Invisible (and intangible) Cold Dark Matter

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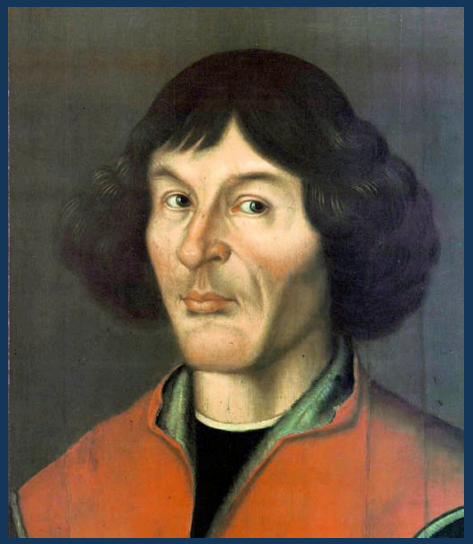
Voici mon secret. Il est très simple :
L'essentiel est invisible pour les yeux.
– L'essentiel est invisible pour les yeux,
répéta le petit prince, afin de se souvenir.

Le Petit Prince
Antoine de Saint-Exupéry

We will not try to explain how the Universe is. We simply build a model: we use just a few postulates and reason alone.



Our work can be regarded as a mere speculation, which does not necessarily represent physical reality.

Any similarity to actual physical laws is purely coincidental, neither intentional.

Axioms and Definitions

Axiom 1: The rapidity of time is not an invariant of space.

In other words, time is non-uniform, i.e., every point of space (inertial frame) features its specific rapidity of time.

Axiom 2: The speed of light (*c*) is an absolute invariant.

I.e., it does not depend on any variables and conditions.

The domain of velocity:

$$\forall u \in (0, c] .$$

I.e., no physical entity can move faster than light, and no physical entity can be in the state of absolute rest.

Axioms and Definitions

Definition 1: By inertial frame of reference, we mean a frame not affected by any external influence.

Definition 2: The idea of physical entity encompasses an electromagnetic wave, a light quantum (photon), a physical body, a mass point m, a neutrino-like elementary particle, i.e., everything featuring at least one of the following apparent physical characteristics: mass (m), energy (E), momentum (P).

Note: Neither a frame of reference nor an observer attached to it are physical entities.

Le temps et l'espace…
Ce n'est pas la nature qui nous les impose, c'est nous qui les imposons à la nature…

Henri Poincaré (1905)

Time and space… It is not nature
which imposes them upon us,
it is we who impose them upon nature…

A discussion of spacetime metric goes beyond the scope of our work.

Principle of Time Relativity

An observer attached to an inertial reference frame cannot detect any time flow variance within its own reference frame by the mean of any internal observation.

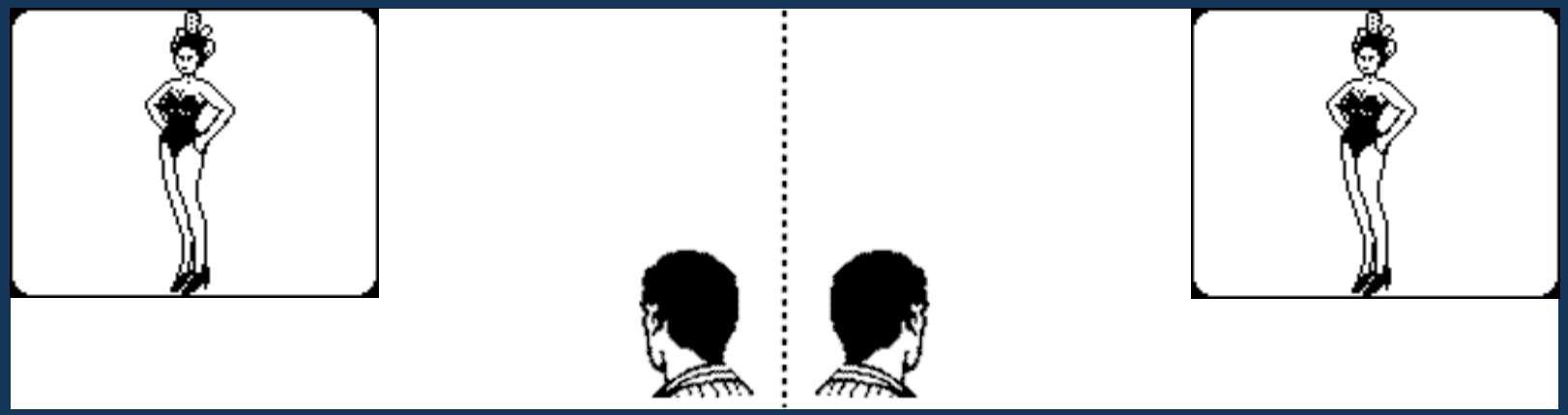


Fig. 1. Time flow anomalies cannot be detected by internal observations.

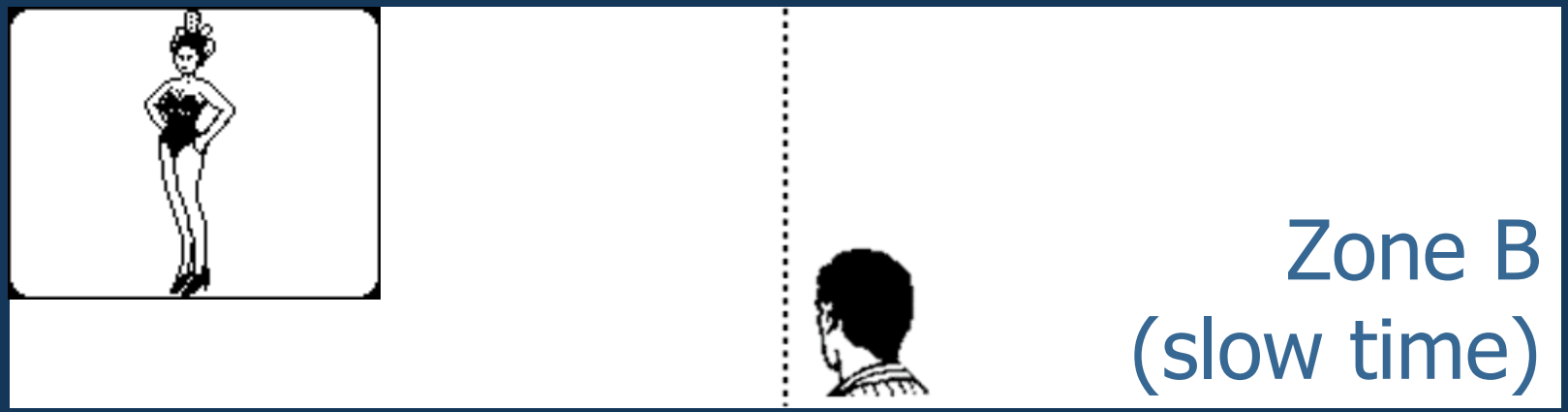


Fig. 2. The “slow” observer B sees the
processes in zone A as slowed

Principle of Time Relativity

Fig. 3. The “rapid” observer A sees the
processes in zone B as speeded up.

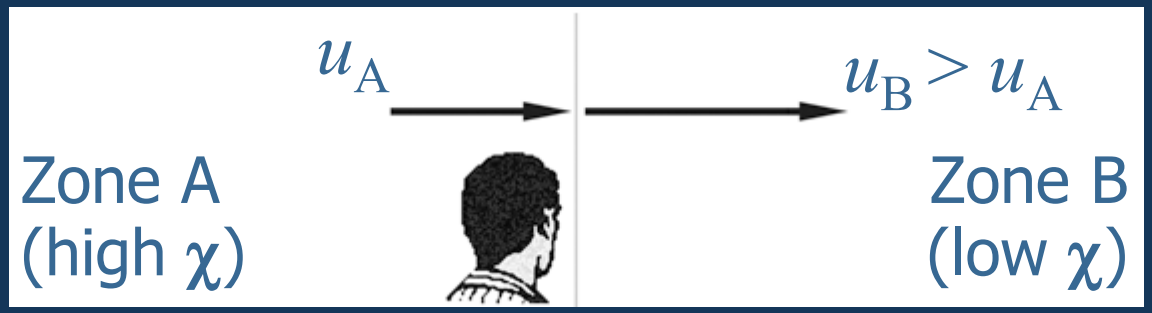


Fig. 4. The "rapid" observer sees sudden acceleration.

Fig. 5. The line segment becomes longer in the zone of slow time.

Equivalence Principle

The outcome of non-uniform time in an inertial frame of reference is equivalent to the outcome of a fictitious gravity force external to the frame of reference.

A light quantum in the field of non-uniform time

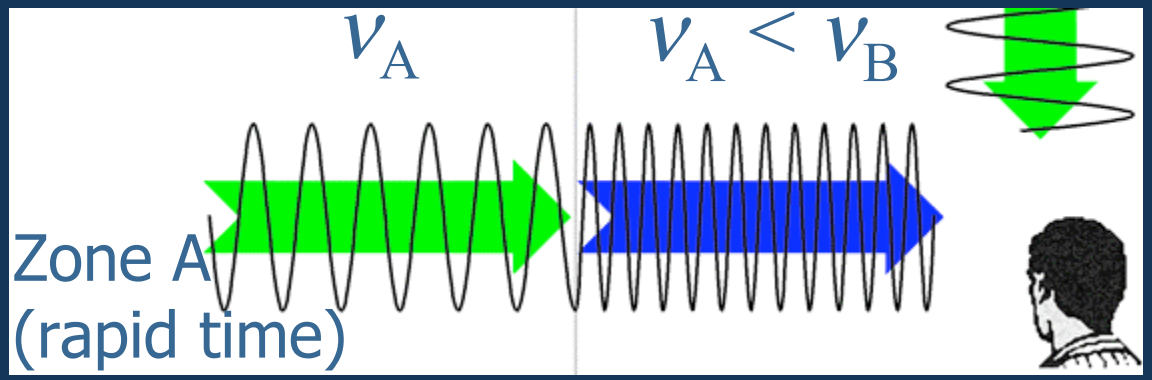


Fig. 6. The "slow" observer sees blue shift.

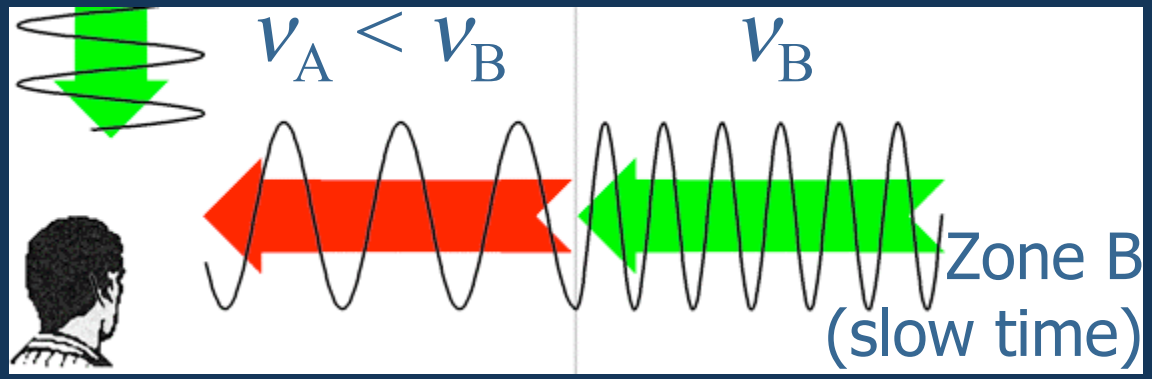


Fig. 7. The "rapid" observer sees red shift.

Statement of the Problem

Let us consider a physical entity with initial conditions $E \rightarrow 0$, situated infinitely far and travelling in the direction of a decreasing flow of time according to the equivalence principle.

The initial condition $E \rightarrow 0$ (at $r \rightarrow \infty$) means an infinitely large red shift for a light quantum ($\nu \rightarrow 0$), and an infinitesimal velocity for a physical body ($u \rightarrow 0$).

Statement of the Problem

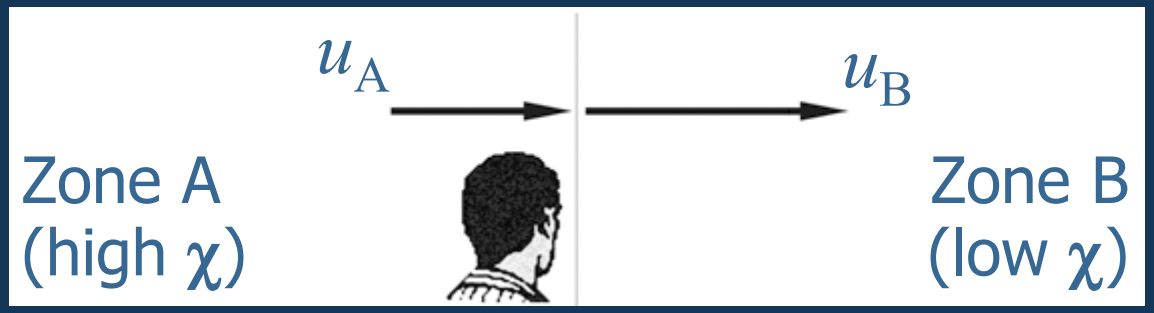


Fig. 8.
$u_A \chi_A = u_B \chi_B$

Let us introduce dimensionless scalar variable χ, so that

$$u_A \chi_A = u_B \chi_B \text{ or}$$

$$u \chi = \text{const} .$$

where χ is rapidity of flow of time, or simply *flow of time*.

$$u\chi = \text{const} \Rightarrow u = c \text{ at } \chi = 1 .$$

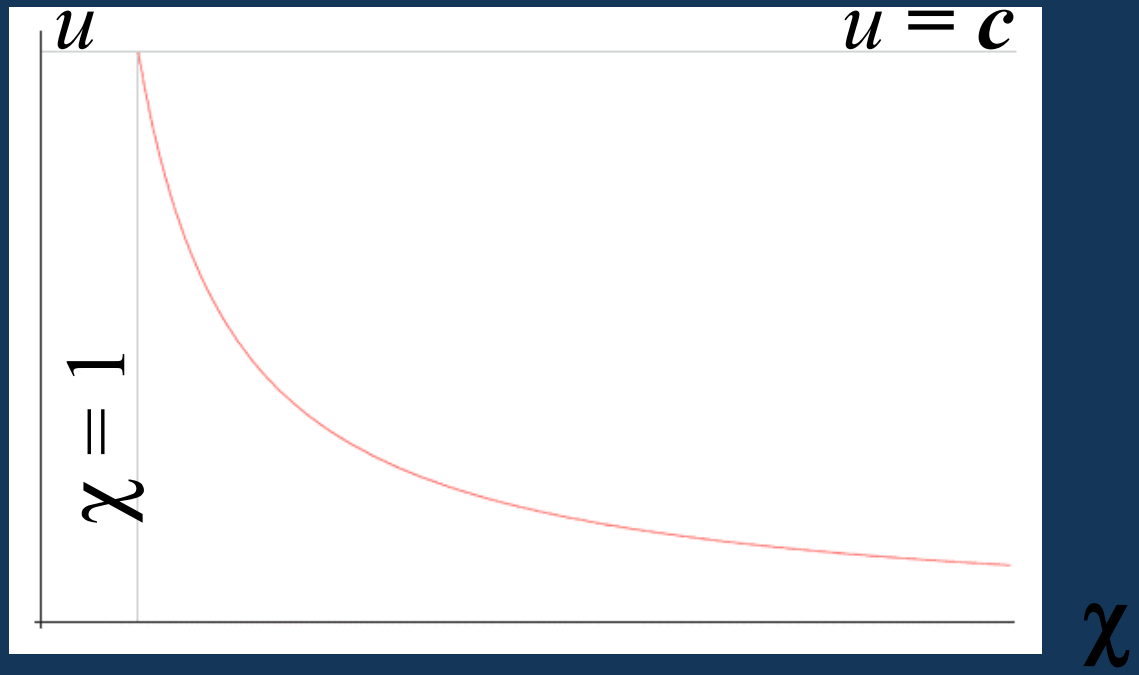
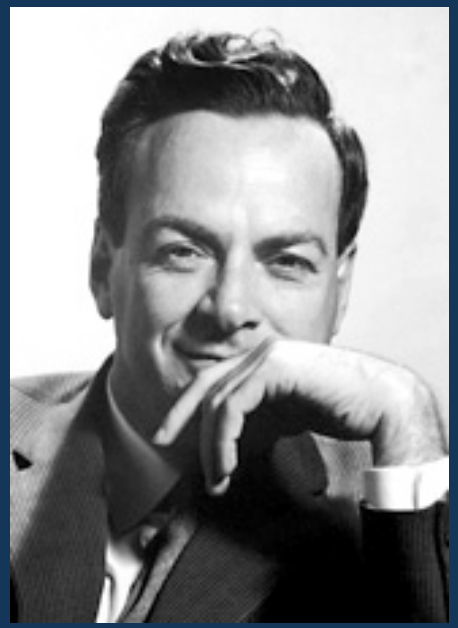


Fig. 9. The point mass reaches the speed of light at $\chi = 1$.
No allusion to asymptotic behaviour near $\chi = 1$.

$$u\chi = c$$



It may well turn out that some of the laws which we see today may not be exactly perfect.

Richard Feynman (1964)

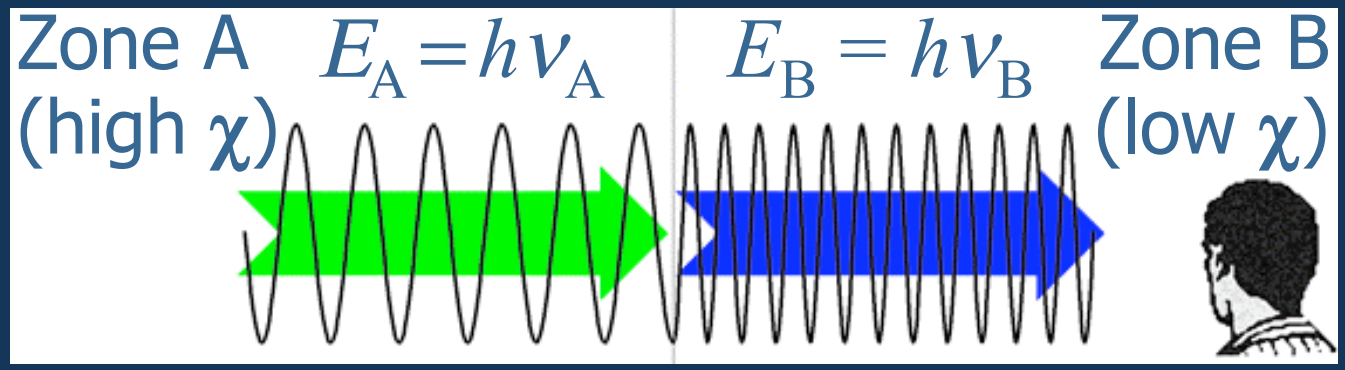
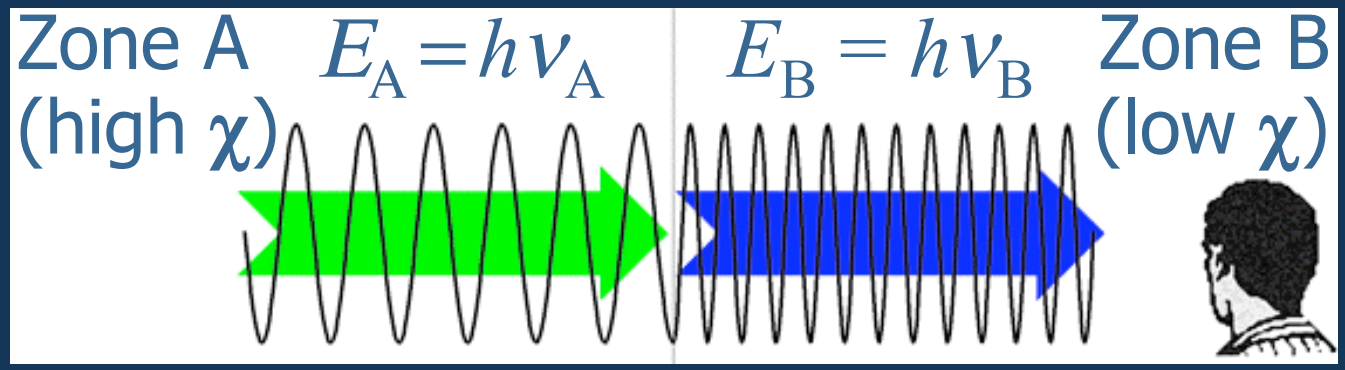


Fig. 10. Energy conservation is violated in the frames featuring *non-uniform* time.

That simply repeats a special case of Noether's theorem.



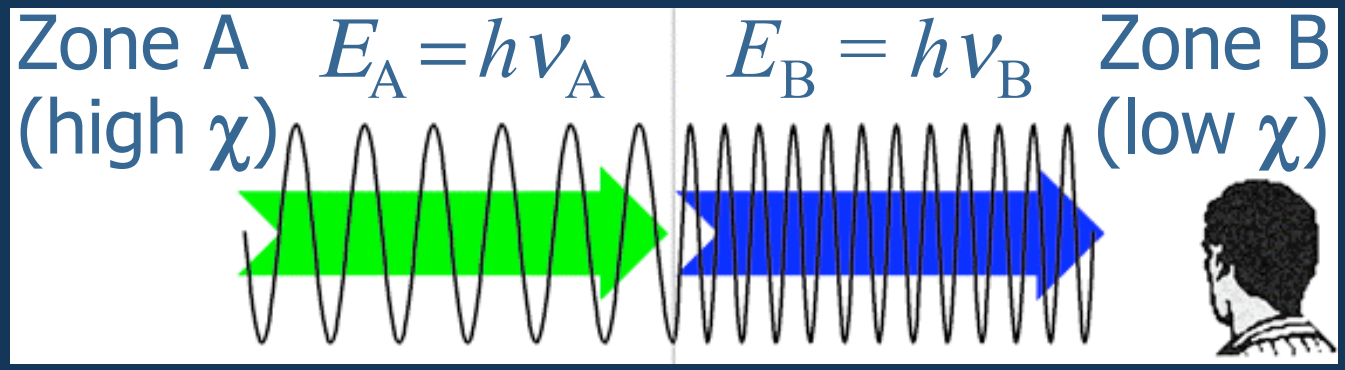
Classical energy conservation is applicable only in the frames featuring *uniform* time. It is the

generalized energy conservation

law that should apply to the frames of non-uniform

time:

$$E\chi = \mathrm{const}.$$



$$E\chi = \text{const}\ .$$

This expression is absolutely equivalent to Max Plank's $E = h\nu$.

$$E\chi = \text{const} \iff E = \text{const}\ \chi^{-1} \Rightarrow E = \text{const}\ \nu\ .$$

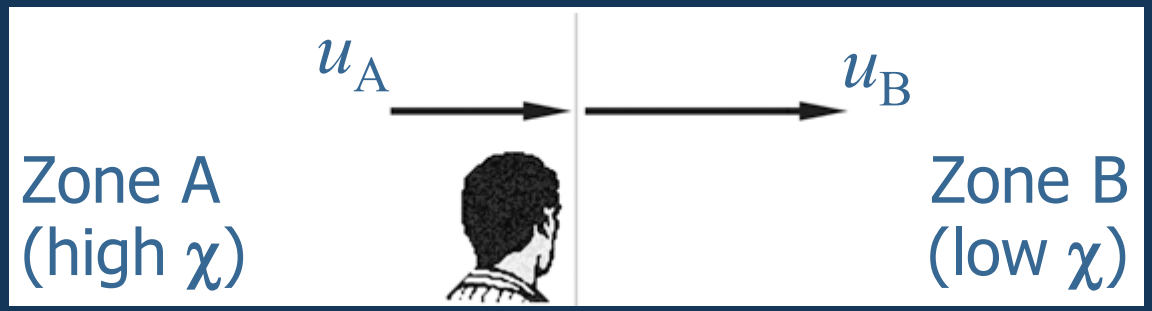


Fig. 8.
$u_A \chi_A = u_B \chi_B$

Conservation of Momentum

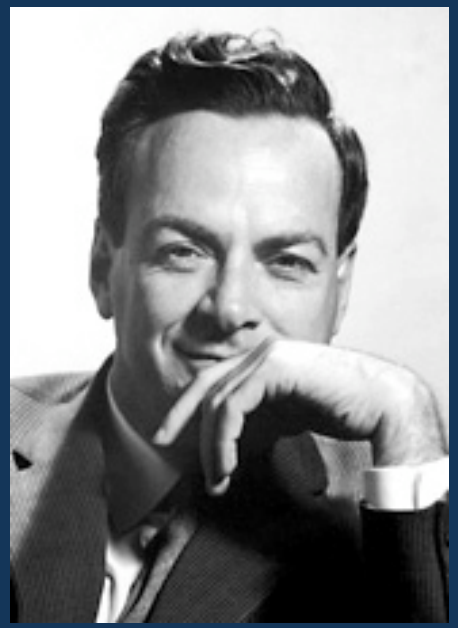
$$E_A \chi_A = E_B \chi_B ; \qquad u_A \chi_A = u_B \chi_B \Rightarrow$$

$$E_A u_A^{-1} = E_B u_B^{-1} .$$

$$\text{If } E \sim mu^2 \Rightarrow$$

$$m_A u_A = m_B u_B \Rightarrow$$

$$\boldsymbol{P_A = P_B}$$



Richard Feynman (1964)

Up to today, from the time of Newton, no one has invented another theoretical description of the mathematical machinery behind this law <Newton's law of gravity> which does not either say the same thing over again, or make the mathematics harder, or predict some wrong phenomena. So there is no model of the theory of gravitation today, other than the mathematical form.

Inverse square law of universal gravitation

$$E\chi = \text{const} \;\Rightarrow\; \chi\nabla E + E\nabla\chi = 0\,.$$

$$\nabla E = F\,;\;\; E = C\chi^{-1} \Rightarrow$$

$$F = -\,C\,\frac{\nabla\chi}{\chi^2}\,.$$

If $\nabla\chi = 0 \;\Rightarrow\; F = 0\,.$

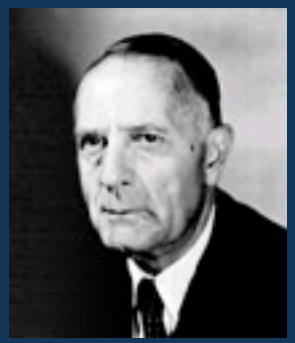
If $\chi \sim r \;\Rightarrow\; \boldsymbol{F \sim r^{-2}}.$

Hubble's Law of Redshift

$$\chi = \beth r$$
$$E\chi = \text{const} \quad \Rightarrow \quad z = \frac{\nu_{emit}}{\nu_{obs}} - 1$$

$$z = \frac{r}{R_0} - 1$$

At $r >> R_0$ $\quad z = \frac{r}{R_0}$



Edwin Hubble

Relativity of mass

From $m_A u_A = m_B u_B$; $u_A \chi_A = u_B \chi_B \Rightarrow$

$$m_A \chi_A^{-1} = m_B \chi_B^{-1}$$

I.e., $$m = \mathfrak{m}\chi,$$

where $\mathfrak{m}$ is *reduced* or "*basic*" mass.

$\chi \to 0 \Rightarrow m \to 0$

a finite displacement takes an infinitesimal slice of time

$\Rightarrow$ even an infinitesimal force makes the body move at an infinite velocity

$\chi \to \infty \Rightarrow m \to \infty$

a finite displacement takes an infinitely long time

$\Rightarrow$ an infinite force makes the body move infinitesimally slow

Relativity of mass

From $m_A u_A = m_B u_B$; $u_A \chi_A = u_B \chi_B \Rightarrow$

$$m_A \chi_A^{-1} = m_B \chi_B^{-1}$$

I.e., $$m = \mathfrak{m}\chi,$$

where $\mathfrak{m}$ is *reduced* or "*basic*" mass.

?

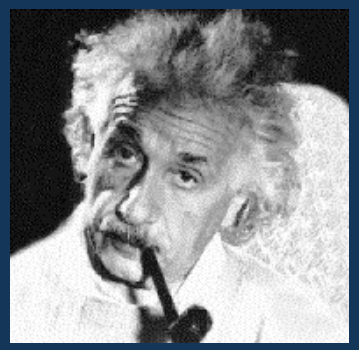
Improved generalized energy conservation

$$\boldsymbol{u}\chi = \boldsymbol{c} \quad \Rightarrow \quad \chi\nabla\boldsymbol{u} + u\nabla\chi = 0$$

$$\nabla\boldsymbol{u} = \frac{\mathrm{d}\boldsymbol{u}\ \mathrm{dt}}{\mathrm{d}r\ \mathrm{dt}} \quad \Rightarrow$$

$$F = m\boldsymbol{g} = -\beth\,\mathfrak{M}\,\frac{\boldsymbol{c}^2}{\chi^2} \quad \Rightarrow$$

$$E\chi = \mathfrak{M}\,\boldsymbol{c}^2$$



At $\chi = 1$ $\qquad E\chi = \mathfrak{M}\,\boldsymbol{c}^2 \Rightarrow E = m\boldsymbol{c}^2$

Extreme cases of generalized energy conservation

$$E\chi = \text{const} \Rightarrow \begin{array}{l} 1)\ \chi \to \infty \Rightarrow E \to 0, \\ 2)\ \chi \to 0 \Rightarrow E \to \infty\ . \end{array}$$

a) quantum model,

b) corpuscular model.

Infinite flow of time
Quantum model

$$\chi \to \infty \Rightarrow E \to 0\,,\ \nu \to 0\,.$$

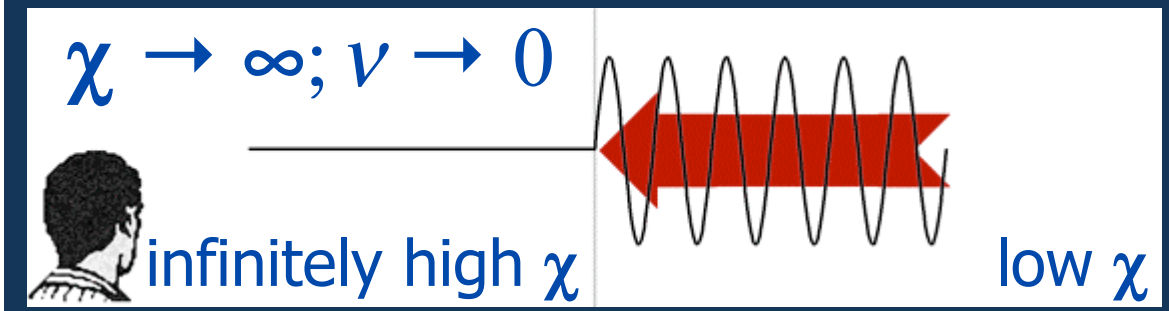


Fig. 11. The observer sees an infinite red shift.

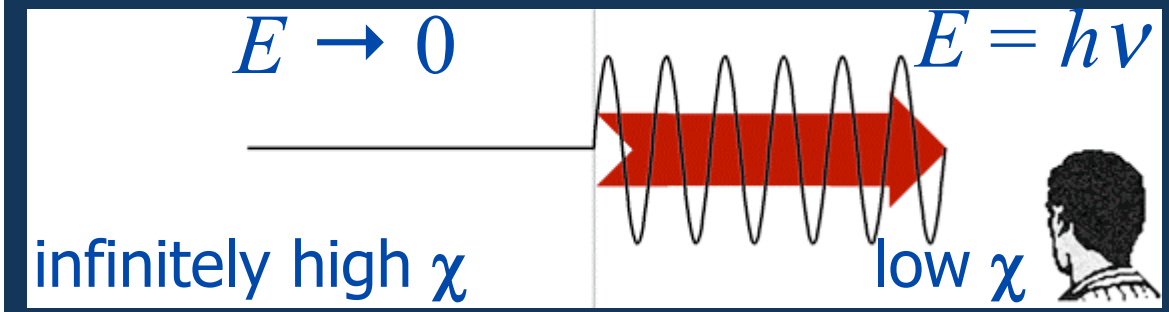


Fig. 12. The observer sees certain background radiation.

Infinite flow of time
Quantum model

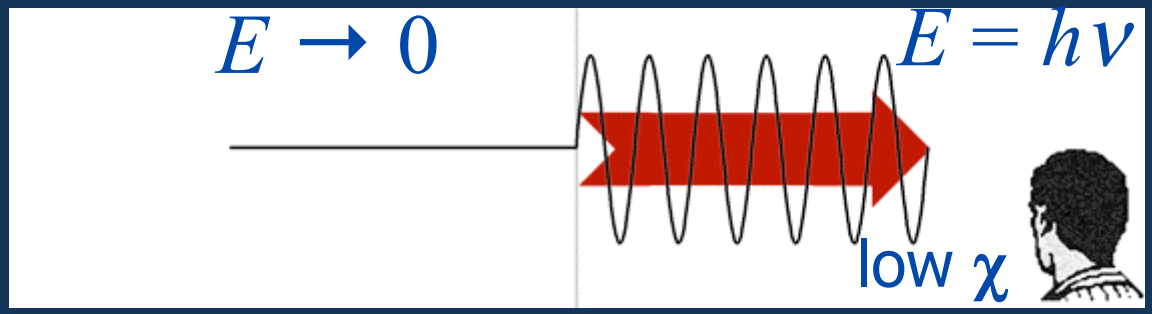
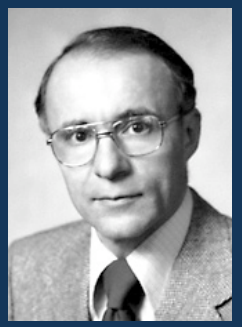
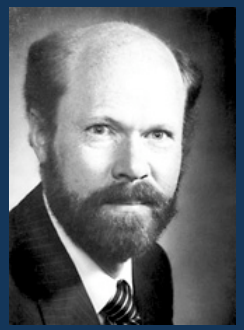


Fig. 12. The observer sees certain background radiation.

Cosmic Microwave Background Radiation



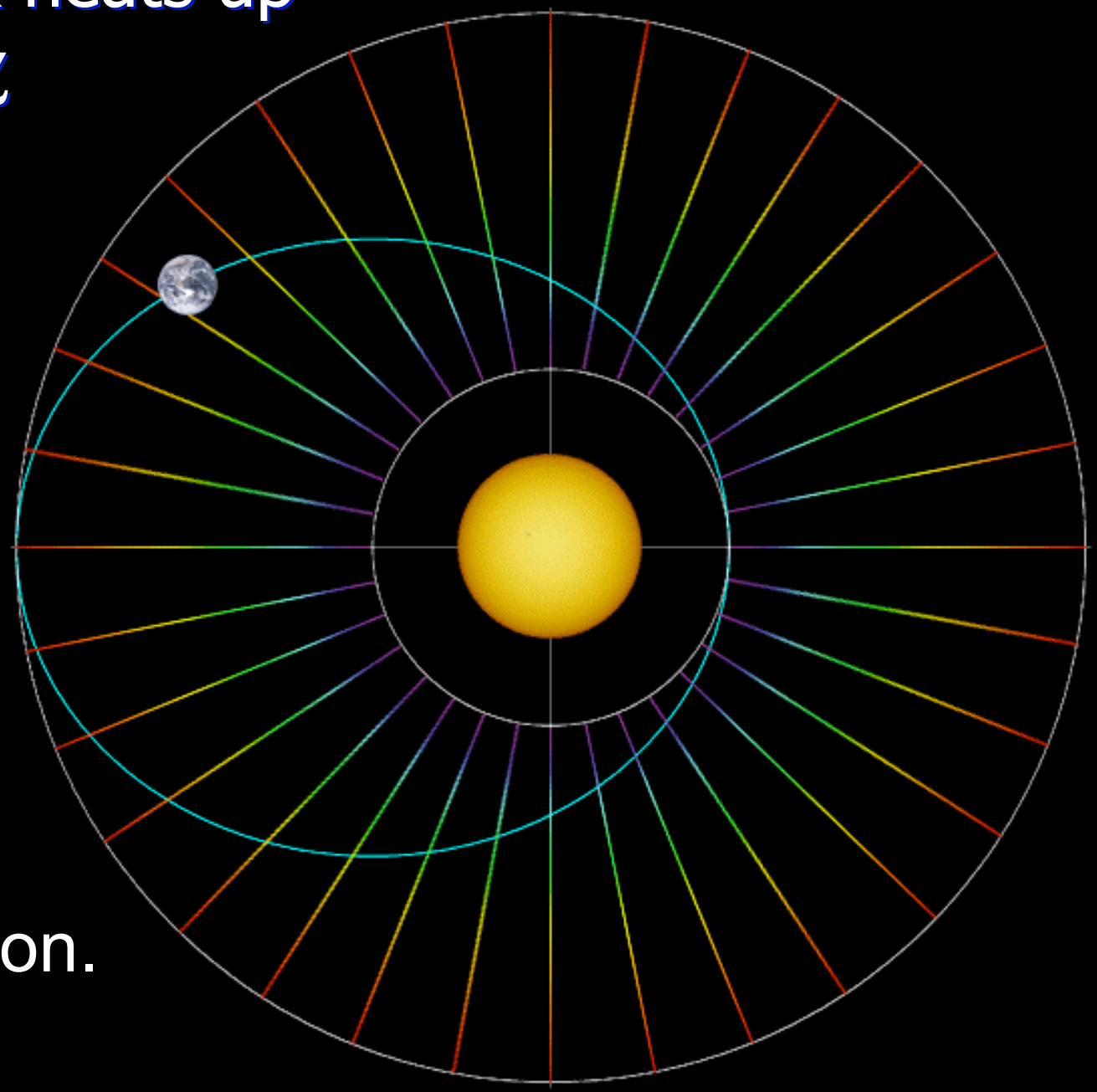
Arno Penzias



Robert Wilson

Fig 13. CMBR heats up from higher χ to lower χ.

Temperature Of CMB radiation measured in the Earth's perihelion should be 0.02 K higher than in aphelion.



Violation of the second law of thermodynamics

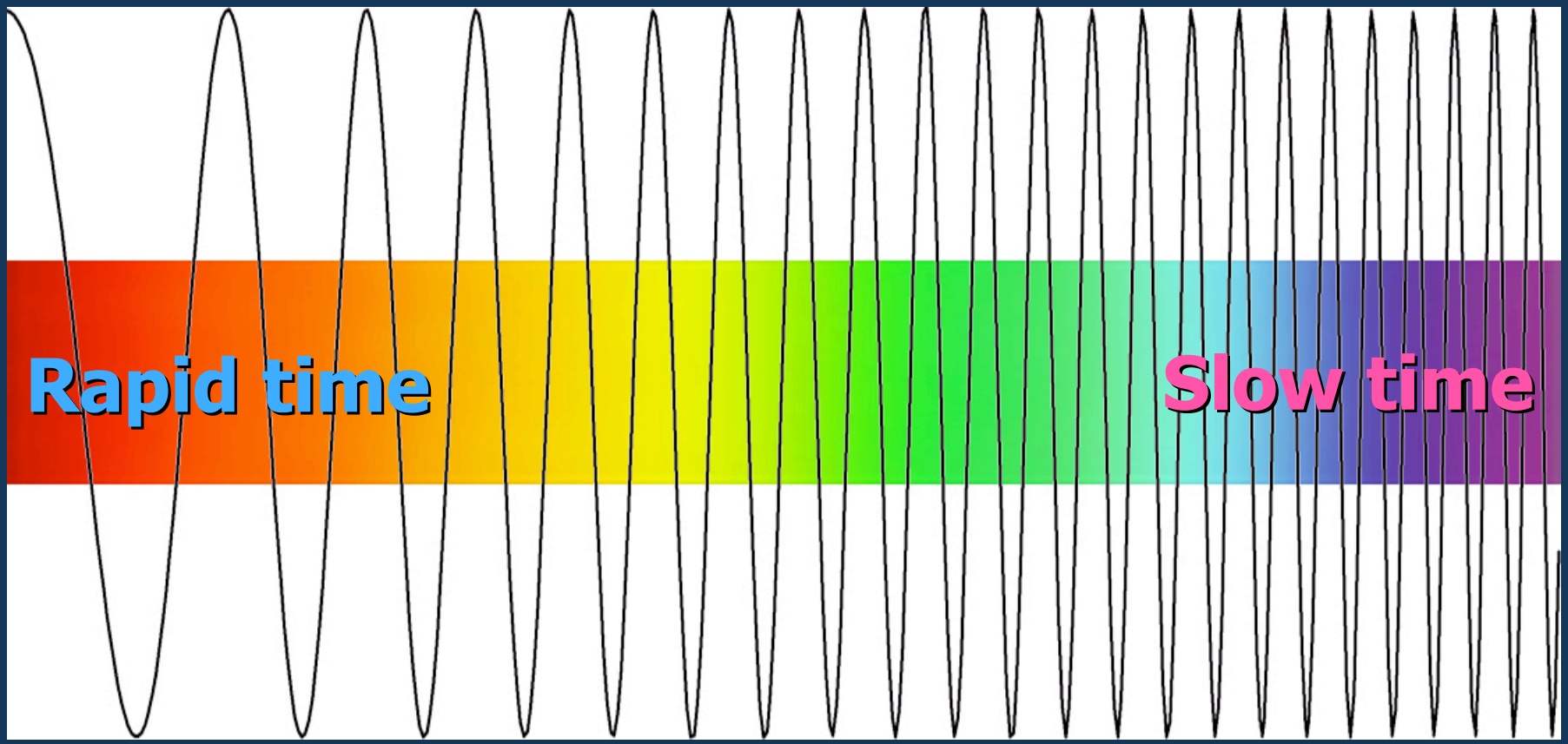


Fig. 14. Energy flows from the zone of rapid time to the zone of slow time spontaneously, without work input.

Infinite flow of time
Corpuscular model

$$\chi \to \infty \quad \Rightarrow E \to 0\,,$$
$$\Rightarrow m \to \infty\,.$$

Mass is a measure of an entity's inertia. In a zone of infinitely rapid flow of time, a point mass becomes ***infinitely inertial***.

Cold Dark Matter

Fritz Zwicky

Space “curvature”
(A First Approximation)

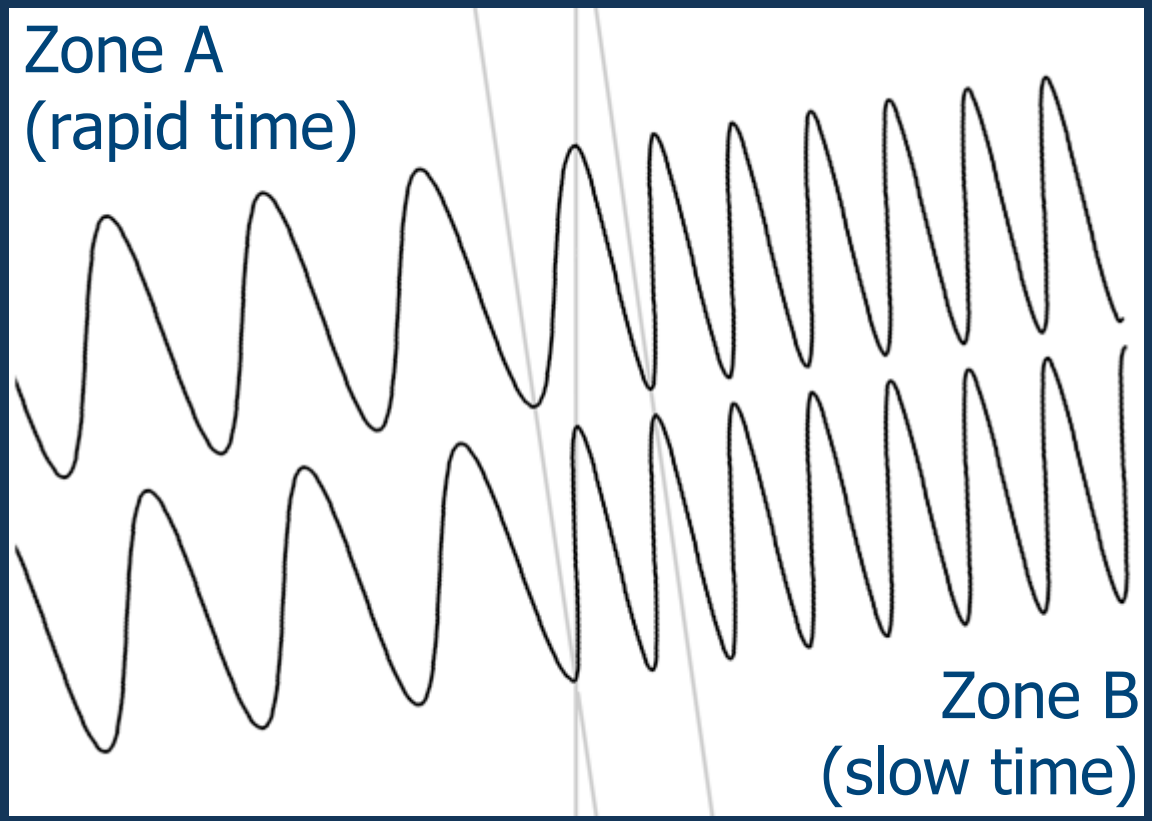


Fig. 15. At a frequency shift, conservation of direction violates phase.

Space "curvature"
(A First Approximation)

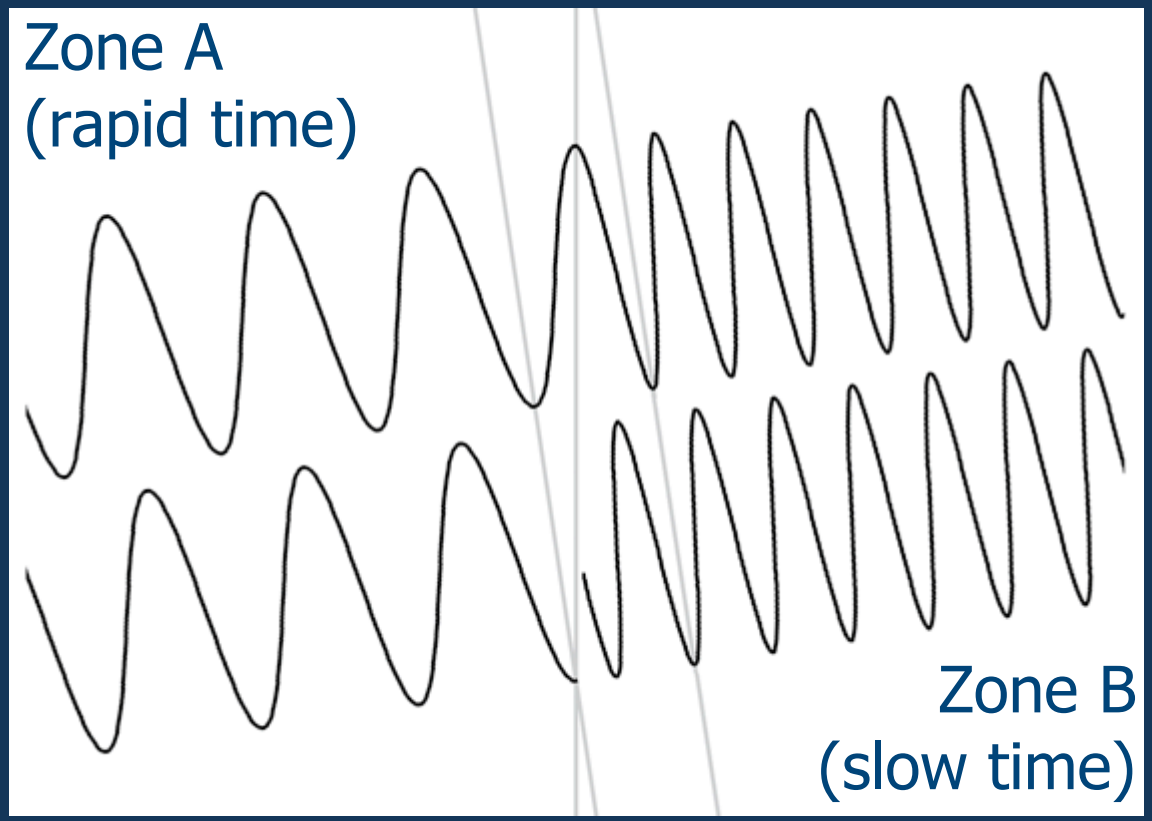
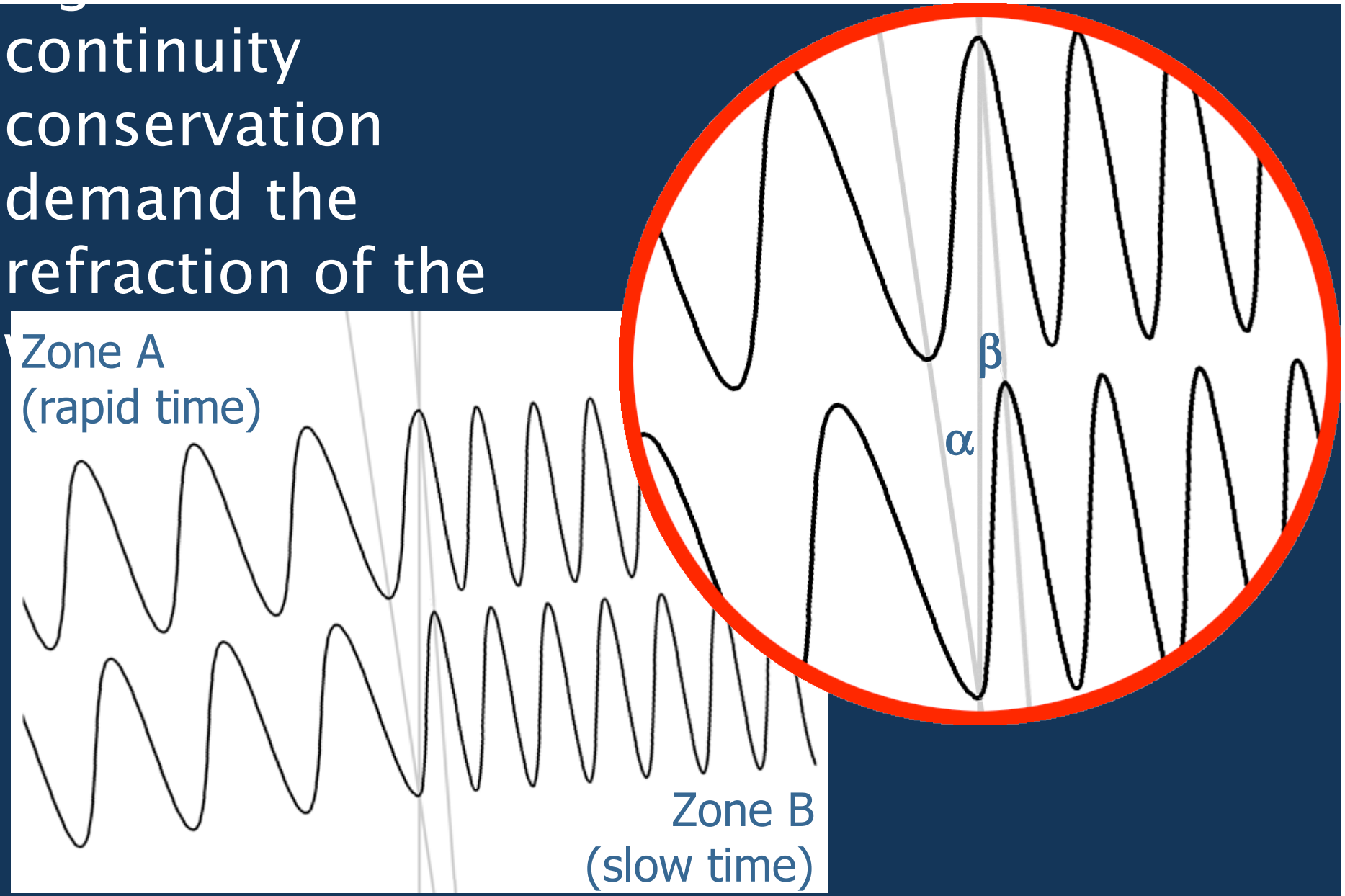


Fig. 16. At a frequency shift, conservation of direction violates continuity.

continuity
conservation
demand the
refraction of the



$$\sin\beta/\sin\alpha = T_B/T_A = \nu_A/\nu_B = E_A/E_B$$

Time lens effect

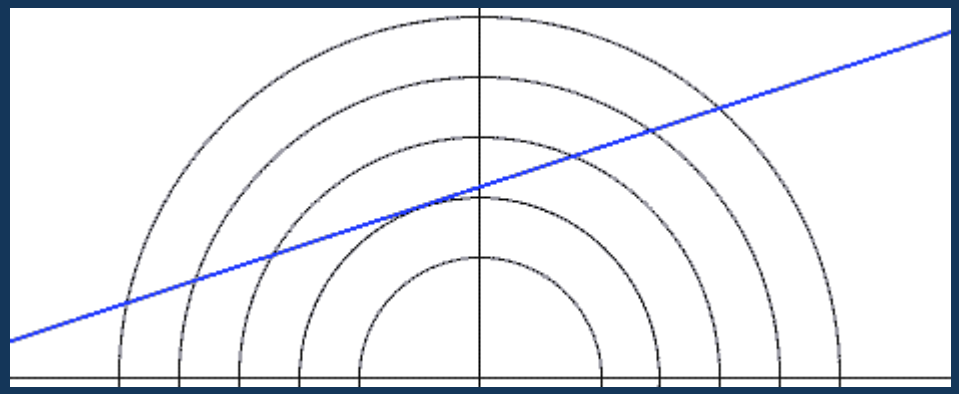
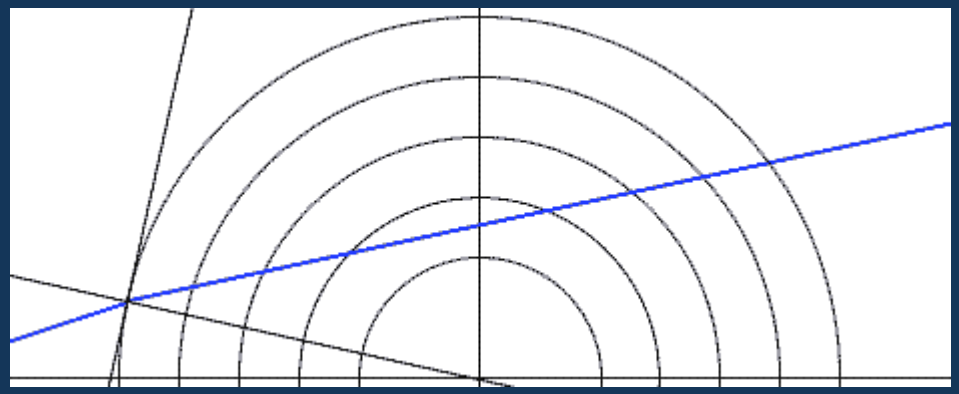


Fig 18. As light travels through spherical layers of space featuring time slowing down, the direction of a ray refracts each time the ray enters (and subsequently leaves) a layer of slower time.

Time lens effect



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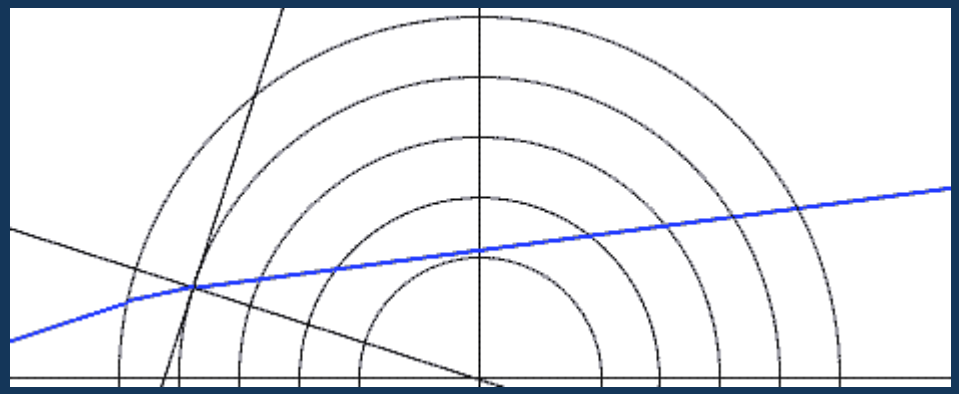

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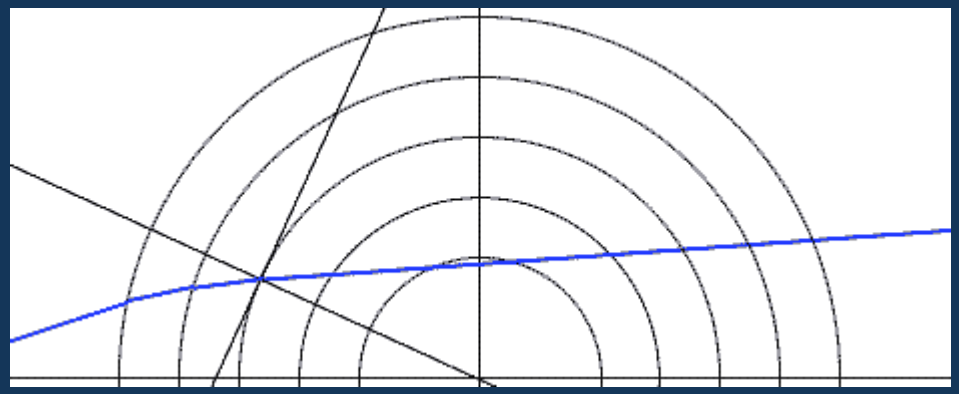

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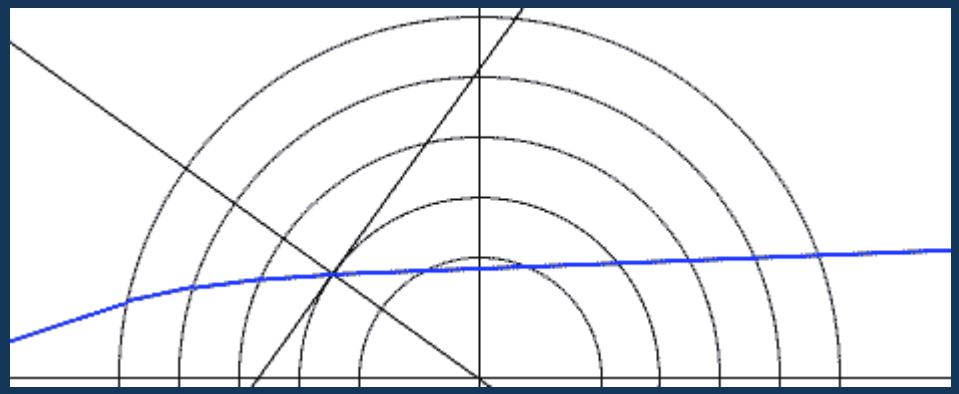

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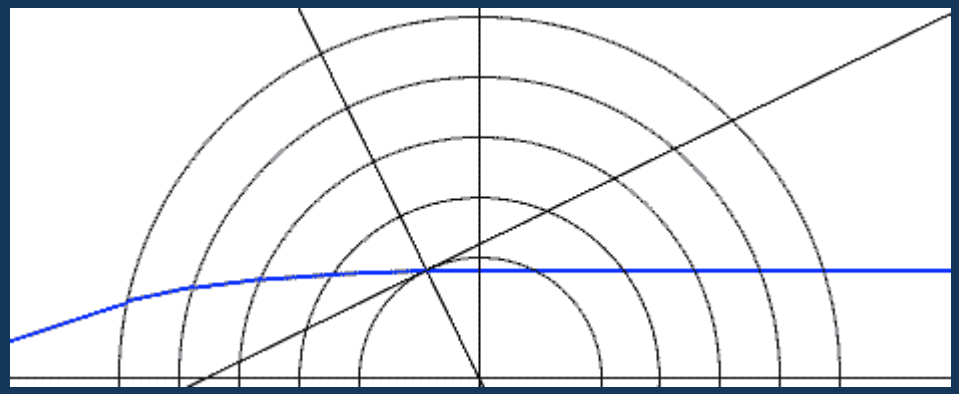

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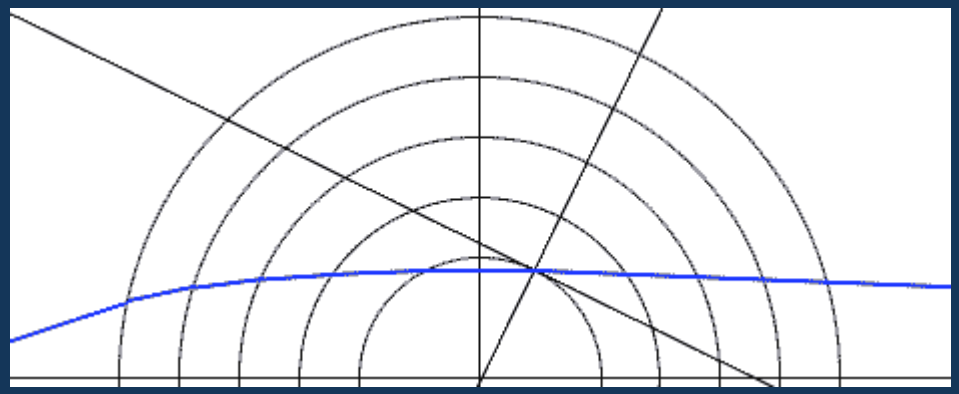

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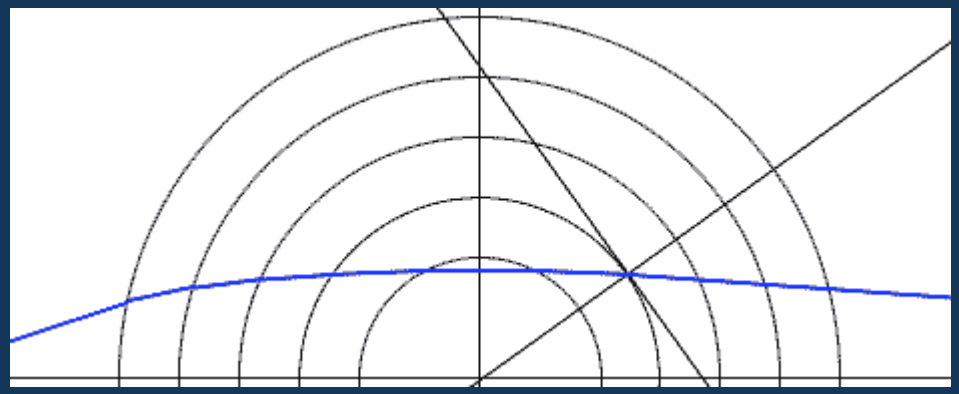

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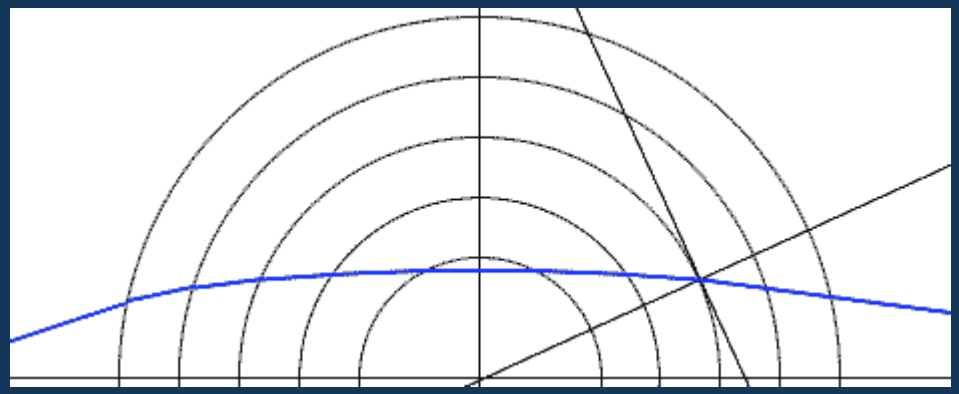

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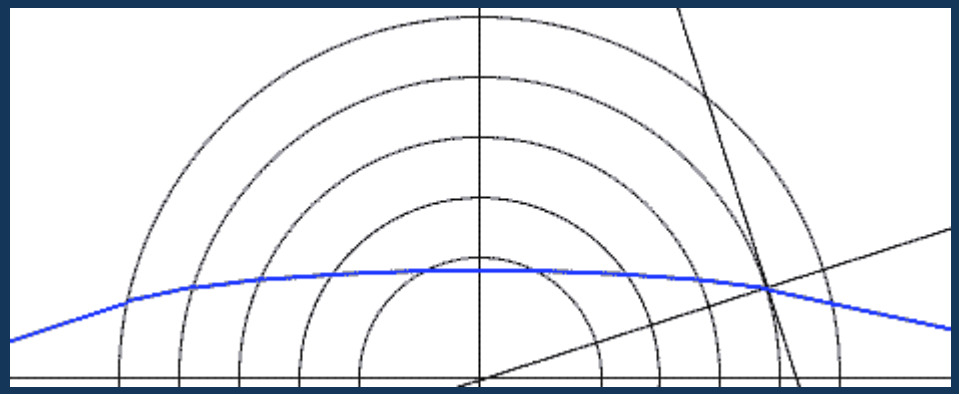

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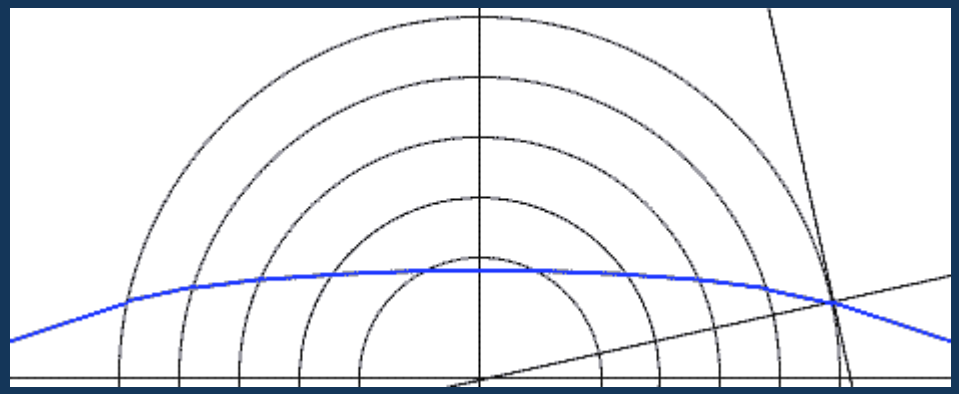

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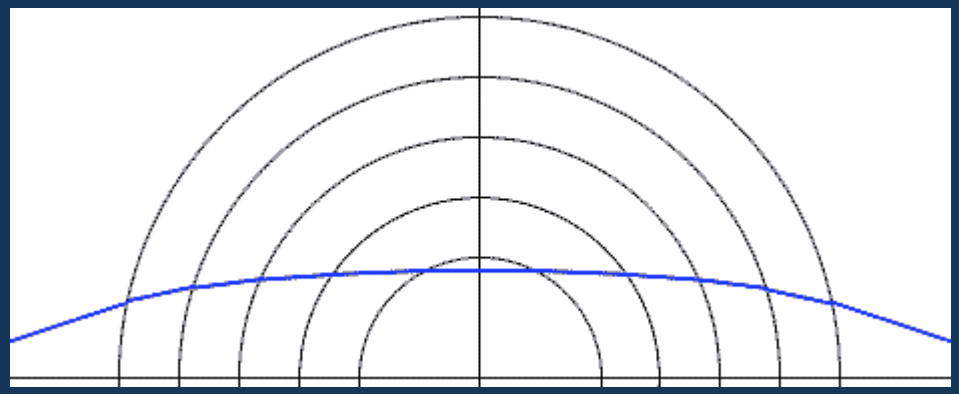

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“Temporal” curved mirror effect or “temporal” scattering

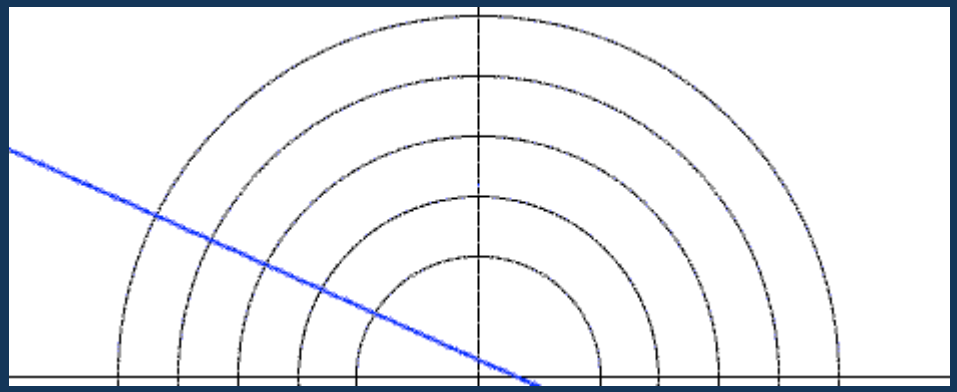
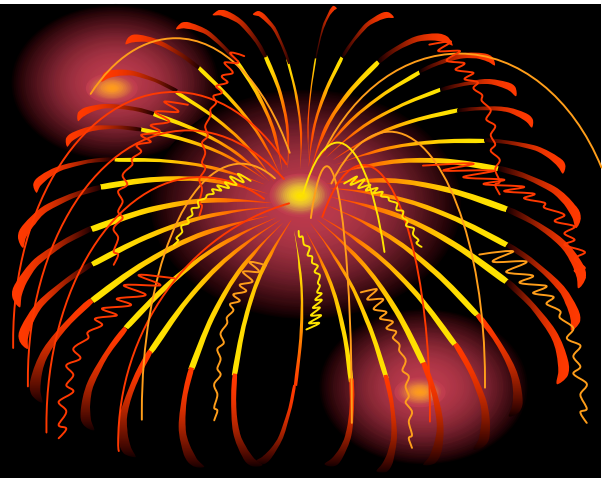


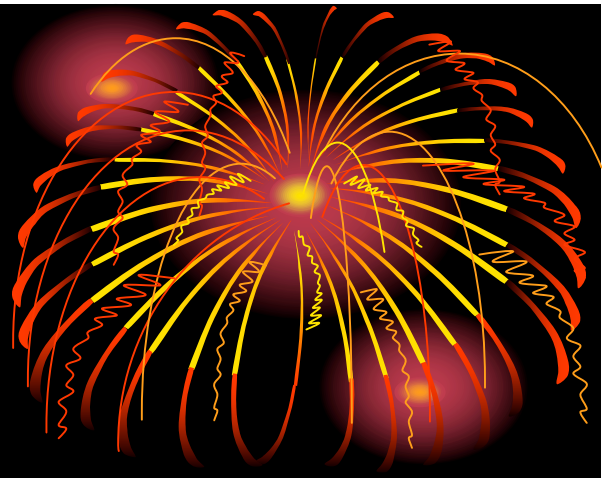
Fig. 19. The zone of an “infinite” flow of time works like a curved mirror, which has nothing in common with the lens effect.
One can see anything in such a “temporal” curved mirror.



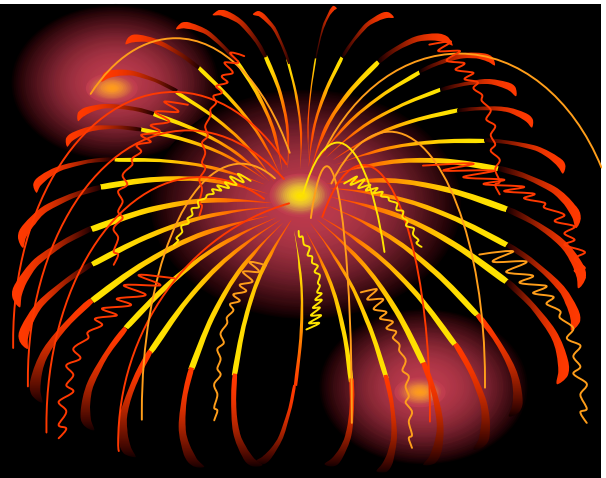
All of physics, as we know it, is just
a rather narrow, specific case of

a physics of non-uniform time.

CDM is not a matter rather a ***phenomenon*** that is a natural consequence of generalized energy conservation.



The attempts to find any tangible candidates for the dark matter, regardless of whether their nature is baryonic or non-baryonic, resemble the Chinese proverb about the prospects to see a black cat in a dark room.



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