

# The arrow of time

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**The arrow of time** is the "one-way direction" or "asymmetry" of **time**. The thermodynamic **arrow of time** is provided by the Second Law of Thermodynamics, which says that in an isolated system, entropy tends to increase with **time** (**Wikipedia**).

Nevertheless, this asymmetry of time is not intuitive based on the Einstein's field equations that relate to space and time as one entity. Since space is symmetrical to all directions time is also expected to be a "two way direction".

Based on Einstein's field equations mass curves space time and curvature of space-time is actually what Newtonian physics refer to as potential energy or the gravitational field.

Two major questions can arise from this field equation interpretation:

1. Mass  $m$ , has a well-defined inherent energy based on Einstein's special relativity equation,  $E = mc^2$ . The mass curves space-time and this curvature adds potential energy to its surrounding based on Einstein's field equations. What is the source of this added potential energy?
2. Since space-time is considered as a unified description and since space is symmetric to all directions, we expect that time should flow symmetrically both to the future and to the past. We know that this is not the case and time flows only towards the future.

## I. INTRODUCTION

### **DYNAMIC FLOW INSTEAD OF CURVATURE, OF SPACE-TIME**

We suggest in this article a new interpretation (equivalence principle) that will fit the Einstein field equations. Our new suggestion is based on dynamic flow of space-time towards mass  $A'$ . Meaning, that mass  $A'$  doesn't curve space-time around it but rather sucks the space-time towards it. Mass  $A'$  absorbs into it the flow of space-time (as if it was a drain).

## WHERE DOES SPACE TIME FLOW TO AND WHERE DOES IT COME FROM?

If space-time floats towards mass A' as this article suggests, than there is an important questions to be asked: Where does this space-time float to? We claim that the fabric of the universe is quantized into quantized cells in the size of Planck's length (in each dimension) and these quantized local cells are divided by non-local grid like dimensions [1]. When space time floats into the mass it floats into these non-local grid like dimensions. We claim that anti-matter applies anti-gravity [2] and for each particle of matter that absorbs space-time (gravity) there is an anti-matter particle [3] that generates space-time (anti- gravity). As the universe developed, pure energy generated pairs of matter and anti-matter, matter particles clustered together because of gravitation while anti-matter particles were spread apart throughout the universe because of anti – gravitation. As the matter particles clustered to form stars and galaxies by a dynamic flow of space-time into the matter grid dimensions and the local gravitation grew in the cluster regions, anti-matter anti-particles spread uniformly throughout space causing the expansion of space by applying anti-gravitation through a flow of space-time out of the anti-matter grid dimensions. To summarize, space-time flows inwards through the matter grid dimensions (“Drain”) and back outwards through the anti-matter grid dimensions (“Source”). This circulation (Fig. 2), causes a local clustering of matter (stars, galaxies, clusters of galaxies and black holes) while the void region of space is expanding through the outer flow of space from the anti-matter particles which are spread evenly through our universe (in contrast to the matter particles that cluster together because of the gravitational effect). Massless photons will flow in the speed of light in all frames of reference. When a photon travels with the flow direction of space it will undergo a gravitational blue shift and when it will travel against the flow of space it will undergo a gravitational red shift.

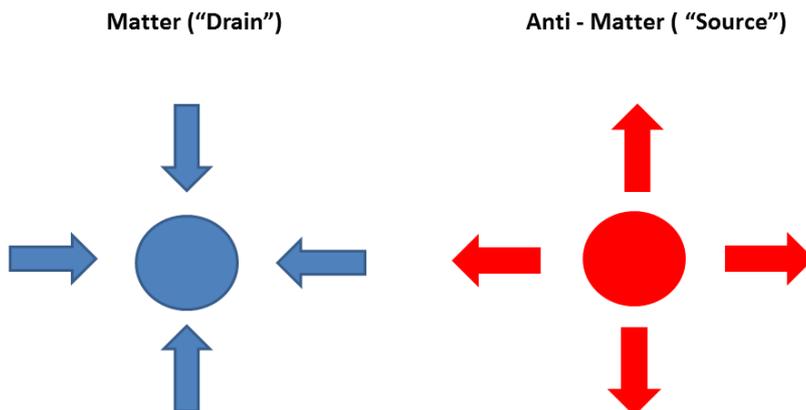


Fig. 2: Space-time flows into the matter grid dimensions (left, colored blue in the figure).the flow of space-time into matter is dictated by mass and energy of the matter as described by the mass, stress, energy tensor:

$$\frac{8\pi G}{c^4} T_{\mu\nu}$$

Its influence on space-time, meaning the metric tensor and Riemann curvature tensor are as described in the Field equations:

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R$$

Space-time flows out of the anti-matter grid dimensions (right, colored red), and is represented in the field equations by the metric tensor multiplied by the cosmological constant:

$$+ \Lambda g_{\mu\nu}$$

The arrow directions represent the direction of the flow of space-time, into

Matter (gravitation) and out of anti-matter (anti-gravitation which causes the expansion of space).

This flow of space-time into matter and out of anti-matter increases the potential energy near the matter but decreases the energy near the spread out anti-matter (as space expands electro-magnetic wave length increases and its energy decreases).

This explains the source of the potential energy caused by the curvature of space – time and the source of the dark energy which expands space (the antimatter particles spread uniformly throughout space, decrease the total energy and expands the “fabric” of space-time).

Since space time flow into matter and out of anti-matter there is a well-defined direction of time and time cannot flow backwards (since than space-time should flow out of matter and into anti-matter). This explains the asymmetric arrow of time from the past to the future.

## V. CONCLUSION

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This article suggests a new concept in which Einstein’s field equations describe the dynamic flow of space-time into the grid dimensions of matter, which behave like a drain for space-time. As mass A’ increases, the flow of space-time into its grid

dimensions increases .As you get closer to the grid dimensions of matter the flow of space-time (gravitation) increases and time slows down exactly like described mathematically in the Einstein field equations. Mass B floats in the flow of space-time towards mass A’.

We suggest a new equivalence principle (a dynamic flow description of space-time that fit the Einstein field equations) in which curvature, geodesic lines and mediating gravitons are replaced by the flow of space time into matter particles (as if they were a drain sucking in the space-time fabric). The space-time fabric that was absorbed into matter clustered particles is spread back throughout the universe through the anti-matter particles [2], [3] (as if they were a source generating new fabric of space-time) which are spread uniformly throughout space and expand the universe and reduce its total energy by expanding the electro-magnetic wave lengths. We also suggest that this flow of space-time happens through the grid (sometimes referred as GRID) dimensions [1] .this explains also the fact that matter tends to cluster up while anti-matter tends to spread out evenly throughout space, and this can explain the missing anti-matter in our clustered universe and the mechanism that is responsible for the expansion of the universe (“Dark Energy”).

This new equivalent description describes the source of the increase in the potential energy induced through the curved space-time near matter (it is balanced by the reduction in energy caused by the expansion of space near the spread out antimatter) and the reason for the asymmetric arrow of time (space-time floats in one direction only, into the grid dimensions of matter and out of the grid dimensions of anti-matter). The prediction that comes out from this article is that anti matter, when measured, will prove to have anti-gravity influence on its surrounding and it is spread evenly throughout the universe as elementary anti-particles.

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[1] Quantization of photonic energy and photonic wavelength

<http://www.slideshare.net/eransinbar1/quantization-of-photonic-energy-and-photonic-wave-length>

[2] Anti-matters gravity paradox

<http://www.slideshare.net/eransinbar1/anti-matters-gravity-paradox>

[3] Entanglement between matter and anti-matter particles

<http://www.slideshare.net/eransinbar1/entanglement-between-matter-and-anti-matter-particles>