Dear.

Long ago people were convinced that the Earth is a plane
Now people believe that the universe is Euclidean.

Grigory Perelman proved the poincaré conjecture.

I apply this to the Universe.

Pay attention to Greenland

https://jakubmarian.com/how-big-are-greenland-and-russia-in-comparison-to-africa/

If we are in the Universe, existing as a closed 3-sphere,
we are committed in assessing the scale away the same error
when you look at a map of the Earth.

This applies both to changes in the wavelength of the electromagnetic waves (supposedly the Hubble flow),
and luminosity some remote anomalously bright objects.

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Analysis of experimental data. Universe is a 3-sphere.

by

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The principles of the light propagation in a three-dimensional sphere, discovered by scientists, along with the experimental data obtained – "Hubble flow", "Dark energy", and abnormally high luminosity of distant quasars – prove the hypothesis for the Universe to be a stationary three-dimensional sphere.
The diameter of the Universe is estimated.

This is that physicists are not aware of while mathematicians are not interested in.
Vladimir Arnold on electronic spin cause.

This is now more than 10 years since the Gregory Perelman's publication resulted into proof of the Poincare conjecture:

Every simply connected, closed 3-manifold is homeomorphic to the 3-sphere.

However the cosmological application of the thesis did not follow.
In order to view the structure of the Universe, we need to compare the hypotheses of its structure with the test data being obtained.

Most knowledge about the Universe's structure has been gained by astronomers from observations of the cosmic electromagnetic radiation. In particular, the measured are apparent brightness, rate of emittance change, angular displacement, and spectral characteristics of an object including spectral line shift.

The distance to a celestial object is defined by measuring the brightness and spectral line shift. The size of a celestial object is defined according to the rate of emittance change.

Let's review some of the features of the three-dimensional sphere S^3.
Each point in a 3-sphere is equivalent to and indistinguishable from any other point of this sphere, though there is a certain allocated point where we are situated in. It is hardly possible to make difference between our space and the Euclidean one.

So, our space R^3 appears to be tangent to the three-dimensional sphere S^3.

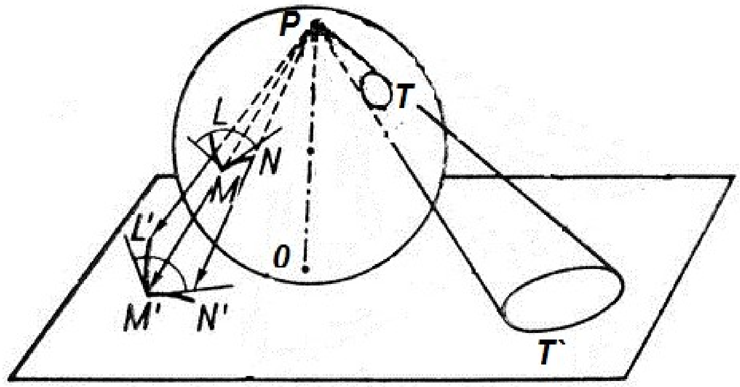
The second allocated point ***P*** on the 3-sphere is located on the opposite side of the sphere and corresponds to the infinity in the tangent space.
If the flow of time in 3-sphere is being reviewed, the time appears to be wholly homogeneous throughout the space, and its velocity is the same in each point of 3-sphere.

The physical processes are the same in each point of 3-sphere, for instance, the distance light passes per unit of time.
Emission frequencies of excited atoms are the same too – such atoms are being studied by those astronomers who receive the celestial objects spectrum.

The spectrum line shift measured is interpreted to be caused by Doppler effect.

Let's compare one and the same physical process within the Earth and without it.

For that we use a stereographic projection. Among its characteristics worth mentioning are the following:



1) circles on the sphere correspond to those on the plane
2) the correspondence determined by the projection is conformal, that is the angles are preserved

The consequence is the physical laws to be equivalent (locally) in each point of the sphere and of its projection in the tangent space. The difference is only in perception of scale.

Let's dissect the 3-sphere S^3 with diameter ***P*** and the space R^3 tangent to it in the point ***0*** (see **Fig. 1)**

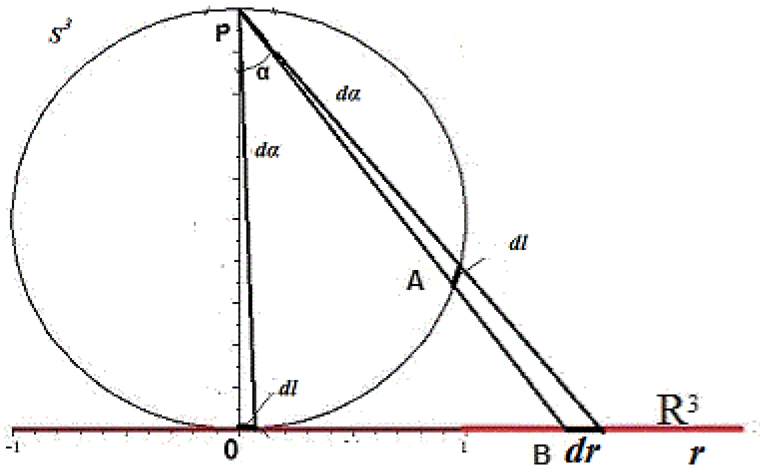


Figure 1

For equal period of time – for example, light wave period – light passes the same distance ***dl*** either on the Earth (see point ***0*** on **Fig. 1**) or away from it in the 3-sphere (see point ***A***).

The angles inscribed into the circle are equal if they are subtended by equal arcs.
Let's draw the lines from the pole ***P*** through the terminal points of the arc ***dl*** nearby the point ***A***, then project the arc ***dl*** onto the tangent space R^3 so that we get the segment ***dr*** nearby the point ***B.***
For **Fig. 1** the relations are:

$$\Delta\alpha = \frac{\Delta l}{P} \qquad (1)$$

and
$$\tan\alpha = \frac{r}{P} \qquad (2)$$

where ***r*** is a current distance off the point ***0***,
α is an angle between the points ***0*** and ***r***

(2) shows

$$\alpha = \arctan\left(\frac{r}{P}\right) \qquad (3)$$

from the other hand, $r = P\tan(\alpha)$ (2\`)
let's differentiate the distance with respect to the angle ***α***

$$\frac{dr}{d\alpha} = \frac{P}{\cos^2(a)}; \qquad (4)$$

Let's replace ***dα*** in (4) by its expression in terms of ***dl*** from (1)

$$\frac{dr}{dl} = \frac{1}{\cos^2(\alpha)} \qquad (5)$$

and substitute (3) into (5)

After elementary trigonometric calculation,

$$\frac{dr}{dl} = 1 + \frac{r^2}{P^2} \qquad (6)$$

we get an increment ratio for the equal distances dl in the sphere S^3 and in the tangent space R^3 depending upon how r is far from the point 0 in this tangent space.

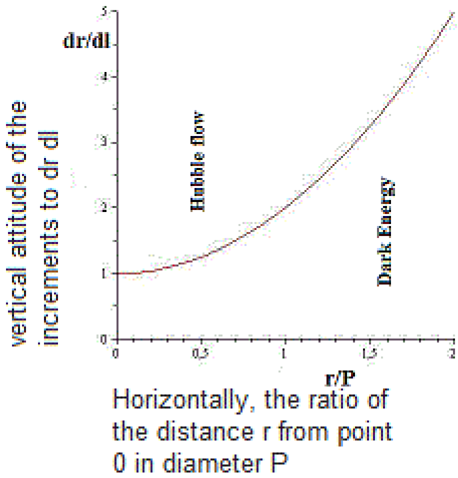


Figure 2

Horizontally, it shows the ratio of the distance r from point 0 to P – diameter of S^3

Vertically, it shows the ratio of the increments of dr and dl in R^3 and S^3, respectively.

Hence the light wavelength measured in the point A projects into the point B with the increment in size according to (6). **(Fig. 2).**

For the speed of light is constant in any point of the sphere S^3, the last paragraph suggests a conclusion:
In tangent Euclidean space the speed of light (observed) rises as the distance increases.

Physically it means that the spectral line shift of celestial objects, measured by astronomers, rests upon the geometric cause, at least in its most part, as a result of the geometry of the Universe being a three-dimensional sphere.

To be noted is the pace of time being equal in B and 0, for there are no relative speeds, and therefore no «cosmologic» time dilation exists.
The squared relationship of spectral shift, as the distance to celestial objects keeps increasing, enables us to question the «Dark energy» hypothesis.

Using the calculation of spectral line shift of a celestial object for estimating the distance to it shall lead to an error, for the real distance ought to be defined according to the length of arc l along the surface of the sphere (see **Fig. 1**).

$$l = \alpha P \qquad (7)$$

Using (3), we get

$$l = P\arctan\left(\frac{r}{P}\right); \qquad (8)$$

Where ***r*** is a distance defined by the traditional methods in R^3 according to the spectral shift.
The ratio (6) enables to estimate the size of the Universe.
The celestial object redshift (z) enables, with a fair accuracy, to define distances to celestial objects (in the Euclidean tangent space) using the formula:

r = zc/H.

r — distance to object, ***H*** — Hubble constant. H = 70 km/sec/mpc.
Substitution of ***z=1*** gives a result of 4000 Mpc or approximately 13.4 billion light years,

and (6) shows that the duplication occurs when ***r*** distance equals to the diameter ***P*** of the sphere S^3 - that is the diameter ***P*** of the sphere S^3 is also about 4000 Mpc. Hence the length of the semicircumference ***l*** from ***0 to P*** (**Fig.3)** accounts approximately 6300 Mpc or 21 billion light years.

$$L \approx 6300 \text{ MPs} = 21 \cdot 10^9 \text{ light years.}$$

Hypothesis: our Universe is stationary, a single "Big Bang" is unlikely, rather, each galaxy is the result of a mini-"Big Bang".

There is another error that occurs in the estimation of intervals perpendicular to a sight line. It is traditionally (that is for the tangent space R^3) assumed that a sight line to a celestial object is a straight line.

However as for the three-dimensional sphere S^3, it is, indeed, a circle (meridian) but not a straight line. If the sight angle from the Earth between two objects equals to the angle ***γ***, then the lines forming the angle are two circles in the sphere S^3. These two circles intersect in the view point (point ***0***) and in the opposite pole of the sphere S^3 (point ***P***, **Fig. 3**).

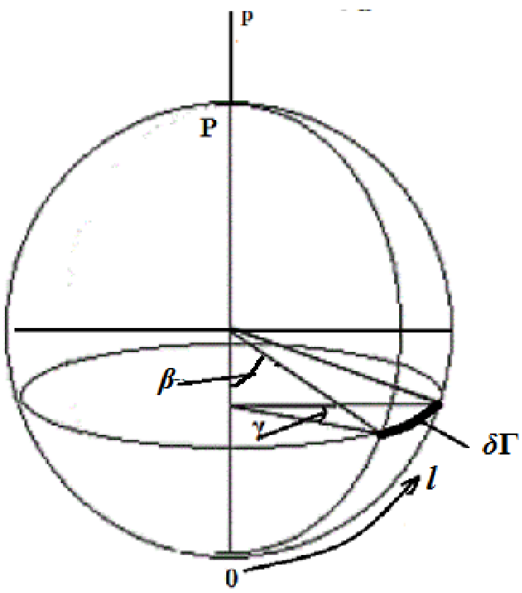


Figure 3

The current arc $\boldsymbol{l}$ length is

$$l = \frac{\beta P}{2}; \qquad (9)$$

Hence $$\beta = \frac{2l}{P} \qquad (10)$$

Radius $\boldsymbol{Q}$ of parallel $\boldsymbol{\Gamma}$ is

$$Q_\Gamma = \frac{P\sin\beta}{2}; \qquad (11)$$

The length of the parallel segment between the lines forming the dihedron $\boldsymbol{\gamma}$ is

$$\delta\Gamma = \gamma Q_\Gamma; \qquad (12)$$

Consequently (10), (11), (12) suggest

$$\delta\Gamma = \frac{\gamma P \sin\left(\frac{2l}{P}\right)}{2}; \qquad (13)$$

As the distance increases, the current interval between the lines forming the sight angle reaches its upper limit on the equator of the sphere and decreases down to zero on the opposite pole of it.

For instance, the interval between the lines forming the same angle in the tangent space $\boldsymbol{R}^3$, depending upon the distance from the view point, would be proportional to the product of the sight angle and the current distance – $\boldsymbol{\gamma r}$, and would grow infinitely.

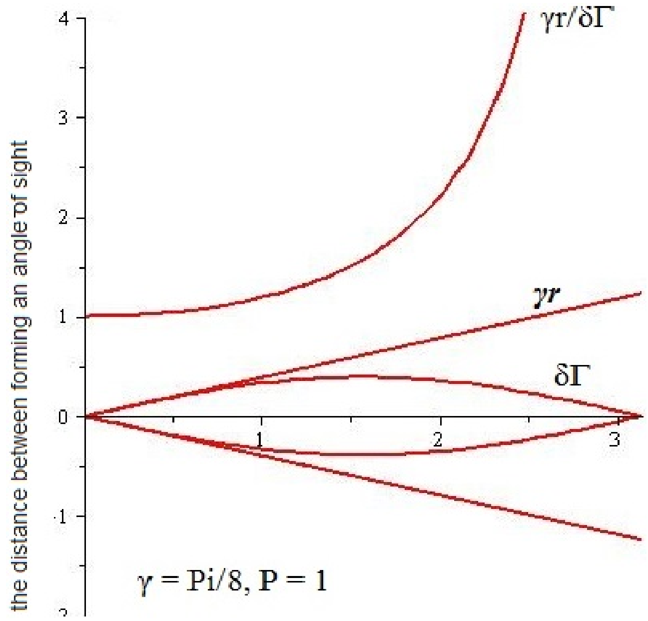


Figure 4

The upper curve in Fig.4 shows an error factor when the cross distances are defined for $\boldsymbol{R}^3$ and $\boldsymbol{S}^3$
By substituting (8) into (13)

$$\delta\Gamma = \frac{\gamma P \sin\left(2\arctan\left(\frac{r}{P}\right)\right)}{2}; \qquad (14)$$

and dividing γr by the consequent expression (14), we will get the size distortion factor depending upon the distance r to an object which has been measured by the spectral shift in the tangent Euclidean space.

$$k = \frac{2r}{P \sin\left(2\arctan\left(\frac{r}{P}\right)\right)}; \qquad (15)$$

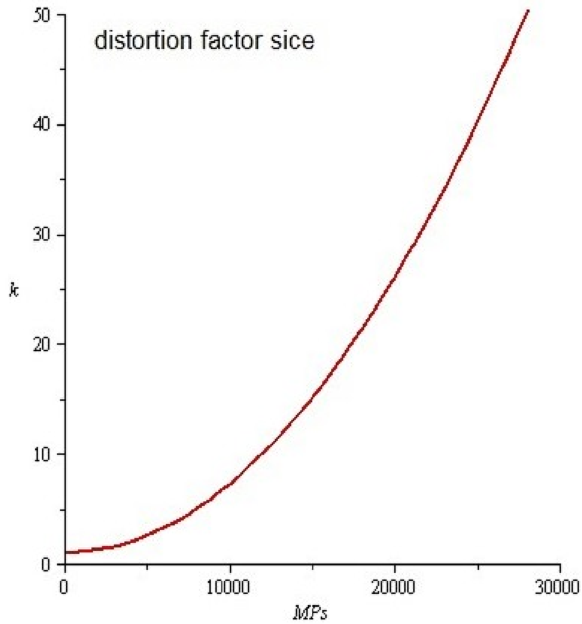


Figure 5

An apparent brightness of the object I in the Euclidean space R^3 is inversely proportional to the square of the distance to it.

$I = \frac{I_0}{r^2}$ Where I_0 is object brightness at a unit distance.

Let's examine some circumferential spatial angle with a celestial object in the center.
Spatial angle is a circular cone formed by radial lines that are tangent to the apparent disk of an object.

In the case of the three-dimensional sphere S^3 such cone is formed by the meridians the distance between which would be little different from the one in the Euclidean space, if it is near an observer of the light source, however, as that observer moves farther, the distance between them would increase slower and slower. On the equator of the three-dimensional sphere these meridians would become parallel to each other and then start getting closer (**Fig. 4**.).

Thus in the three-dimensional sphere S^3 it would be an object similar to a spindle instead of a circular cone moving into the infinity in case of the Euclidean space R^3.

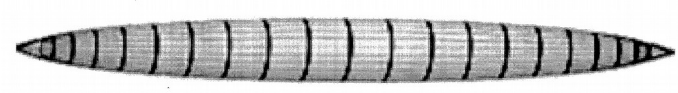


Figure 6

The quantity of light propagating in any cross-section of such «spindle» would be constant.

The ratio of the squares of the circular cone cross-section in the space $\boldsymbol{R}^3$ and that of such «spindle» in the three-dimensional sphere $\boldsymbol{S}^3$ would equal to the squared size distortion factor (15) or **Fig. 5**.

Let's compare that with the experimental data.
It is pretty hard to interpret the inexplicably intensive luminosity of far distant celestial objects, which contradicts their luminosity change that is quick enough to restrict the emitting area. [1]

Let's make a calculation of the true quasar luminosity.

Quasar (ULAS J112001.48+064124.3) [2]

observations of a quasar (ULAS J112001.48+064124.3) at a redshift of 7.085, which is 0.77 billion years after the Big Bang. ULAS J1120+0641 has a luminosity of 6.3×10^{13} *L and hosts a black hole with a mass of* 2×10^{9} *M (where L and M are the luminosity and mass of the Sun).*

The distance to it is traditionally calculated using the formula $r = \frac{cz}{H}$

$$\boldsymbol{r} = 300000*7/70 \approx 30000\text{Mpc}$$

Let's assume that the three-dimensional sphere diameter is 4000 Mpc and substitute this figure into (14). Thus we get:

if $\boldsymbol{r}$ = 30000Mpc and $\boldsymbol{P}$ = 4000Mpc, the distortion factor is about 57.

So, the quick change of its luminosity becomes explainable.
As the cross-section square of both cone and «spindle» has the squared relationship relative to the cross-section radius, the quasar brightness shall be reduced by 3250 times. Hence the true quasar luminosity is
quasar (ULAS J112001.48+064124.3)

$6.3 \times \frac{10^{13}}{3250} = 2 \cdot 10^{10}$ of solar luminosity, that is more than three orders of magnitude less than the figure provided by the publishers.

Conclusion:

The discovered principles of the light propagation in the three-dimensional sphere along with the perception of them in the tangent Euclidean space are supported by the experimental data such as "Hubble flow", "Dark energy", and abnormally high luminosity of distant quasars which are in fact the geometric consequences of the Universe geometry. All this proves the hypothesis:

Our Universe is a stationary three-dimensional sphere.

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(Sardanashvili Gennadi https://sites.google.com/site/sardanashvily/) for the advice:
«If any results are, publish them. It is easy now, for example, in arXiv».

References:

[1] Chernin A.D. Stars and Physics M. Science 1984

[2] Nature 474, 616–619 Aluminous quasar at a redshift of z = 7.085
http://www.nature.com/nature/journal/v474/n7353/full/nature10159.html

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