

The Speed of Communication and the Place of our Life

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Abstract. Some considerations are given that we are either part of the communication - nervous - cosmological system. The estimation of the sizes of viable cosmological discreteness for a man and his society is made. The estimate is $d=u \cdot t$, where d is the linear size of the discreteness, and $u=c \cdot k^n$ is the data transfer rate of the structural elements of the discreteness, in which c is the speed of light, k is the Zhirmunsky-Kuzmin scale factor $e^{(e^e)}=3.814 \cdot 10^6$, n - the number of the level of the hierarchy. We assume that a social person is a measure of all things, then for him $n=0$ and $t=(1 \text{ s})/(24 \text{ frames})=0.042 \text{ s}$ - the sampling period is the reciprocal of the global frame rate standard.

$c \cdot k^{-1}=79 \text{ m/s}$, $d \sim 3.3 \text{ m}$, bio-human

$ck^0=2.998 \cdot 10^8 \text{ m/s}$, $d \sim 13,000 \text{ km}$, geosocium

$c \cdot k^1=1.143 \cdot 10^{15} \text{ m/s}$, $d \sim 320 \text{ au}$, heliosocium

$c \cdot k^2=4.362 \cdot 10^{21} \text{ m/s}$, $d \sim 20,000 \text{ ly}$ galactosocium,
here au is an astronomical unit, ly is a light year.

Astonishing life crosswords -

A mixture of truth and lies

And our honest words.

If the road to hell is paved with good intentions, then to heaven - with sharp jokes.

Now many people are interested in the question - where to find free space for our Life? For example, how and where to look for earth-like exoplanets?

I am interested in another question - where is the place of our Life?

Many scientists by vocation have an intuitive feeling that we can get at least a partial answer to this question, if we guess, or better - by experiment, we find out what part of the nearest size of discreteness in the hierarchy of living systems is our earthly world.

In this regard, I like the attempt by Aleksey Zhirmunsky and Viktor Kuzmin to reveal, on the basis of available empirical knowledge, the form and numerical value of a critical scale factor that allows, predictably, to predict the sizes of discrete values in a nested hierarchical sequence of living systems [1]. Visually, I sometimes see their attempt in a tree in the spirit of p-adic numbers, in which each structural element of the hierarchy — stem, branch, leaf — develops in accordance with its exponent, and this exponent contains exponents of lower rank elements. They got an amazing result - for our today's World, the limiting critical scale factor is a construction of three nested exponents - the number

$e^{(e^e)}=3.814 \cdot 10^6$.

In the Russian edition [2] there is a table 34, which demonstrates the predictive power of the critical factor.

I counted the table, starting with the mass of the galactic nucleus, everything coincided, except for the electron mass. I checked, if we take as a parameter not mass, but the size of the discreteness or the speed of communication, we get the same sequence.

In general, it turns out that the living discretion closest to our terrestrial World is, oddly enough, the Sun, the next is the Galaxy.

We already know something about our earthly world. In this regard, I am interested in such an inverse problem. I arranged in a row 3 tables of chemical elemental composition - the two shells of the Earth available to us - the atmosphere and the crust and between them a table for the biosphere organism, of course, man. Nothing can be done, selfish interest, a man - the measure of all things, although any other would have approached. And looking at the tables, I immediately see their connection, in general, something trivial. But then I have next to me a table of the composition of the Earth's atmosphere and the sun's photosphere, and I also see a connection and interesting sensations of analogy and similarity appear, and questions arise. The most interesting for me were the following: which element —

magnesium or sulfur — is analogous to the carbon of terrestrial organisms, and where there is a place on our planet that even approximately corresponds in pressure and surface temperature to the Sun. In general, it seems to me that it makes sense for us to be interested not only in aliens, but also in Sun dwellers, although it is possible that the latter smell of sulfur. Joke, of course.

By the way, Vladimir Fortov, the former president of the Russian Academy of Sciences, is the most authoritative expert on plasma-dust organized discrete in Russia. It turns out that it is closest to the Sun, perhaps because it does not see anything mystical and impossible in the existence of a "frozen" quasicrystalline plasma, at least, as he believes, due to the overwhelming prevalence of the Coulomb interparticle interaction energy over the thermal motion of plasma particles. And most importantly, he and his staff already know how to create, even if they are still primitive, solar discreteness. Its installations are no less, and perhaps even more interesting, than all colliders, including photon ones, although everything is necessary and important if you follow the principle of maximum geochemical activity.

More recently, some 100 years ago, theoretical physicists began to construct a quantitative model of the emergence of our Universe, according to which, from the start, the cosmological singularity jerked, which expanding, cooling down and becoming more complex along the course, eventually led to the emergence of Life - to least on Earth.

I noticed that for many people, the Big Bang Model causes, often unconsciously in words, a deaf protest - it is difficult for them to accept the secondary nature of Life. It seems that protest carriers have been and will always be in the history of people.. Many of them, especially those who believe in analogies, the similarity and fractality of the World, construct anthropomorphic biomodels of our Universe. Sometimes they look very curious, but, unfortunately, all without exception are humanitarian, philosophical, not quantitative, not numerical. I would say prophetic, but not predictive and, moreover, complete, explaining everything and everyone, leaving no room for the creativity of living people. It's not interesting.

By the way, in my work I somehow had to look into the literature on embryology, I wanted to see what the graph of intrauterine fetal development looks like - how the mass changes in time, the size of the fetus - from the embryonic cell to birth and with surprise I discovered that in the accessible special literature there are only words, words, words ... and very few numbers. True, as colonies grow, microbial colonies spread across the surface of the nutrient medium of their flat World — there are many such quantitative data — a theory of industrial bioreactors is built on them.

In general, there is no clarity here, as well as with vitalism. For example, I cannot understand why Wöhler's synthesis of urea refutes vitalism. After all, all he managed to do was synthesize urea outside the body, but all the same, the synthesis was carried out with the participation of the body, living matter, and special vitality in the person of Wöhler himself. Now, if the dead Wöhler synthesized urea, then I would have to agree with the statement that vitalism is naive nonsense. In short - ... all living things from living.

As always, Life is beautiful and amazing and, most importantly, does not let you get bored and even makes many look for it.

Many believe that only the Creator knows where to look for Life.

And gamers will say - ... clearly where - Life in the Game.

The game is a search sign of creative life - a universal way to get out of the usual - ... Gödel's theorem, Dr. Watson. And why is it necessary to search? Maybe playfully create?

To the question of the scientific principles of the search for life.

Experience and observations show that it is unlikely to find life interesting to us where there is silence, calmness and order, unless in a dream or, for example, at a cemetery. The most attractive life for us is on the verge of day and night — although it is harder than rest with children.

The most interesting science for the search for life is non-equilibrium quantum thermodynamics, synergetics - we cannot imagine Life without the heat and seething openness of the World. Below is one of the particular formulations of one of its principles, realized by our Life. :)

Heisenberg uncertainty principle. The Smile of the Universe.

Freedom, Brotherhood, Equality -
Them hadn't been and will not be.
The Cause of any action Is Inequality.
So it was, is and will be.
If seen in the Heisenberg's principle only Equality,
It can scare anyone -
An enormous splash of Energy
and no Time to run.
However, Uncertainty Principle not so simply,
Inequality sign in it as the Universe Smile –
Equality is Childhood simply.

To the question of the scientific principles of the Sunday search for human life.
The basic principle in a concise statement is simply about the complex in the format of the verse.

Billeting!
I can't as you.
Of course!
Time waits.
I'll wait for you.

Comment scientist.

Experience and observations show that in an accessible Universe the speed of any process is equal to the speed of the slowest stage. The result — our search for life — seems to be no exception — the quick stages elude us. We are told - ... Snail, you should slowly crawl at Fuji. But I want a little faster. It is possible and faster, but we have not yet learned.

The hierarchy of communication speeds, estimates:

c is the speed of light and k is a critical scale factor of Zhirmunsky-Kuzmin, $k=e^{(e^e)}=3.814 \cdot 10^6$.

On an organism scale, $c \cdot k^{-1} = 79$ m/s.

On the scale of the biosphere $c \cdot k^0 = 2.998 \cdot 10^8$ m/s.

On the scale of the heliosphere $c \cdot k^1 = 1.143 \cdot 10^{15}$ m/s.

On a galaxy scale, $c \cdot k^2 = 4.362 \cdot 10^{21}$ m/s.

We appeared later than the Universe. And on Earth, not the first. It seems that we are either part of the communication - nervous - cosmological system, or parasites. Arthur Clark in the story "Out of the Sun" made the second, but experience and observations point rather to the first - Vladimir Vernadsky notes a billion-year irreversible cephalization of Earth Life as a confirming example. Now in the biosphere only a social person is endowed with the desire and ability to see and realize the World as a whole on the scale of the Universe - we did not stop at communication at the speed of sound and do not seem to linger at communication at the speed of light - we'll try to master the following speed with the combined forces of natural and artificial intelligence - as it seems to us, from our selfish interests.

I have already given an estimate of the galaxy-wide communication speed $c \cdot k^2 = 4.362 \cdot 10^{21}$ m/s, made with the help of the Zhirmunsky-Kuzmin scale factor. People usually rely on, I underline this, not trust, but rely on estimations published in rating journals of the planetary science community. So I cite here, disguised as nonsense, the estimation from article of Boris Bolotovskiy and Vitaly Ginzburg at UFN [3]. According to observation data for pulsar NP 0532 in the Crab Nebula the travel speed of "superlight spot" is $12 \cdot 10^{21}$ m/s.

I personally prefer estimation made by "common sense" reason, combined with as much as possible view on the problem, like ...all is discrete and connected to all here and now... Many sentences can be cited about this - from Hermes Trismegistus to Benoit Mandelbrot. Such vision is cultivated by wise

system analysts, and philosophers of course, but they are not able to measure, to evaluate, to put into numbers.

I used the estimation from following "common sense" logic:

- A star is structural element of our Galaxy, similar to a cell of a terrestrial organism;
- The number of stars in our Galaxy is 3 orders lower than number of cells in 70kg weight human body;
- Hence, a human in his complexity, is no less than the Galaxy, and it is attractive to use him as analogous model of the Galaxy, especially, in certain way, him, in other words we are, its part.

Disturbance transit time at nervous system from man's heel to head is about 0.1 second. So, the same time interval is necessary to communicative, control disturbance in the Galaxy to travel the distance equal to its diameter. Dividing the Galaxy diameter by 0.1 second, we get the estimation $9 \cdot 10^{21}$ m/s, maybe graviton speed.

I like the statement ... in a complex system, any signal are to be communicative, control... there are simply no strength, no energy, no possibilities for any others. But, of course, these strength, energy and possibilities can be from other system, which has its own goals. It is enough to remember twitch of cut frog leg in the experiment of Luigi Galvani.

It is possible for the future to estimate the size of viable cosmological discreteness for a man and his society. Estimation according to the formula $d = u \cdot t$, where d is the linear dimension of discreteness and $u = c \cdot k^n$ is the communication speed of the structural elements of discreteness, in which c is the speed of light, k is the scale factor of Zhirmunsky-Kuzmin, n is the number of the hierarchy level. We assume that a social person is the measure of all things, then for him $n=0$ and $t = (1 \text{ second}) / (24 \text{ frame}) = 0.042 \text{ s}$ - the sampling period is the reciprocal of the global frame rate standard.

The size of viable discreteness is strictly related to the speed of communication and cannot exceed the estimate. Of course, if we remain human:

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The size hierarchy follows from the hierarchy of communication speeds - what speed, such and size. Questions - how to get to the next speeds and do we have a natural ability to perceive signals at these speeds? Some, such as Wolfgang Pauli, believe that if there is, then it works during a night's sleep, when we are protected from the Sun by the thickness of the Earth and it is connected with our natural radioactivity. The opinion is curious, as well as the sleep - wakefulness cycle itself - inexorable, uncontrollable, unquestioning for all living things, at least on Earth. The bioman, during the life of 82 years, experiences $\sim 30,000$ sleep and wakefulness switchings. Hence, the switching frequency is $f = 1/82 \text{ yr} = 3.864 \cdot 10^{-10} \text{ Hz}$ and the wavelength $(79 \text{ m/s})/f = 1.36 \text{ au}$ - approximately, as from us to the Sun. By the way, Karl Jung calls our ability to perceive signals at high communication speeds as synchronism. Human senses of perception are surprisingly well coordinated with each other and our World (atmosphere transparency windows). In particular, the matching of the ranges of visible light and audible sound is amazing [4].

For them, the condition $(\text{sound speed}) \cdot (\text{sound wavelength}) = (\text{speed of light}) \cdot (\text{light wavelength})$ is satisfied. It is universal for humans, so you can estimate the wavelength (frequency) for the following communication speeds and try to imagine possible ways of natural or perception of signals at these speeds.

Literature

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