Looking into Universe. 2 2NdV.2_EN

2NdV.2_EN Looking into Universe. 2

Authors: brilliant predecessors in my interpretation. Composed by VVvv. Translated by Google translate, ran by VVvv. Thanks are given to professors Jiri Bicak and Michal Krizek.

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This version is the second part of a series of articles, which was created by extracting from the original zero version "02NdV1_EN Looking into Universe, Part 1" into a separate part. The effort was to systematically reach stages that would describe the consequences of using a simple model of closed space with constant curvature to describe observations
in the space of the Universe as a whole. And order the consequences from simpler to more complex as I found them on my expedition to the distant Universe.

The **Abstract Looking into Universe.2** {**2NdV.2A_EN**} and **Summary Looking into Universe.2** {**2NdV.2S_EN**} are available for this work.

(Notice to reader: The timestamp of the parentheses tells me when the note was either created or reformulated. To keep the versions organized, if I change the text or image then I change the date of version by at least one day. The whole words written in capital letters are words from dictionaries, which I use in a specific meaning, and which I am specifying in my writings. The original files are in Czech, my mother language. If there are discrepancies between the translations, the version in the original takes precedence.)

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A. INTRODUCTION TO PART TWO

B. STARTING POINT

C. EXPANSION OF SPACE

D. IMPLICATION ON OUR OBSERVATIONS

E. OBSERVATION ALONG THE ARC

F. GRAVITY DEFICIT

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In the first part of Looking into the Universe, we didn't need any physics yet. We presented only the simplest geometric model of a curved 3D space that could capture Einstein's idea of the Universe as a self-contained space that must be curved in order to be closed.

We helped us by realizing that our observation in 2D space along the surface of a sphere is the same as in 1D space along a circle, so following a straight line would take us to the starting point from the opposite side. I just called that circle a SUBSTITUTIVE CIRCLE because it substitutes a straight direction in space with constant curvature. If a straight direction were to lead us back to the starting point from the opposite side even in some hypothetical constantly curved 3D space, our observation in it would also have to take place along SUBSTITUTIVE CIRCLES.

The light from the source at the actual location "S" would then have to travel to us observers at the point "P" along the surface of a geometrical figure which I have called "rugball" because its shape reminds us of a rugby ball constantly curved with the vertices "P" and " S", and which is created by turning the SUBSTITUTIVE CIRCLE around the connecting line "P-S", i.e. the secant of the circle. We are still only talking about geometry.

If such a model could be applied to our looking into the Universe, then it would begin to be physics.

But the universe cannot be exactly constantly curved, since unevenly distributed gravity precludes this. Tangential directions from "P" to the "rugball" surface, which would otherwise form an illuminated circle in the sky, would be reduced to discrete directions along which light would travel to us from apparent "Z" positions in the sky, and which would be arranged into a ring. The diameter of such a ring would increase with increasing distance from us to the observed light source "S", and its center would point to the hidden position "S".

If such rings could be found in the sky, then it would already be physics.

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On September 6, 2021, during my visit to Mr. Jiri Bicak, professor from the Institute of Theoretical Physics, Faculty of Mathematics and Physics, Charles University in Prague, I received a notice from him, for which I thank him. The so-called gravitational lensing (https://en.wikipedia.org/wiki/Gravitational_lens), which is said to have been predicted already by Einstein, is currently being confirmed by an intensive study of black holes in the Universe.

Local gravitational lensing occurs by the

curvature of space due to local strong gravity.

If the first consequence of the chosen model described in the first part is verified, then it could point to a similar global effect but caused by the

curvature of space due to weak global gravity that holds the Universe together.

The model-predicted multiple observations of objects in the Universe would begin to alert us to the possibility that observing of assumed unique objects may be just an optical effect of our observation. It could be some a kind of optical distortion, which for clarity I will call **"The First Optical illusion in looking into the Universe"**, to distinguish it from the other two, which I will be discuss in this second part.

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Along the SUBSTITUTIVE CIRCLE, we can express the observed distance from us as **z=R•φ,** where **R** is the radius of curvature of the space [radius of the SUBSTITUTIVE CIRCLE] and **φ** is the distance along the arc of the circle measured in arc measure with the origin at our point of observation. And the speed of moving away (or moving closer) of fixed

points on the circle, for which **φ** is constant but only the radius of the circle R increases (or decreases), we can then write as the time change of the distance along the arc of this circle **dz/dt= dR/dt•φ**, and by marking **dR/dt** with the symbol *ΔV0*, as *ΔV*= *ΔV0* **•φ**.

A spherical coordinate system, in which the direction of observation is determined by the combination of two central angles, has proven to be advantageous for describing our observation. We also realized that all our observations seem to be projected onto a plane perpendicular to the direction of observation, which I call the PLANE OF OBSERVATION. And since we can generally do our observations in all different directions, we can replace this plane with what we call the OBSERVATION BUBBLE, which completely surrounds us as observers.

But our model ruled out the idea of an expanding space from some center of expansion to an increasingly distant and more expanded space. There is no **EXCEPTIONAL** place in our model where anything can happen differently than in other places. And this must also apply to expanding the space. The search for such a process, which would somehow describe the expansion of space, is therefore limited to the search for something that takes place in all places in the same way.

And that is exactly what we will be looking for in this stage. And also what consequences we would have to be aware of when looking into such a space by using our model to look into the Universe as a whole.
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In the previous stage, we examined a four-dimensional self-contained space, which appears to us to be three-dimensional, like some kind of mathematical or geometric model, if you like, in order to find out the consequences that follow from it. Now we are getting to the point on our journey where we are going to investigate whether such a model might be useful in modeling observations in the real Universe as it appears to us.

We will try to see the **consequences** of the **IDEA** if we were to use the constant curvature closed space model just described to describe the actual space in the Universe. That is, a 4D model that appears to us as a 3D space from the inside and where the observed **objects move away from the observer, and the farther the objects, the faster.** As **Edwin Hubble** tells us with the **discovery of the red shift** of light emitted from observed objects in the Universe.

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In any case, the interpretation of some “expansion” of the space of the Universe, where something constantly changing from a less expanded center with an extremely high density and temperature of matter should spread into an increasingly expanded space, such an interpretation is no longer possible. Our model requires that everything happens equally in all places, including the expansion of space. It is as if something is pushing everything from every point in every direction, to a greater and greater distance, and at the same time to a greater and greater past in our observation.

Exploring such an IDEA seems like an attractive possibility. Well, at least to me, so I couldn’t help but follow such a trail.

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But if such an IDEA happens to be successful, then watch out. Let’s not stop perceiving the IDEA as a model, and the model will always remain something other than what it models.

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To call the observed receding of objects in the Universe in our model the expansion of space would be “classical”, but dangerous, because the word “**expansion**” suggests something that has some center of expansion, i.e. that it also originated from somewhere, and that it has the front of the expansion, i.e. how far the expansion has reached. This suggests that it is some sort of ever-changing transient process that has its boundaries. Not a process that should be continuously the same in all places, equally ongoing, perhaps quite stable, almost stationary (?). And which, due to the distortion of our observation in curved space, only appears to us as a process of expansion in all directions from us. Although we ourselves do not think that we occupy some EXCEPTIONAL place in the Universe that should coincide with the center of such an expansion.

Therefore, it would be better to choose some names in English such as “**flatulence**“, “**swelling**“, or “**effervescence**” [**CZ original: „nadýmání“, „bobtnání“, „kypění**], which would better describe such a process, a process that takes place in the same way in all places of space. In other words, it would capture that our observation of such a process from any point of our observation would have to be the same, equivalent. The same process must take place in each location. Surely no place in some space that is enclosed within itself

with [spatially] constant curvature can somehow be EXCEPTIONAL, so that anything can happen in it differently than in other places? That is inherent in that model.

I am still looking for a suitable English word that would describe it better. There can be no "flatulence", no smoke is produced, no moisture supplied to make it "swell", and no chemical reaction necessary for "effervescence" is produced. And yet, in order for the word to continue to be easily used, it should be easily translatable into foreign languages, easy to remember, and at the same time somehow convey that this kind of expansion is just a little different from the name expansion used so far.

I apologize for choosing an easy-to-remember name for such a process (perhaps with a bit of humor, :D) **ECSTASY** ***[CZ original: EXTÁZE, NL:extase]***. In Czech, it is not far from **expansion** ***[CZ original: expanze]***. And if it should meet with a lot of resistance, I will apologize again and withdraw it.

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The recognition of the "expansion" of space in physics required that, by backward extrapolation, we necessarily arrive at the "beginning" of such an expansion, which we call the **Big Bang**. A kind of singular point and singular moment where and when it all started "from nothing". Therefore, if we look into the past, then we must also come across the end of our view, or rather the beginning, when it all began. **Perpetum mobile** or **Perpetual motion** is excluded. That's what physics teaches us. And now all of a sudden so much energy out of nothing, that would be a blessedly big exception, wouldn't it? (Something like we know that stealing a little money is also something completely different than stealing the whole bank, :D).

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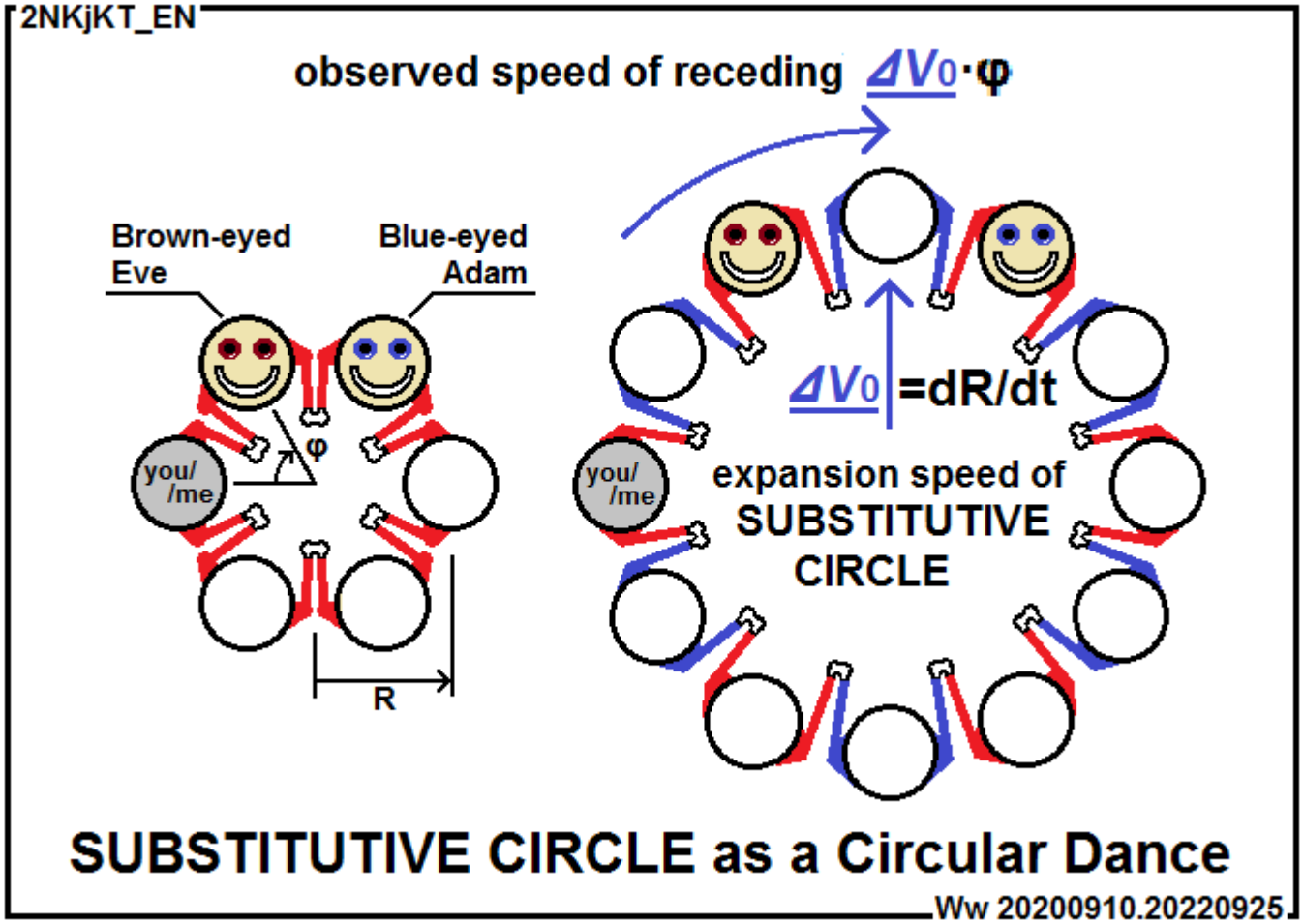
But how can we imagine such a process, the same at every point? So that we can have at least some tangible IDEA of such an observed moving away, I would like to offer a suggestive image of a **SUBSTITUTIVE CIRCLE as a Circular Dance [2NKjKT_EN]:**



In the left part, we can see schematically as if you, or I, were dancing in a circle next to the brown-eyed Eve and the blue-eyed Adam (with an apology: since I am a man, I chose a more attractive place for me closer to Eve than Adam :D) all in a red suit.

On the right part, other blue-clad dancers join the dance spatially evenly. It is easy to see from the sketch that Adam will move away from us faster than Eve (and we will also move away from Adam faster than Eve). Or to put it another way: The more distant dancers will automatically move away from us faster than the closer ones, even if their position angle φ on the circle has not changed.

The radius **R** of the circle is also marked on the left side, as well as how the angle **φ** is measured from us. On the right side, the increase in the radius of the circle is also marked, i.e. the expansion of the SUBSTITUTIVE CIRCLE. If the rate of expansion **dR/dt** is denoted by the symbol $\underline{\Delta V_0}$, then the observed rate of receding along the arc has the magnitude $\underline{\Delta V_0}$**·φ**.

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< 20181202 The expanding circle of dancers in our image is reminiscent of Hawking´s IDEA, presented in a popular science program1 , where the expansion of the Universe was simplified from 3D to 2D, as if created by the mutual "pushing" of objects into space.

The skaters on the ice surface were lined up behind each other in the shape of the three-pointed star of the Mercedes brand, leaning on each other and holding some kind of airbags between them. On command, the airbags began to inflate at the same time, so that by the expansion of the airbags, they began to push each other away, in such a way that during the contact with each other, the skaters further away from the center obviously gained a greater and greater initial speed. Then, when the skaters lost contact with each other, they continued to move away from each other by inertia alone. This is how the IDEA of the universe, which was created by an explosion called the Big Bang, became popular.

Skaters resemble our Circular Dance, but they are not the same. The movement of the skaters after the end of the airbag function is considered as inertia, whereas in the circular dance, the addition of dancers to each place continues.

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[1] This IDEA of Stephen Hawking is popularly and scientifically presented in the program called "Genius by Stephen Hawking".

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There, the expansion of space was perceived as an immediate activity that ended with an explosion, and further expansion continues only through the inertia of all objects that were set in motion by the explosion, and the farther from the center of the explosion, the faster. That is, not as some ongoing addition of dancers to the SUBSTITUTIVE CIRCLE, which they represent here, and which expands smoothly and evenly with the passage of time. 20210601 >

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But our model offers something else: If in our expression of the receding velocity $\Delta V = \Delta V0 \cdot \boldsymbol{\varphi}$ the quantity $\Delta V0$ is **non-zero** ($\Delta V0 > \mathbf{0}$), then with increasing $\boldsymbol{\varphi}$ the observed receding velocity will grow indefinitely. And for a sufficient distance $\boldsymbol{\varphi}$ from the observer, the observed speed of retreat will reach the limiting size $\Delta V0 = \mathbf{c}$, which I called the **LIGHT BARRIER** [2] . I chose the name based on the "Sound Barrier", which has proven itself in

aviation, for example.

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Professor Bicak from the Charles University in Prague pointed out to me that what I call the* LIGHT BARRIER *could probably best be called the "cosmological horizon" in physics. I thank him for this notice.

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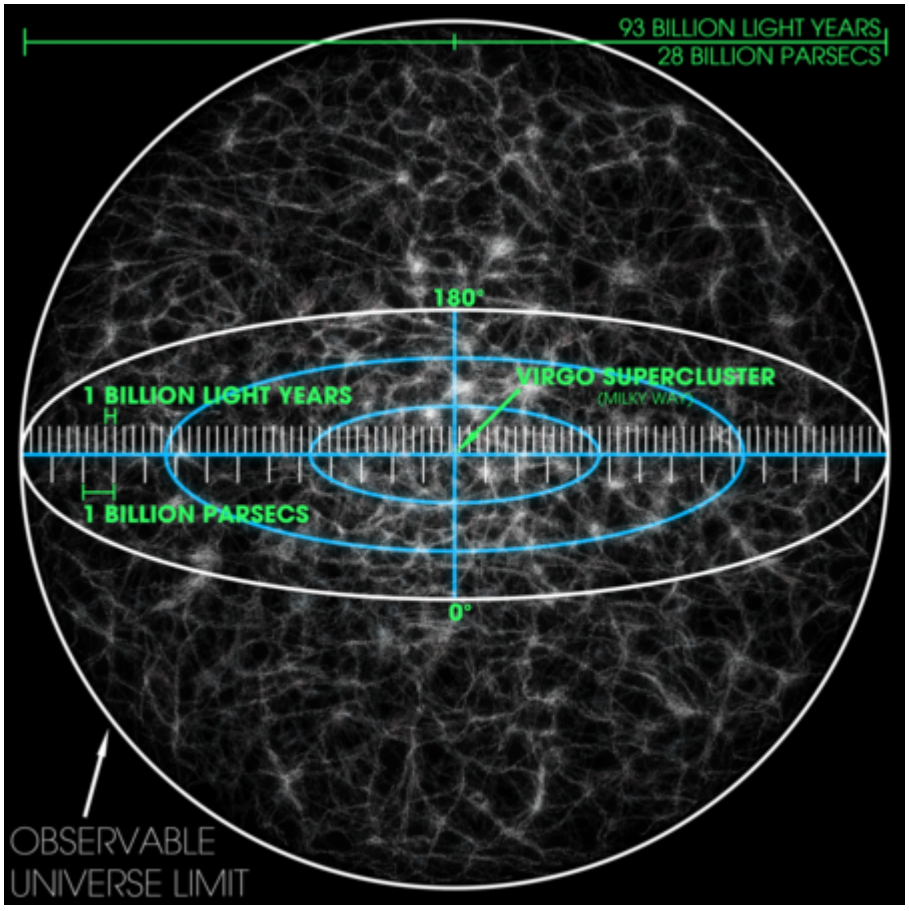
According to **https://en.wikipedia.org/wiki/Cosmological_horizon**, a **Cosmological horizon** is a measure of the distance from which one could possibly retrieve information. This observable constraint is due to various properties of **general relativity**, the **expanding universe**, and the physics of **Big Bang cosmology**. Cosmological horizons set the size and scale of the **observable universe**. This article further explains a number of these horizons (1 Particle horizon, 2 Hubble horizon, 3 Event horizon, 4 Future horizon, 5 Practical horizons).

But how does this measure of the observable Universe relate to the IDEA of the size of the Universe in contemporary cosmology? In search of an answer,

[2] < 20210520 I thank Professor Krizek from the Mathematical Institute of the Academy of Sciences of the Czech Republic for pointing out how he himself had already come across a calculation that considered a speed of retreat beyond the "horizon of the universe" greater than the speed of light **c**. Even a speed exceeding by a factor of ten! However, the presented model does not exclude the IDEA of observing movement through a closed space along the SUBSTITUTIVE CIRCLE multiple times repeatedly, and thus the speed of retreat increasing indefinitely. So after the first orbit, the observed velocity of retreat comes out as $\Delta V = 2\pi \cdot \Delta V_0$, and each subsequent orbit adds a $2\pi \cdot \Delta V_0$ increase to the velocity. Then it would be possible, at least theoretically, to consider a speed of, say, **10·c**. 20210520 >

I opened the article https://en.wikipedia.org/wiki/Hubble_volume. (I must point out in advance that by opening any article on cosmology one can see the enormous amount of work that has been done in it, and how many of our brilliant predecessors have participated in its research. Therefore, it is perhaps not surprising that any layman should lose track, what can cosmology even mean to him.)

The presented visualization of the entire observable Universe is interesting:



With description: Visualization of the whole observable universe. The scale is such that the fine grains represent collections of large numbers of "superclusters". The "Virgo Supercluster"—home of Milky Way—is marked at the center, but is too small to be seen.

Since we, as observers, would observe the homogenous Universe equally deep on all sides, our position, our Earth, our Milky Way will of course be drawn in the center of the visualization. And what I call the LIGHT BARRIER, and here is called the Limit of Observable Universe, is shown here as an enveloping sphere. The same visualization is also presented at https://en.wikipedia.org/wiki/Observable_universe, specifying that the **observable universe** is a **ball-shaped** region of the **universe** comprising all **matter** that can be **observed** from **Earth** or its space-based telescopes and exploratory probes at the present time, because the **electromagnetic radiation** from these **objects** has had time to reach the **Solar System** and Earth since the beginning of the **cosmological expansion**. And data such as its **diameter $D=2R\approx 8{,}8\cdot 10^{26}m$**, and **volume $V=\pi\cdot R^3\cdot 4/3\approx 3{,}6\cdot 10^{80}m^3$** are added to the enveloping sphere.

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But this would mean that the propagation of light to the observer in a straight line is considered here. As if the light came to us not along an arc but along a straight line. Such a straight line is used here as the radius **R** to determine the **volume of the observable Universe as the volume of a sphere!** That would not respect Einstein's IDEA that the Universe should be considered a curved and self-contained space where light must travel to the observer along an arc? Does modern cosmology not respect this IDEA of Einstein?

If we observe everything along an arc in a curved space, and along a SUBSTITUTIVE CIRCLE in a space with constant curvature, then we spatially reach the place of the observer at a distance corresponding to the central angle of **2π (360°)**. And further beyond it, we would begin to observe everything again, as if in the "second round".

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