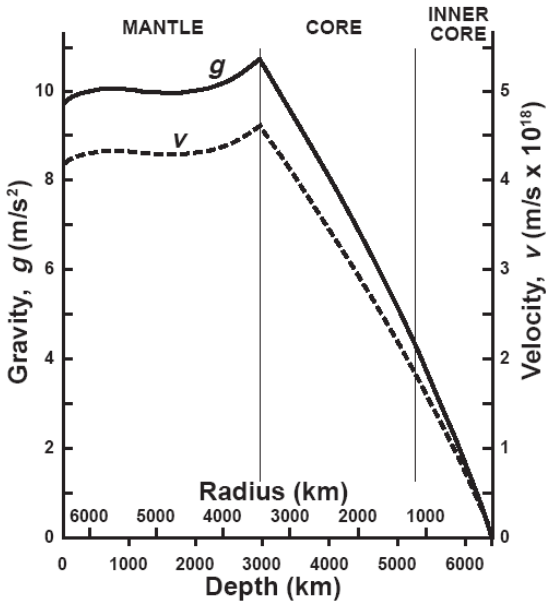

Fig.01 - Variation of the acceleration of gravity (***g***, solid line) in the Earth's interior. The analogy between gravitation ***g*** and forces among sinks in hydrodynamics - both with a trend as $1/r^2$ outside the celestial bodies - leads to a prolongation of the correspondence also within the planets. Then, starting from the astrophysical estimated value for the velocity of the fluid at the earth's surface, v = $4.2 \cdot 10^{18}$ m/s, the trend for ***v*** (dashed line) was plotted, taking into account as negligible the mass-energy transfer rate compared to the masses of the planet during its journey within it. Unlike for sinks or sources, no singularity occurs at the planetary center.

Fig.01 shows the trend of the field ***g*** from the surface to the geocenter, and the same trend must be assumed, at least as a first approximation for the flow field ***v*** of the aether superfluid. We must speak of first approximation as the conversion of the aether into normal matter can change its concentration and speed. In any case the field ***v*** does not increase without limits tending to infinite values (as in hydrodynamic sinks), but starting from the mantle-core boundary begins an almost linear decrease towards the zero value at the Earth's center. In this whole region of the core, considering the deceleration of the incoming flux, a more efficient transformation from constitutive matter to ordinary matter must be expected, without any singularity.

A second zone with strong slowing down and therefore of self-superimposition of the flow, which maintains an almost constant speed from 700 km to about 2000 km, could be related to the maximum observed depth of earthquakes, which in the Wadati-Benioff regions is 700 km.

Overcoming Phenomenological Fields

What we call the gravity field, the intensity of which decreases as $1/r^2$, is nothing more than the force exerted on a unitary mass *m* placed in a given point, but that force does not exist in another different point if we do not place there a unitary mass *m*. The field is therefore a point-by-point mapping of what a unit mass *m* would experience if placed in each of the infinite points of the space surrounding the central massive body with $M >> m$. It is not perceptible what really exists in all the infinite points in which we could place *m*, and which exerts a physical action on *m* (something that is there even if we do not place the test mass *m* in that place). The Newtonian gravitational field is therefore a phenomenological and incomplete description of physical reality (similar fate for the electromagnetic field).

The concepts of gravitational and electromagnetic fields developed almost independently and only for the latter did we arrive at the understanding of the dynamic links existing between the electric and magnetic fields (Maxwell, in his *Treatise* of 1873; and then many others; among which Oliver Heaviside stands out). For the gravitational field, the difficult experimentability of a counterpart analogous to the magnetic field did not allow the drawing up of equations similar to those of Maxwell before the end of the 19th century (Heaviside, 1893). Today it is commonly accepted that it is legitimate to generalize gravitation in a "gravitoelectromagnetic" (GEM) field, whose equations quite similar to Maxwell's (EM) are in Table 2.

TABLE 2

equazioni di Maxwell (EM)	**equazioni gravitoelettromagnetiche (GEM)**	**equazioni idrogravimagnetiche (IGM)**
$\nabla \cdot \mathbf{E} = \frac{\rho}{\epsilon_0}$	$\nabla \cdot \text{Ǝ} = -4\pi G \rho_g$	$\nabla \cdot \mathbf{v} = -\frac{\rho}{\epsilon_0}$
$\nabla \cdot \mathbf{B} = 0$	$\nabla \cdot \text{ɘ} = 0$	$\nabla \cdot \mathbf{w} = 0$
$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$	$\nabla \times \text{Ǝ} = -\frac{\partial \text{ɘ}}{\partial t}$	$\nabla \times \mathbf{v} = -\frac{\partial \mathbf{w}}{\partial t}$
$\nabla \times \mathbf{B} = \frac{1}{\epsilon_0 c^2}\mathbf{J} + \frac{1}{c^2}\frac{\partial \mathbf{E}}{\partial t}$	$\nabla \times \text{ɘ} = \frac{4\pi G}{c^2}\mathbf{J} + \frac{1}{c^2}\frac{\partial \text{Ǝ}}{\partial t}$	$\nabla \times \mathbf{w} = \frac{1}{\epsilon_0 c^2}\mathbf{J} + \frac{1}{c^2}\frac{\partial \mathbf{v}}{\partial t}$

Furthermore, an analogy can be placed between EM, GEM and hydrodynamics, reflecting that to the electric and gravitational fields that decrease as $1/r^2$ away from charges and point masses, the material field of the fluid that gushes from sources or flows into point sinks, whose outflow or inflow velocity also has a $1/r^2$ trend for perfect incompressible fluids. Equations similar to EM and GEM are thus written also for the material fields of hydrodynamics (IGM in Table 2). The vector field $\boldsymbol{v}$ is that of the velocity of the flow towards or from sinks and sources and that $\boldsymbol{w}$ is a further vector field associated with properties that actually exist point by point in space.

We should, however, expect that $\boldsymbol{w}$ to be perpendicular to the field $\boldsymbol{v}$, that an ideal cable along which a current $\boldsymbol{J}$ of sinks or sources travels produces a field $\boldsymbol{w}$ that surrounds the cable, and that a

long series of coils of this ideal cable produces a dipole of $\boldsymbol{w}$, analogous to the magnetic dipole generated by coils of conducting cable crossed by electric current or to that generated by a magnetized bar. A good experimentation of the $\boldsymbol{w}$-field could be carried out without the disturbance of Earth's gravitation – which increases the pressure with depth – probably only in future space experiments in satellite orbits, for example in very large balloons filled with water at a pressure much greater than that produced by self-gravitation.

An added bonus of this descent from phenomenological fields to the really acting material fields could be the ability to make explainable on concrete bases those disturbing phenomena still a source of threads such as displacement currents or the phenomena like those linked to Aharonov-Bohm effect.

Recalling that the relativistic contractions of lengths can be explained by the properties of flattening in the direction of the motion of fields in general (Heaviside, 1888; Jefimenko, 1994), and that the temporal dilations refer to common physical phenomena (Bell, 1976; Selleri, 1993), in the description of the world that descends from the expansion of celestial bodies the theories of relativity are not necessary, and a Lorentzian treatment would be sufficient. The very thin fluid that constitutes a universal ocean is to be considered an average reference. The presence of this fluid means that the concepts of the principle of inertia, conservative field, escape velocity, etc., are only stated as good approximations of a more complex reality. We could also try to develop a hydrodynamic interpretation of the quantum world (an example in Buffoni, 2013).

Conclusion

The last century was a historical period in which a "virtuosic" way of doing physics prevailed which proudly departed from seeking a close description of reality. *Horror vaqui* has been incredibly replaced by *horror pleni*, with a consequent demonization of the concept of aether and of those who dealt with it.

This note is only one of an initial steps (perhaps a long way) to restrict the values of the parameters at the present epoch of the aether and its flow within narrower windows, with a process similar to that undergone by the Hubble parameter H_0.

The discrepancy (about a factor of 2) between the field velocity values $\boldsymbol{v}$ (x, y, z) in (13) and (14) should be seen as a tool for Earth Sciences to better model evolution over time of the planetary body, as well as for astrophysics in modeling the transfer of aether from space to celestial bodies. But other possibilities should be taken into account, e.g. a partial conversion of aether in ordinary matter.

It has also been shown that the expansion of celestial bodies is indissolubly linked with a general revision of the concepts of physics and cosmology, prefiguring a more unitary and realistic image, in which the upper limit to the reachable values of speed is no longer necessary. In this image a role seems necessarily to play the preferred conception of Hubble and several of his colleagues of the time (Kragh, 2017) in explaining the cosmological redshift: the idea of "tired light".

We could not conclude this "technical" note without also expressing the feelings of dismay that emerge at having made this superluminary movement explicit – something very different from the quiet *πάντα ῥεῖ* we immagined – whose speed is so alien to us as to be unimaginable, which makes everything fall for the infinities of the universe, that everything moves, and in different forms it will move.

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