

Extra-spatial basis of spatial world. Principles of panory

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Abstract

A description of the matter and the world structure based on the action-duration change is proposed. The concept of place and spatial relations for its harmonics are introduced. The world emergence from extra-spatial noise and its development to the over-noisy spatial structure are studied. The environment hidden behind the seemingly empty space has a huge density and is the cause of electric and gravity fields. There is an endless chain of interconnected and controlled worlds. An explanation of the particle structure was proposed. Modern physical theories may be derived from this representation.

Introduction. World of changes

Three basic physic concepts were used in the late 19th century in addition to absolute time: bodies, fields, and space. The bodies move in the space, are fields sources and interact with other bodies through fields. The bodies and fields are located in the empty space that is not material but has properties: infinity, three dimensions, and distances. It was assumed that there is an unobservable environment in space — the Descartes ether [1] in which all phenomena should occur: fields are waves and bodies are features of a structure or movement (for example vortices).

Experiences and theories reveal inconsistencies and contradictions in this representation of the world at the beginning of the 20th century [1]. This led to the creation of two new mechanics: the theory of relativity [2, 3] and the quantum mechanics [4, 5]. Previously clear concepts of bodies, waves, fields, and space began to blur, intersect and interact with each other in them. The concept of the ether was recognized as erroneous because its theories was

contradicted with the experience [1, 2]. However there were and are still attempts to revive it.

The continuation of these attempts to revive the concept of the ether is associated with the special and unusual characteristics that the new mechanics give to empty space. Their characteristics correspond more to the substance than to the void [6]. Gravity changes the "empty space" which now affects movement of bodies and fields [3]. "Void" is represented by a "physical vacuum" [7] with irreducible zero oscillations, virtual particles and energy fluctuations.

Einstein's and quantum mechanics are good enough to describe the results of experiments and observations but their foundations are still unclear. This is mainly due to the inductive path of physics development — from observations of ordinary phenomena to simple laws for them and the further successive complication of laws (theories) as the volume of experimental knowledge increases accompanied by an increase in their abstraction. Abstract tools of cognition (symmetries, groups, complex spaces) allow to see general patterns "from afar" as if "from above" but do not penetrate deeply enough into their foundations. However these obscure grounds leave their traces in the physical laws. This is energy, action, time, space.

In physics everything that exists (Everything) is matter, and all its parts have energy which is the ability to do work — to change the state. Therefore energy, as a characteristic of change and contained in everything, transmits own totality to change. Then **Everything is a change**. It has two components (magnitude, duration) and is not reduced to anything else. Replacing one magnitude or duration with another only converts one change into another.

It is necessary to have samples and a comparison method to compare and measure a change. One sample is taken as conditional zero, the other as a conditional unit of measurement. The choice of some method to compare any change with these samples gives its numerical characteristic and allows to measure the change. A transition to another samples, may be non-constant compared to the first, modifies the measured change but leaves it as a change.

Everything is scaling. It has no any specific magnitudes or durations. But the choice of any sample as zero define summarily symmetrical stationary repeats relatively to it. Zero becomes the average line of repetitions and the only conserved value that determines the voidness of Everything — the **relativity of void**. Non-stationarity (also relative) is possible only temporarily as a special case. Everything consists of these special cases that

expresses the **constancy of changes**.

It is convenient and usual to describe the infinite repetition variety by an **infinite set of harmonics** which have any frequencies, amplitudes and phases. Everything is scaling and has not special harmonics with properties different from others. The representation of Everything using harmonics is not a Fourier transform which applies only to one certain periodic function possibly with an infinite period in a limit. This requires an infinite set of each frequency harmonics.

Everything is fully represented in any harmonic. The frequency and amplitude define its scale. Other harmonics with a lower frequency add up to its middle line taken as the zero, and harmonics with a higher frequency add up to the oscillation noise which is described by multiplying a random amplitude by a certain oscillation in the probability theory.

General conclusions about the matter structure

Everything is not empty and changeable relatively to any harmonic. But for each harmonic there is an antiphase one with the same amplitude and frequency. The sum of all harmonics is zero. Then Everything is void and therefore constant. Total voidness is manifested through changeable fullness. **Everything is nothing but appears as something.**

Any part of Everything is opposite and equal in absolute magnitude to the rest as their sum is void. Any part has a zero which is Everything. Hence any **part contains Everything** together with each part including their past, present and future.

This is **the logic of infinities** which differs from the usual finite logic where the part does not exceed the whole. Infinite sets have similar properties in mathematics. There are in them a finite or infinite number of subsets which are isomorphic to the set. Each subset has its own sub-subsets which are isomorphic to the set also. Therefore these subsets contain set. It is possible to divide infinity into infinite parts which have own infinite parts isomorphic to the original infinity. For example sum/product of all elements is zero/one in an infinite additive/multiplicative abelian group. The entire group is contained in zero/one. Some numerical groups have this property.

A set of the same frequency harmonics make up an additive abelian group. It is two-dimensional — two amplitudes (multipliers before $\cos \omega t$ and $\sin \omega t$) or an amplitude and initial phase. This group is enough to express the above mentioned properties of Everything but not enough to describe it completely that requires a three-dimensional groups family of all frequencies harmonic. This family is no longer a group.

Since an infinite set can be divided into any (up to an infinite) number of isomorphic subsets then the **infinity is divisible by repeats of itself**. Everything is void but has infinite energy how infinite harmonics set of all frequencies and amplitudes. Any part as containing Everything also has infinite energy. Therefore the **part owns infinite energy of Everything**.

Everything is an unmanifest state (not-reality, chaos) from which worlds (reality, cosmos) are manifested (born). Their set and variety is countless. Our temporary and changeable world is among an infinite number of other worlds. Its special properties are not derived logically entirely from general considerations although they are inextricably linked to them. Our world is known from the particular experience of our life in it.

Harmonic of action-energy (gaen)

In the introduction it was proposed to represent repetitions of change by an infinite set of harmonics. The equation of harmonic and its solution are $\ddot{s} \equiv d^2s/dt^2 = -\Omega^2s$, $s(t, \varphi) = S \cos(\Omega t + \varphi) = ReSe^{i(\Omega t + \varphi)}$.

The oscillation $s(t)$ have the frequency Ω and amplitude S . The initial phase φ gives oscillation shift in time. Two harmonics with the same Ω and S but different φ represent two coincident oscillations shifted in phase. They are like bodies in different places of space. Thus the initial phase may be called the **place of harmonic**. Determining the place is possible for its slowly change $\dot{\varphi} \ll \Omega$. Otherwise the concept of place is blurred. The oscillation period is a **quantum of time** which restricts the temporal and spatial relations.

Two more quantities characterizing a harmonic as a whole are determined by Ω and S . This is the impulse ΩS representing it externally and the internal energy $\Omega^2 S^2$ supporting it. But $\Omega \hbar$ is an oscillation energy quantum. If ΩS is also considered as a harmonic energy then S would be the action amplitude and $s(t)$ — the negative action so that its speed $e = \dot{s}$ is the oscillating energy and corresponds to the usual connection of energy with the action. Thus the impulse of harmonic is its external energy involved in external interactions. The "harmonic of action-energy" (gaen, Γ) is formed.

After selecting any gaen frequency it can be taken as a unit of measurement $\Omega = 1$. This makes time dimensionless $t = \Omega t$ and gives the same dimensions for energy and action.

$$s = S_c \cos t + S_s \sin t = S \cos(t + \varphi) = ReSe^{i(t+\varphi)} \quad (1)$$

where $S_c = S \cos \varphi$, $S_s = S \sin \varphi$.

The gaen with the place $\varphi \pm \pi$ (shifted by half-turn) is **antigaen** Π . It is represented as a negative-amplitude ($-S$) gaen in the place φ . After the introduction of antigaens the set of places is divided into the real space $|\varphi| \leq \pi/2$ and the mirror antispace $\pi/2 \leq |\varphi| \leq \pi$ in which Γ and Π are mutually replaced. These concepts are relative for each gaen. All gaens with places other than its place by less than $\pi/2$ are included in its space, the rest — in anti-space. The sum $\Pi + \Gamma$ gives zero oscillation. But Γ and Π do not disappear but hide preserving their energy.

Noise and over-noisy gaens

According to the introduction Everything is an infinite harmonics set of equals frequency for which harmonics with a lower frequency describe the midline taken as zero and with a higher one — modulation.

An oscillating variable may be represented as a random quantity (**ranqu**) having probability of observation equal to the ratio of its existence time to the oscillation period. According to Lyapunov central limit theorem [8] an infinite sum of ranqu with any probability distributions converges to the Gauss distribution. Now the harmonic modulations sum becomes the equilibrium fluctuations (**noise**) of oscillations at the selected frequency.

The modulation magnitude is uncertain. But the Gauss distribution is infinitely divisible. Then the modulation magnitude uncertainty is replaced by an infinite set of independent noises with any finite dispersions. One of them is the carrier of our world. The dispersion $\langle S^2 \rangle$ define noise scale. There is nothing to compare it with but can be taken $\langle S^2 \rangle^{1/2} = 1$ as the unit of the gaen amplitude measurements. Now an infinitesimal part of Everything is taken but it remains as infinite for us.

A stationary ranqu must have a canonical harmonic decomposition. In it the harmonics amplitudes S_c and S_s (1) are ranqus with zero averages $\langle S_c \rangle = \langle S_s \rangle = 0$ and have the same Gaussian distributions. From the noise dispersion $\langle S^2 \rangle = \langle S_c^2 \rangle + \langle S_s^2 \rangle = 1$ follows $\langle S_c^2 \rangle = \langle S_s^2 \rangle = 1/2$. Then the noise probability density is

$$P^e(S_c, S_s) = (1/\pi)e^{-S^2}, \quad S^2 = S_c^2 + S_s^2. \quad (2)$$

If go to a distribution $P^e(S, \varphi)$ for $S > 0$ then

$$P^e(S, \varphi) = (S/\pi)e^{-S^2}, \quad |\varphi| \leq \pi. \quad (3)$$

This distribution is homogeneous over the place φ . It has no spatial relations other than one-dimensionality.

From the 1-d noise (2, 3) and the infinite divisibility of the Gauss distribution follows the 3-d noise consisting of independent identical ranqus S_j , $j = 1, 2, 3$ with zero averages $\langle S_j \rangle = 0$ and unit disperses $\langle S_j^2 \rangle = 1$:

$$P^e(\mathbf{S}, \boldsymbol{\varphi}) = \prod_{j=1}^3 P_j^e(S_j, \varphi_j), \quad P_j^e(S_j, \varphi_j) = (S_j/\pi)e^{-S_j^2}.$$

Here the vectors $\mathbf{S} = \{S_j \geq 0\}$, $\boldsymbol{\varphi} = \{\varphi_j\} (|\varphi_j| \leq \pi)$ are entered.

Noise alone is not enough to create and exist a complex ordered world. **The world is over-noise structure** consisting of over-noisy gaens which should be able to combine into more complex developing structures. They can appear from a noise if its level decreases but some fluctuation set do not adjust to it and remains as over-noisy gaens.

If the relaxation is great then there is only noise in which there can be no the world. If the relaxation is small then as the noise decreases its some large fluctuations become over-noisy gaens. Since the gaen amplitudes are counted in units of the noise level this looks like their increase — the release of over-noisy energy which becomes the world energy. This is the world birth (manifestation) from the noise (chaos, etc.). The noise constancy ensures the world development with the energy preservation. The noise increase looks like a gaen amplitude decrease and the absorption of over-noisy world energy. The world plunges (returns) into noise (chaos).

Let there be 3-d defined gaen (1) and the noise (2). Their joint distribution has gaen average amplitudes \bar{S}_{cj} , \bar{S}_{sj} , the noise dispersion and becomes the **over-noisy gaen distribution**

$$P^\Gamma(\mathbf{S}_c, \mathbf{S}_s) = \prod_{j=1}^3 P_j^\Gamma(S_{cj}, S_{sj}), \quad P_j^\Gamma(S_{cj}, S_{sj}) = (1/\pi)e^{-\mathring{S}_j^2}. \quad (4)$$

Here $\mathbf{S}_c = \{S_{cj}\}$, $\mathbf{S}_s = \{S_{sj}\}$ — the random vectors, $\mathring{S}_j^2 = \mathring{S}_{cj}^2 + \mathring{S}_{sj}^2$, $\mathring{S}_{cj} = S_{cj} - \bar{S}_{cj}$, $\mathring{S}_{sj} = S_{sj} - \bar{S}_{sj}$ — the centered ranqus (fluctuations). The ranqu stationarity conditions (zero means and the same dispersions) are not satisfied for this distribution. Hence the **distributions of over-noisy gaens are non-stationary**.

After switching to variables S_j and φ_j as in output (3), the spatial distribution is followed: $P_j^\Gamma(S_j, \varphi_j) = S_j P_j^\Gamma(S_{cj}, S_{sj})$

where $S_{cj} = S_j \cos \varphi_j$, $S_{sj} = S_j \sin \varphi_j$, $\bar{S}_j^2 = \bar{S}_{cj}^2 + \bar{S}_{sj}^2$.

Entered $\bar{\varphi}_j = \text{arctg}(\bar{S}_{sj}/\bar{S}_{cj})$, $\mathring{\varphi}_j = \varphi_j - \bar{\varphi}_j$, $\mathring{S}_j = S_j - \bar{S}_j$, $\langle S_j \rangle = \bar{S}_j \cos \mathring{\varphi}_j$.

Then exponent indicator omitting indexes j ,

$$\begin{aligned}
-\{\dots\} &= S^2 \cos^2 \varphi - 2S\bar{S}_c \cos \varphi + \bar{S}_c^2 + S^2 \sin^2 \varphi - 2S\bar{S}_s \sin \varphi + \bar{S}_s^2 \\
&= S^2 + \bar{S}^2 - 2S(\bar{S}_c \cos \varphi + \bar{S}_s \sin \varphi) \\
&= S^2 + \bar{S}^2 - 2S\bar{S}(\cos \bar{\varphi} \cos \varphi + \sin \bar{\varphi} \sin \varphi) = S^2 + \bar{S}^2 - 2S\bar{S} \cos \bar{\varphi} \\
&= S^2 + \bar{S}^2 - 2S\bar{S} + 2S\bar{S}(1 - \cos \bar{\varphi}) = \dot{S}^2 + 4S\bar{S} \sin^2(\bar{\varphi}/2). \\
\text{or } -\{\dots\} &= S^2 + \bar{S}^2 - 2S\bar{S} \cos \bar{\varphi} + \bar{S}^2 \cos^2 \bar{\varphi} - \bar{S}^2 \sin^2 \bar{\varphi} \\
&= (S - \langle S \rangle)^2 + \bar{S}^2 \sin^2 \bar{\varphi}.
\end{aligned}$$

The spatial distribution of over-noisy gaens is

$$\begin{aligned}
P^\Gamma(\mathbf{S}, \bar{\varphi}) &= \prod_{j=1}^3 P_j^\Gamma(S_j, \bar{\varphi}_j), \\
P_j^\Gamma(S_j, \bar{\varphi}_j) &= (S_j/\pi) \exp\{-\dot{S}_j^2 - 4S_j\bar{S}_j \sin^2(\bar{\varphi}_j/2)\} \\
&= (S_j/\pi) \exp\{-(S_j - \langle S_j \rangle)^2 - \bar{S}_j^2 \sin^2 \bar{\varphi}_j\}
\end{aligned}$$

where $\mathbf{S} = \{S_j\}$, $S_j \geq 0$, $\bar{\varphi} = \{\bar{\varphi}_j\}$, $|\bar{\varphi}_j| \leq \pi$. Two types of the same distribution are written here. They have the different average amplitudes \bar{S}_j , $\langle S_j \rangle$ and spatial disperses. The width of the distribution depends on the distance $\bar{\varphi}_j$ to its center. Near it $|\bar{\varphi}_j| \ll 1$ and the distribution is Gaussian with the width $1/\bar{S}_j$. The width increases further from the center and the distribution merges with the noise.

For a largely over-noisy gaens $\bar{S}_j \gg 1$ this distribution is narrow because $\bar{S}_j \sin \bar{\varphi}_j$ grows rapidly with $\bar{\varphi}_j$. Then $|\bar{\varphi}_j| \ll 1$. Exponent indicator omitting indexes j : $\dot{S}^2 + 4S\bar{S} \sin^2(\bar{\varphi}/2) = \dot{S}^2 + S\bar{S}\bar{\varphi}^2$. And another $(S - \langle S \rangle)^2 + \bar{S}^2 \sin^2 \bar{\varphi} = S^2 - 2S\bar{S} \cos \bar{\varphi} + \bar{S}^2 \cos^2 \bar{\varphi} + \bar{S}^2 \sin^2 \bar{\varphi} = S^2 + \bar{S}^2 - 2S\bar{S} + 2S\bar{S}(1 - \cos \bar{\varphi}) = (S - \bar{S})^2 + 2S\bar{S}(1 - 1 + \bar{\varphi}^2/2) = \dot{S}^2 + S\bar{S}\bar{\varphi}^2$. Then

$$P^\Gamma(\mathbf{S}, \bar{\varphi}) = \prod_{j=1}^3 P_j^\Gamma(S_j, \bar{\varphi}_j), \quad P_j^\Gamma(S_j, \bar{\varphi}_j) = \frac{S_j}{\pi} \exp\{-\dot{S}_j^2 - S_j\bar{S}_j\bar{\varphi}_j^2\}. \quad (5)$$

The distribution of the place is found by an approximate integration (5) over the amplitude in which the main contribution is given by $S_j \sim \bar{S}_j$:

$$P^\Gamma(\bar{\varphi}) = \prod_{j=1}^3 P_j^\Gamma(\bar{\varphi}_j), \quad P_j^\Gamma(\bar{\varphi}_j) = \frac{\bar{S}_j}{\pi^{1/2}} \exp\{-\bar{S}_j^2 \bar{\varphi}_j^2\} \quad (6)$$

where $|\bar{S}_j| \gg 1$. Since the distribution width $\langle \bar{\varphi}_j^2 \rangle^{1/2} \sim 1/\bar{S}_j$ then the space capacity for gaens $\sim \bar{S}_j$ increases with their amplitude.

Planck constant. 1-d gaen is the certain oscillation (2) blurred by the noise (3). Its amplitude uncertainty is $\langle \dot{S}^2 \rangle^{1/2} = 1$. The vertices of the two distributions are distinguishable if the average amplitudes differ by more $\Delta \bar{S} = 2$. They are quantized by quantum 2. Then the oscillation average amplitudes coincide with the energy levels of the quantum harmonic oscillator $\bar{S} = 2n + 1 = (n + 1/2)\hbar$ where n is an integer. Thus the Planck constant \hbar is twice the average noise amplitude $\hbar = 2$. However indistinguishability of the nearest amplitude gaens is only external. They are quite distinguishable by their average values.

Space and Environment of our world

The stationary noise of Everything fluctuations is described by the probability density Gauss distribution of gaen amplitudes. From infinite divisibility it can be represented by multidimensional oscillations formings a dimensions of the places space. Let the set of gaens forming a 1-d part of its space be called **gdim** (reduction of "gaen dimension").

However any parts of Everything are non-stationary. The noise variability leads to a difference in the probability distribution from Gaussian and to a change in the average values. The non-zero average amplitudes and correlations between gdims are originated. A gaen and antigaen of each gdim should also be correlated with each other. Their set

$$\langle S_i^\Gamma S_j^\Gamma \rangle, \langle S_j^\Gamma S_j^\Pi \rangle, \langle S_i^\Gamma S_j^\Gamma S_k^\Gamma \rangle, \langle S_i^\Gamma S_i^\Pi S_j^\Gamma \rangle, \langle S_i^\Gamma S_i^\Pi S_j^\Pi \rangle, \dots \quad (7)$$

where S_j^Γ and S_j^Π — the gaen and antigaen amplitudes in the gdim j . The set of correlations depend on how the probability distribution is distorted and is infinite. It is necessary to choose appropriate for our world.

A rearrangement of a changing noise distribution is affected by its fluctuation relaxation rate to a new noise level. The distribution is quasi-stationary Gaussian with variable averages if the relaxation is large. And its change lags behind the changes in the average noise level if the relaxation is small. In this case some large fluctuations of the old noise remain as over-noisy gaens blurred by the new noise level. Correlations (7) are passed to them. The amplitudes of over-noisy gaens do not exceed the initial noise and their dimension is determined by correlations which are not destroyed by noise. **The world is not created but manifested from primordial chaos.**

Correlations between gaens of different gdims or between a gaen and antigaen of one gdim have the same cause and are similar. They may be taken equals. Then it is assumed that the existence of our world is provided by the same connections of gaens from different gdims which can switch to the connections of a gaen and antygaen in the same gdim. They are represented as two free bonds in a gaen to connect with the same bonds in gaen of other gdim or with antygaen of own gdim where both bonds are involved.

The gaens random amplitudes S_j^Γ and S_j^Π of gdims j from the distribution (5) can be written as noises sums. In this case the paired correlations between 1-d gaens Γ_j^1 inside the 3-d gaen Γ^3 should be amplitude exchanges that preserve the amplitude sums.

$$S_j^\Gamma = \bar{S}_j^\Gamma + \epsilon_j + gS_j^\Gamma \sum_{i=1}^3 \eta_{ji} S_i^\Gamma, \quad \eta_{ji} = -\eta_{ij}. \quad (8)$$

The equations for the amplitudes of a 1-d gaen and antigaen of one gdim which ensure the preservation of the amplitudes sum in paired exchanges and take into account the pairness of bonds have added

$$S_j^\Gamma = \bar{S}_j^\Gamma + \epsilon_j + g(\eta_j + \theta_j) S_j^\Gamma S_j^\Pi, \quad S_j^\Pi = \bar{S}_j^\Pi + \epsilon_j - g(\eta_j + \theta_j) S_j^\Gamma S_j^\Pi. \quad (9)$$

Here ϵ_j is common for a gaen and antigaen unit noise in gdim j , η_{ji} is unit noise of amplitude exchange between gaens of different gdims, η_j and θ_j are unit noises of amplitude exchanges between gaen and antigaen of one gdim, g are coupling coefficients between gaens of different gdims or between a gaen and antigaen of one gdim, which are taken to be same.

1-dimensional weakly over-noisy gaens Γ^1 should appear first when noise is attenuated. They create a 1-d gaens space of small-capacity. 2-d gaens $\Gamma^2 = \Gamma_1^1 g \Gamma_2^1 g$, 1-d pairs $\nu_j = \Gamma_j^1 g \Pi_j^1 g$ of gdims $j = 1, 2$ and their 2-d sums $\nu_1 \nu_2$ based on Γ^1 appear further. (Here and after the last g -bond connects last and first gaens.) They create a 2-d space of gaens and two 1-d spaces of pairs ν_j . The continued noise attenuation causes the appearance of 1-d pairs $\nu_j = \Gamma_j^1 g \Pi_j^1 g$, 2-d $\nu_j \nu_k, \nu_{jk} = \Gamma_j^1 g \Pi_j^1 g \Gamma_k^1 g \Pi_k^1 g$, 3-d $\nu_{123} = \Gamma_1^1 g \Pi_1^1 g \Gamma_2^1 g \Pi_2^1 g \Gamma_3^1 g \Pi_3^1 g$, $\nu_1 \nu_2 \nu_3$ ($j = 1, 2, 3$) and longer combinations. This process can continue creating worlds of higher dimensions.

The space of our world has three dimensions. It is homogeneous, isotropic, and circular — the places $\varphi_j = \pm\pi$ coincide. Gaens are its material points, gdims are the absolute axes. In relation to any place the space can be

represented as consisting of the real world space and the mirror anti-world space in which the gaen and the antigaen are mutually replaced. The world seems infinite only if is viewed from small its part in a small time.

Thus the world could arise from the initial spaceless noise (2, 3) attenuated with the preservation of fluctuations. They are distinguished if the difference of their amplitudes is more twice noisy average amplitude. It is possible that each twofold noise decrease is accompanied by the formation of a new over-noisy gaen level from the stored fluctuations of previous. Here the fluctuations has a width $\sim 1/S$ where $S \sim 2^n$ is their amplitude which summed by n over-noise levels.

The spatial uncertainty of gaens is $\Delta\phi = S\Delta\varphi \sim 2$. They do not differ in appearance if the distance between their centers is $r < 2$. In this case a level is the gaens plateau over which the current noise fluctuates. The spatial constancy of the plateau leads to the invisibility of the level and the energy can be counted relative it. The elevations above it remain noticeable only. This is the current noise with a unit dispersion and over-noisy gaens that form the world structure.

Let take the Universe radius $\sim 10^{27}m$ to estimate of the over-noise levels number n . The gaen size is no more the electron radius ($\lesssim 10^{-22}m$ [9], see "Particles"). If the Universe occupies the entire space of gaen places then along each axis it can have at least 10^{49} gaens. This axis capacity is proportional to the gaen amplitude S in noise units (6). Then $S \gtrsim 10^{49} \sim 2^{163}$ or $n \gtrsim 163$ when the amplitude doubles from level to level. The plateau has the amplitude $S_0 \gtrsim 10^{22}ergs$ if a noise amplitude is $\sim \hbar \sim 10^{-27}ergs$.

Our world stand on a powerful but invisible basis. The fluctuations of its noise give zero oscillations of "physical vacuum" over which relatively rare particles are released. These fluctuations are spatially distinguishable. Although the particles are noticeably blurred by the noise (quantum uncertainty) they have a spatial localization.

Gaens interaction

The correlation g -connection (8, 9) combining 1-d gaens into 3-d creates the basis of our 3-dimensional space. However this is not enough for the existence of complex and developing world. The interaction between 3-d gaens is required allowing them to form larger and larger constructions. This is the **gaens interaction through noise**.

A gaen is the certain oscillation that is located in the noise and depends on it. The presence of another gaen near the first changes the noise and thus affects first gaen. The defining parameters of a gaen are its frequency Ω and amplitude S . Hence the noise action is described by the derivatives $\dot{\Omega}$ and \dot{S} if the influence of the noise perturbation is weak. The gaen preservation requires constancy of Ω and S . Its change may be transmitted to the movement $\dot{\Omega} = \dot{\varphi}$. Then the gaens interaction is expressed by their acceleration.

The average interaction effect is determined by the average amplitude \bar{S} and is expressed by a function $U(\bar{S})$ for given gaen frequency $\Omega = 1$. If \bar{S} is constant in space then the noise is unchanged and other gaen in it does not change. A gaen is accelerated by the gradient U : $\dot{\varphi} = -\partial_{\varphi}U$ if the affecting gaen have a constant in time distribution. Thus the function $U(\bar{S})$ is the **potential of the gaens interaction through the noise**.

Our world emerged from the original noise attenuated with the fluctuation preservation. It consists of a basis (plateau of upper level) with the amplitude S_0 and the distinguishable gaen parts rising above it with amplitude S_u : $S = S_0 + S_u$, $\bar{S} = S_0 + \bar{S}_u$. If $S_0 \gg \bar{S}_u$, then $U(\bar{S})$ decomposes in the series $U(\bar{S}) = U(S_0) + U_S \bar{S}_u + U_{SS} \bar{S}_u^2 + \dots$ where $U_S = d_S U(S = S_0)$, $U_{SS} = d_S^2 U(S = S_0)$. Selecting $U(S_0) = 0$ gives

$$U(\bar{S}) = U(\bar{S}_u) = U_S \bar{S}_u + U_{SS} \bar{S}_u^2 / 2 = U_{\gamma}(\bar{S}_u) + U_G(\bar{S}_u), \quad U_{\gamma} \gg U_G \quad (10)$$

where the smallness of U_G/U_{γ} is related to the smallness of \bar{S}_u/S_0 .

After the introduction of antigaens their amplitude \bar{S}_u is taken negative. Now the potential consists of odd $U_{\gamma} = U_S \bar{S}_u$ and even $U_G = U_{SS} \bar{S}_u^2 / 2$ parts. Its dependence on the place $\dot{\varphi}$ follows from the distribution (5) changed to $P_j^{\Gamma}(S_j, \dot{\varphi}_j) = P_j^{\Gamma}(S_{uj}, \dot{\varphi}_j) = (S_0/\pi) \exp\{-\dot{S}_{uj}^2 - \dot{\varphi}_j^2\}$, $\dot{\varphi}_j = S \dot{\varphi}_j \approx S_0 \dot{\varphi}_j$. Since $P_j^{\Gamma}(\dot{S}_{uj}, \dot{\varphi}_j) = P_j^{\Gamma}(S_{uj}, \dot{\varphi}_j)/S_0$ then

$$P^{\Gamma}(\dot{\mathbf{S}}_u, \dot{\boldsymbol{\phi}}) = \prod_{j=1}^3 P_j^{\Gamma}(\dot{S}_{uj}, \dot{\varphi}_j), \quad P_j^{\Gamma}(S_{uj}, \dot{\varphi}_j) = \frac{1}{\pi} \exp\{-\dot{S}_{uj}^2 - \dot{\varphi}_j^2\}$$

where $\dot{\mathbf{S}}_u = \{S_{uj} - \bar{S}_{uj}\}$, $\dot{\boldsymbol{\phi}} = \{\phi_j - \bar{\phi}_j\}$, $\bar{\phi}_j = S_0 \bar{\varphi}_j$.

The spatial part of the distribution is written through the basis amplitude S_0 , and the amplitude part — through the elevation S_u above it.

The average gain amplitudes are assumed to be the same $\bar{S}_{uj} = \bar{S}_u$, and $P^{\Gamma}(\dot{\mathbf{S}}_u, \dot{\boldsymbol{\phi}})$ changes to $P^{\Gamma}(S_u, \dot{\boldsymbol{\phi}})$ with the amplitude $S_u \equiv S_{u1} + S_{u2} + S_{u3}$:

$$\begin{aligned}
P^\Gamma(S_u, \dot{\phi}) &= \iint P_1^\Gamma(\dot{S}_{u1}, \dot{\phi}_1) P_2^\Gamma(\dot{S}_{u2}, \dot{\phi}_2) P_3^\Gamma(\dot{S}_u - S_{u1} - S_{u2}, \dot{\phi}_3) dS_{u1} dS_{u2} \\
&= \pi^{-3} \iint \exp\{-\dot{S}_{u1}^2 - \dot{S}_{u2}^2 - (S_u - S_{u1} - S_{u2} - \bar{S}_u)^2 - \dot{\phi}^2\} dS_{u1} dS_{u2}
\end{aligned}$$

where $\dot{\phi}^2 = \dot{\phi}_1^2 + \dot{\phi}_2^2 + \dot{\phi}_3^2$. Since $S_{u1} \sim \bar{S}_u$ and $S_{u2} \sim \bar{S}_u$ makes the main contribution to the integral then $P^\Gamma(S_u, \dot{\phi}) \approx \pi^{-2} \exp\{-(S_u - S_\Gamma)^2 - \dot{\phi}^2\}$ where $S_\Gamma = 3\bar{S}_u$ is the average 3-d gaen amplitude, $\dot{\phi}$ is the distance from its center. The spatial distribution

$$P^\Gamma(\dot{\phi}) = \int_{-\infty}^{\infty} P^\Gamma(S_u, \dot{\phi}) dS_u = \pi^{-2} e^{-\dot{\phi}^2} \int_{-\infty}^{\infty} e^{-(S_u - S_\Gamma)^2} dS_u.$$

Now the **distribution of the 3-d gaen**

$$P^\Gamma(S_u, \dot{\phi}) = \pi^{-2} \exp\{-(S_u - S_\Gamma)^2 - \dot{\phi}^2\}, \quad P^\Gamma(\dot{\phi}) = \pi^{-3/2} e^{-\dot{\phi}^2}. \quad (11)$$

The spatial potential dependence is determined by the spatial distribution of average gaen amplitude or its conditional expectation

$$U(\dot{\phi}) = \langle U(S_u) | \dot{\phi} \rangle = \int_0^\infty U(S_u) P^\Gamma(S_u, \dot{\phi}) dS_u.$$

Since $S_u \sim S_\Gamma$ makes the main contribution to the integral then

$$U(\dot{\phi}) \approx U(S_\Gamma) \pi^{-2} e^{-\dot{\phi}^2} \int_{-\infty}^{\infty} e^{-(S_u - S_\Gamma)^2} dS_u = U(S_\Gamma) \pi^{-3/2} e^{-\dot{\phi}^2}.$$

Now the **potential of the gaens action through the noise** is

$$U(\dot{\phi}) = U_\gamma(\dot{\phi}) + U_G(\dot{\phi}), \quad U_\gamma(\dot{\phi}) = \gamma e^{-\dot{\phi}^2}, \quad U_G(\dot{\phi}) = G e^{-\dot{\phi}^2}, \quad \dot{\phi} = S_0 \dot{\varphi} \quad (12)$$

where $\gamma = \gamma_u S_\Gamma$, $G = G_u S_\Gamma^2$, $\gamma_u = \pi^{-3/2} U_S$, $G_u = \pi^{-3/2} U_{SS}/2$, $|\dot{\varphi}| \leq \pi/2$.

The gaen oscillations interact only locally when their places coincide. But the gaen consists of certain oscillations blurred by the noise. The spatial dependence of the potential (12) is related to this blurring so it is determined by the noise. Hence **any gaens interacts by means of the noise**. The potential does not affect on the noise but the certain gaen oscillation (the distribution center) and accelerates it.

The signs of the constant γ_u, G_u determine the action quality. If $\gamma_u > 0$ then the gaen repel another gaen and attract the antigaen. If $G_u > 0$ then any gaens and antigaens are repelled. Such signs correspond to our world.

Consider 1-d γ -interaction of 3-d gaens Γ^3 with equal amplitude modules S_Γ . The following notation is used in the further description

$$U(r) = e^{-r^2}, \quad f(r) = rU, \quad f_r(r) = (1-2r^2)U, \quad f_{rr}(r) = (4r^3-6r)U. \quad (13)$$

Interaction of two gaens Γ_1 и Γ_2 .

The coordinate system for symmetrical motion is chosen. The gaen places ϕ_1 and $\phi_2 = -\phi_1$, $\phi = \phi_1 - \phi_2$. The interaction potential (12) in units of γ is $\pm U$ where $U = e^{-\phi^2}$. The upper (lower) signs denote the gaen-gaen (gaen-antigaen) interaction. The specific forces (per unit of amplitude) affecting on the gaens are $f_1 = -f_2 = \mp d_\phi U = \pm 2\phi U$. The equation of motion is $\ddot{\phi} = 2f_1 = \mp 2d_\phi U = \pm 4\phi U$.

Since $\dot{\phi} = d_\phi(\dot{\phi})^2/2$ then $(\dot{\phi})^2/2 \pm 2U = E$, $(\dot{\phi})^2 = 2(E \mp 2U)$

where E is the full specific energy of relative motion.

Repulsion gaen-gaen. If $0 < E < 2$ then there is a reflection at the turning point in counter motion. Two identical gaens cannot be in the same place (state). This is a property of fermions caused by γ -repulsion at a sufficiently small energy E .

Attraction gaen-antigaen ($\Gamma\Pi$ -pendulum). If $-2 < E < 0$ then there is a nonlinear soft oscillator in the potential U . For $E + 2 \ll 1$ when $\phi^2 \ll 1$ it is linear $\ddot{\phi} = -4\phi$ with frequency $\omega_\gamma = 2$ or

$$\omega_\gamma = 2\gamma^{1/2}. \quad (14)$$

Interaction of two $\Gamma\Pi$ -pendulums

Let there be two gaen-antigaen pairs $\Gamma_1\Pi_1$ and $\Gamma_2\Pi_2$ with equal modulus of gaen amplitudes. The gaen places are $\phi_1^\Gamma, \phi_1^\Pi, \phi_2^\Gamma, \phi_2^\Pi$. Its difference in pairs $\xi_1 = \phi_1^\Gamma - \phi_1^\Pi$, $\xi_2 = \phi_2^\Gamma - \phi_2^\Pi$. The distance between the pair centers is r . The specific forces acting on the gaens are written in units 2γ (12, 14) and notations (13)

$$\begin{aligned} f_1^\Gamma &= -f(\phi_1^\Gamma - \phi_1^\Pi) + f(\phi_1^\Gamma - \phi_2^\Gamma) - f(\phi_1^\Gamma - \phi_2^\Pi), \\ f_1^\Pi &= f(\phi_1^\Gamma - \phi_1^\Pi) - f(\phi_1^\Pi - \phi_2^\Gamma) + f(\phi_1^\Pi - \phi_2^\Pi), \\ f_2^\Gamma &= -f(\phi_1^\Gamma - \phi_2^\Gamma) + f(\phi_1^\Pi - \phi_2^\Gamma) - f(\phi_2^\Gamma - \phi_2^\Pi), \\ f_2^\Pi &= f(\phi_1^\Gamma - \phi_2^\Pi) - f(\phi_1^\Pi - \phi_2^\Pi) + f(\phi_2^\Gamma - \phi_2^\Pi). \end{aligned}$$

The equations of motion are written in units $2\gamma = \omega_\gamma^2/2$

$$\begin{aligned}
\ddot{\xi}_1 &= f_1^\Gamma - f_1^\Pi = -f(\xi_1) + f(r + (\xi_1 - \xi_2)/2) - f(r + (\xi_1 + \xi_2)/2) \\
&\quad - f(\xi_1) + f(r - (\xi_1 + \xi_2)/2) - f(r - (\xi_1 - \xi_2)/2), \\
\ddot{\xi}_2 &= f_2^\Gamma - f_2^\Pi = -f(r + (\xi_1 - \xi_2)/2) + f(r - (\xi_1 + \xi_2)/2) - f(\xi_2) \\
&\quad - f(r + (\xi_1 + \xi_2)/2) + f(r - (\xi_1 - \xi_2)/2) - f(\xi_2), \\
2\ddot{r} &= f_1^\Gamma + f_1^\Pi - f_2^\Gamma - f_2^\Pi = -f(\xi_1) + f(r + (\xi_1 - \xi_2)/2) \\
&\quad - f(r + (\xi_1 + \xi_2)/2) + f(\xi_1) - f(r - (\xi_1 + \xi_2)/2) + f(r - (\xi_1 - \xi_2)/2) \\
&\quad + f(r + (\xi_1 - \xi_2)/2) - f(r - (\xi_1 + \xi_2)/2) + f(\xi_2) - f(r + (\xi_1 + \xi_2)/2) \\
&\quad + f(r - (\xi_1 - \xi_2)/2) - f(\xi_2) = \\
&= 2[f(r + (\xi_1 - \xi_2)/2) - f(r + (\xi_1 + \xi_2)/2) - f(r - (\xi_1 + \xi_2)/2) + f(r - (\xi_1 - \xi_2)/2)].
\end{aligned}$$

The specific forces are decomposed in a series by degrees ξ up to ξ^3 for $|\xi| \ll r$. Then the equations of motion are

$$\begin{aligned}
\ddot{\xi}_1 &= -2(\xi_1 - \xi_1^3) + f_r(\xi_1 - \xi_2) + f_{rrr}(\xi_1 - \xi_2)^3/24 - f_r(\xi_1 + \xi_2) - f_{rrr}(\xi_1 + \xi_2)^3/24 \\
&= -2(\xi_1 - \xi_1^3) - 2f_r\xi_2 - f_{rrr}(\xi_1^3 + 3\xi_1^2\xi_2 + 3\xi_1\xi_2^2 + \xi_2^3 - \xi_1^3 + 3\xi_1^2\xi_2 - 3\xi_1\xi_2^2 + \xi_2^3)/24 \\
&= -2(\xi_1 - \xi_1^3) - 2f_r\xi_2 - f_{rrr}(3\xi_1^2\xi_2 + \xi_2^3)/12, \\
\ddot{\xi}_2 &= -2(\xi_2 - \xi_2^3) - 2f_r\xi_1 - f_{rrr}(3\xi_2^2\xi_1 + \xi_1^3)/12, \\
\ddot{r} &= f_{rr}(\xi_1 - \xi_2)^2/4 - f_{rr}(\xi_1 + \xi_2)^2/4 = -f_{rr}\xi_1\xi_2
\end{aligned}$$

where $f = f(r)$, $f_r = f_r(r)$, $f_{rr} = f_{rr}(r)$ from (13) and $f_{rrr} = d_r f_{rr}(r)$. Now

$$\begin{aligned}
\ddot{\xi}_1 &= -2(\xi_1 - \xi_1^3) - 2f_r\xi_2 - f_{rrr}(3\xi_1^2\xi_2 + \xi_2^3)/12, \\
\ddot{\xi}_2 &= -2(\xi_2 - \xi_2^3) - 2f_r\xi_1 - f_{rrr}(3\xi_2^2\xi_1 + \xi_1^3)/12, \quad \ddot{r} = -f_{rr}\xi_1\xi_2.
\end{aligned}$$

Because r changes in the second approximation then its change in the equations for ξ_1 and ξ_2 was neglected from the very beginning.

First approximation (linear)

In the linear approximation the equations of motion are

$$\ddot{\xi}_1 = -2\xi_1 - 2f_r\xi_2, \quad \ddot{\xi}_2 = -2\xi_2 - 2f_r\xi_1, \quad \ddot{r} = 0.$$

In variables $\xi_\pm = (\xi_1 \pm \xi_2)$ we get own oscillations

$$\begin{aligned}
\ddot{\xi}_\pm &= -2\xi_\pm - 2f_r\xi_\mp \mp (2\xi_\mp + 2f_r\xi_\pm) = -2(1 \pm f_r)(\xi_\pm \pm \xi_\mp) = -2(1 \pm f_r)\xi_\pm \\
&\text{with the normal frequencies } \omega_\pm^2 = 2(1 \pm f_r) \text{ in units of } \omega_\gamma^2/2 \text{ where } f_r \text{ describes} \\
&\text{the influence of other pair. Since } f_r < 0 \text{ then } \omega_+ < \omega_-.
\end{aligned}$$

If the pairs oscillate in the phase $\xi_1 \approx \xi_2$ and $r^2 > 1/2$ then the specific force decreases with distance. The pair attracts the nearest to it gaen of other pair and repels the farthest but weaker — the pairs are attracted.

If the oscillations are antiphase $\xi_1 \approx -\xi_2$ then the pairs repel.

Second approximation (nonlinear)

In the nonlinear approximation a change of the distance between $\Gamma\Pi$ -pairs is searched

$$\ddot{r} = -f_{rr}\xi_1\xi_2 = -f_{rr}(\xi_+^2 - \xi_-^2)/4 \tag{15}$$

where on the right are solutions of the first approximation. Substituting own

harmonics in form $\xi_{\pm} = a_{\pm} \cos \Phi_{\pm}$, $\Phi_{\pm} = \omega_{\pm} t + \phi_{\pm}$, we get
 $\xi_+^2 - \xi_-^2 = a_+^2 \cos^2 \Phi_+ - a_-^2 \cos^2 \Phi_- = a_+^2 (1 + \cos 2\Phi_+)/2 - a_-^2 (1 + \cos 2\Phi_-)/2$
 $= (a_+^2 - a_-^2 + a_+^2 \cos 2\Phi_+ - a_-^2 \cos 2\Phi_-)/2$.

Without taking into account the second harmonics (averaging over oscillation period) **the specific force of the slow $\Gamma\Pi$ -pairs interaction** is

$$\bar{f} = -f_{rr}(a_+^2 - a_-^2)/8 \quad (16)$$

From (13) $f_{rr} = 2r(2r^2 - 3)U$ changes sign when $r^2 = r_0^2 = 3/2$.

If the $\Gamma\Pi$ -pairs oscillate in the opposite phase $a_-^2 > a_+^2$ then $\bar{f} > 0$ at $r > r_0$ (repulsion of pairs) and $\bar{f} < 0$ at $r < r_0$ (attraction of pairs) where r_0 is the unstable equilibrium point. If $\Gamma\Pi$ -pairs oscillate in the same phase $a_-^2 < a_+^2$ then r_0 is the stable equilibrium point.

Matter and chain of worlds

Gaens and antigaens by the γ -interaction forms $\Gamma\Pi$ -pairs $\Gamma^3\gamma\Pi^3$ which under certain conditions bind to the $\Gamma\Pi$ -environment. The relative shift of Γ and Π in the pair determines the environment polarization. Else there are 1-d pairs $\nu_j = \Gamma_j g \Pi_j g$ of gdims j connected by the correlation interaction (9). This are neutrinos (see "Particles"). They have the average zero amplitude and do not participate in the γ -interaction.

Thus **the matter of our world** contains $\Gamma\Pi$ -pairs and neutrinos mainly. Its density ρ is not less than the $\Gamma\Pi$ -environment density. It is roughly estimated via the $\Gamma\Pi$ -pair mass (of the order of neutrino mass $\sim 10^{-37}kg$ — see "Particles") and distance r between $\Gamma\Pi$ -pairs (no more than the electron size $\sim 10^{-22}m$). Then $\rho \gtrsim 10^{29}kg/m^3$ which is much larger the nuclear density. The Universe matter density is $\sim 10^{-26}kg/m^3$. The difference is 55 orders of magnitude or more. But the $\Gamma\Pi$ -environment only rises above the upper level of the basis which itself is more 49 orders of magnitude larger the modern noise $\sim \hbar$. Then all the energy-mass known to science is negligible compared to the basis energy. This is not counting the infinite noise energy.

Chain of Worlds. The representation of Everything by harmonics has no special frequencies. In each set of harmonics with a frequency taken as a unit ($\Omega = 1$), the harmonics of the remaining frequencies are represented either by the noise (at $\Omega > 1$) and slow changes (at $\Omega < 1$). Each such set of harmonics is the basis for a description of some world. Then there is a connection and mutual influence of worlds with different basic frequencies. So

there is a contribution of slow worlds influence with $\Omega < 1$ to the slow change of our world characteristics, and a fast worlds influence with $\Omega > 1$ is hidden in the noise. Our world acts on other worlds similarly. This connection occurs at the 1-d gaen level and extends to all levels up to the bodies.

Worlds at different basic frequencies are similar but not identical. They may have the same evolution rate measured by periods of their basic frequencies but different relative rates. The worlds with higher frequencies change faster the worlds with lower frequencies. It should be expected that firsts are more advanced in their development. Then seemingly random changes hide the influence of more developed worlds and slow changes are associated with less developed worlds. Randomness becomes an unknown necessity.

Noise is not disorder although it obeys Gaussian distribution for random variables in the equilibrium state. It only seems disorderly due to insufficient time resolution which does not allow to notice the rapid influences of the worlds with higher basic frequencies.

The world is an over-noisy structure that retains its disequilibrium. However a non-equilibrium closed system inevitably passes into the equilibrium state over time and remains in it forever. This is because the support of the equilibrium mess and the fluctuation relaxation are determined by the same mechanism. The over-noisy world should be an open system with external interactions which supports its over-noisiness in order for it to exist and does not relax to the equilibrium noise. Living beings have this property. It may even be taken as their definition: **Life** is the ability to constantly support a non-equilibrium state in an equilibrium environment. Then the concept of life expands and allows to call not only molecular organisms alive. Based on this definition and ancient legends where the Universe is often depicted how a tree, an animal or even a person we may assume that **our world is alive**.

If our world is a living being then the similar worlds on other basic frequencies are alive also. They make up a sequence of living worlds with different levels and rates of a development which are connected by interaction. Faster and more advanced worlds can perceive and control existences of slower and less advanced worlds not allowing them to fall into chaotic noise. Thus there must be an infinite chain of living controlled worlds in which our world is a link. Only a such chain of interconnected and similar worlds of different development levels is able forever support a non-equilibrium ordered state from falling into a equilibrium chaos. This is the **chain of eternal life**.

Polarisation

3-d gaens Γ^3 and antigaens Π^3 by the γ -interaction (12) is combined into $\Gamma\Pi$ -pairs capable to form a stable $\Gamma\Pi$ -environment. Also this interaction shifts Γ^3 and Π^3 inside a pair (polarization) and changes the distance between pairs.

Each gaen has a specific location only on average. Its place distribution (5,6) is blurred with the dispersion $\langle\phi^2\rangle = 1$. In this noise the small separation of Γ^3 and Π^3 does not stand out outwardly. However rapid noise fluctuations are mutually destroyed by averaging over slow gaen motion times. They don't interfere with making ratios for averages values. Infinite noise energy is the necessary condition for the existence of finite polarization.

It is impossible exactly to study the perturbation dynamics in such environment. Simplified approximate approaches are need. They account the interaction only with neighbors and a decomposition by a degree of perturbation. Satisfactory results can be get already in the linear approximation with some nonlinear additions.

Consider a homogeneous $\Gamma\Pi$ -environment which occupies the entire space of places. It consist of $\Gamma\Pi$ -pairs in which the gaen and antigaen have the same average amplitudes. They are together in unperturbed state and separated in perturbed. $\Gamma\Pi$ -pairs connected by γ -interaction constitute a simple lattice of a cube and is used as **$\Gamma\Pi$ -environment model**. Gdims (8, 9) are absolute coordinate axes of the space.

The $\Gamma\Pi$ -pairs are located at the cube vertices. There are three axes: longitudinal l along which the pairs move during the interaction and two transverse j, k . The studied pair $\Gamma\Pi_0$ is placed in the coordinate center. It is affected by 6 adjacent pairs $\Gamma\Pi_{jkl(=\pm 1)}$ (two on each axis) located at the distance r from $\Gamma\Pi_0$. The place projections on axis l of the gaen ϕ_{jkl}^Γ and antigaen ϕ_{jkl}^Π from $\Gamma\Pi_{jkl}$ are located symmetrically relative to the pair center. Their shift (polarization) is $\xi_{jkl} = \phi_{jkl}^\Gamma - \phi_{jkl}^\Pi \ll r$. Polarization of $\Gamma\Pi_0$ is $\xi = \phi^\Gamma - \phi^\Pi$ where $\xi = \xi_{000}$, $\phi^\Gamma = \phi_{000}^\Gamma$, $\phi^\Pi = \phi_{000}^\Pi$. The change of r have the second order of smallness (15) and is considered as a nonlinear amendment.

The polarization is determined by the γ -potentials (12) acting on gaen $U^\Gamma = U_0^\Gamma + U_{jkl}^\Gamma$ and antigaen $U^\Pi = U_0^\Pi + U_{jkl}^\Pi$ of $\Gamma\Pi_0$. They include actions of the neighbor in the pair $U_0^\Gamma = U_0^\Pi$ and the adjacent pairs $U_{jkl}^\Gamma = U_{jkl}^{\Gamma\Gamma} + U_{jkl}^{\Gamma\Pi}$, $U_{jkl}^\Pi = U_{jkl}^{\Pi\Pi} + U_{jkl}^{\Pi\Gamma}$. Here the first superscript indicates the gaen being affected and second — affecting.

The interaction potential inside $\Gamma\Pi_0$ $U_0^\Gamma = -\gamma e^{-\xi^2}$ determines the forces

on the gaen $f_0^\Gamma = -\partial_\xi U_0^\Gamma = -2\gamma\xi e^{-\xi^2} \approx -2\gamma\xi(1 - \xi^2)$ and the antigaen $f_0^\Pi = -f_0^\Gamma$. They are decomposed up to ξ^3 . Other forces are taken linear.

The potentials $U_{jkl}^{\Gamma\Gamma}$ and $U_{jkl}^{\Gamma\Pi}$ are close in absolute value and differ in sign: $U_{jkl}^{\Gamma\Gamma} = U_{jkl}^{\Gamma\Gamma}(\xi - \xi_{jkl}) = U_{jkl}^{\Gamma\Gamma}(\xi) - \xi_{jkl}\partial_\xi U_{jkl}^{\Gamma\Gamma}(\xi, \xi_{jkl} = 0)$, $\partial_\xi = \partial/\partial\xi$, $U_{jkl}^{\Gamma\Pi} = U_{jkl}^{\Gamma\Pi}(\xi + \xi_{jkl}) = -U_{jkl}^{\Gamma\Gamma}(\xi) - \xi_{jkl}\partial_\xi U_{jkl}^{\Gamma\Gamma}(\xi, \xi_{jkl} = 0)$, $U_{jkl}^\Gamma = U_{jkl}^{\Gamma\Gamma} + U_{jkl}^{\Gamma\Pi} = -2\xi_{jkl}\partial_\xi U_{jkl}^{\Gamma\Gamma}(\xi, \xi_{jkl} = 0)$.

Since the gaen place $\phi^\Gamma = \xi/2$ then the force on it is $-\partial_{\phi^\Gamma} U_{jkl}^\Gamma = -2\partial_\xi U_{jkl}^\Gamma$. From the lattice symmetry and the gaen locations in the $\Gamma\Pi$ -pair it follows that in the linear approximation the opposite force acts on the antigaen. Then the force of the pair $\Gamma\Pi_{jkl}$ acting on the shift ξ is $\xi_{jkl}F_{jkl}$ where

$$F_{jkl} = 8\partial_\xi^2 U_{jkl}^{\Gamma\Gamma}(\xi = \xi_{jkl} = 0) \quad (17)$$

is even for each axis: $F_{1kl} = F_{-1kl}, \dots$

Now the force changing the polarization is

$$f = -4\gamma\xi(1 - \xi^2) + \sum_{jkl} \xi_{jkl} F_{jkl},$$

$$\sum_{jkl} \xi_{jkl} F_{jkl} = [(\xi_{100} + \xi_{-100})F_{100} + (\xi_{010} + \xi_{0-10})F_{010} + (\xi_{001} + \xi_{00-1})F_{001}].$$

Transition to the lattice derivatives along each axis $i = j, k, l$

$$\delta_i \xi_{1/2} = \xi_1 - \xi, \quad \delta_i^2 \xi = \delta_i \xi_{1/2} - \delta_i \xi_{-1/2} = (\xi_1 - \xi) - (\xi - \xi_{-1}) = \xi_1 + \xi_{-1} - 2\xi,$$

gives

$$f = -4\gamma\xi(1 - \xi^2) + [F_{100}(\delta_j^2 + 2) + F_{010}(\delta_k^2 + 2) + F_{001}(\delta_l^2 + 2)]\xi.$$

The potentials (12) are used to find F_{jkl} . For transverse axes

$$U_{100}^{\Gamma\Gamma} = \gamma \exp\{-r^2 - (\xi_{100} - \xi)^2/4\},$$

$$\partial_\xi U_{100}^{\Gamma\Gamma} = \gamma(\xi_{100} - \xi) \exp\{-r^2 - (\xi_{100} - \xi)^2/4\}/2|_{\xi_{100}=0}$$

$$= -\gamma\xi \exp\{-r^2 - \xi^2/4\}/2, \quad F_{100} = -4\gamma\partial_\xi [\xi \exp\{-r^2 - \xi^2/4\}]_{\xi=0} = -4\gamma e^{-r^2}.$$

Also $F_{010} = F_{100}$. For the longitudinal axis

$$U_{001}^{\Gamma\Gamma} = \gamma \exp\{-[r + (\xi_{001} - \xi)/2]^2\},$$

$$\partial_\xi U_{001}^{\Gamma\Gamma} = \gamma[r + (\xi_{001} - \xi)/2] \exp\{-[r + (\xi_{001} - \xi)/2]^2\}|_{\xi_{001}=0}$$

$$= \gamma(r - \xi/2) \exp\{-(r - \xi/2)^2\}, \quad F_{001} = 8\gamma\partial_\xi [(r - \xi/2) \exp\{-(r - \xi/2)^2\}]_{\xi=0}$$

$$= 8\gamma[-1/2 + (r - \xi/2)^2] \exp\{-(r - \xi/2)^2\}_{\xi=0} = 4\gamma(2r^2 - 1)e^{-r^2}.$$

$$\text{Now } f = 4\gamma[-(1 - \xi^2) - e^{-r^2}(\delta_j^2 + \delta_k^2 + 4) + (2r^2 - 1)e^{-r^2}(\delta_l^2 + 2)]\xi.$$

The introduction of the notations $\omega_\gamma^2 = 4\gamma$, $U = e^{-r^2}$, $f_r = (1 - 2r^2)U$ from (13, 14) and $c^2 = \omega_\gamma^2 U$, $c_l^2 = -\omega_\gamma^2 f_r = (2r^2 - 1)c^2$ gives

$$f = [-(\omega_\gamma^2 + 4c^2 - 2c_l^2) + \omega_\gamma^2 \xi^2 - c^2(\delta_j^2 + \delta_k^2) + c_l^2 \delta_l^2]\xi.$$

The effect of the distance change h between $\Gamma\Pi$ -pairs along the longitudinal axis on the polarization is found if instead $F_{001} = F_{00-1} = c_l^2(r)$ take $F_{00\pm 1} = c_l^2(r + h_{\pm 1/2}) \approx c_l^2(r) + d_r c_l^2(r) h_{\pm 1/2}$. Then the term $(\xi_{001} + \xi_{00-1})F_{001}$ in the expression for the force f changes to

$\xi_{001}F_{001} + \xi_{00-1}F_{00-1} = (\xi_{001} + \xi_{00-1})c_l^2(r) + d_r c_l^2(r)(\xi_{001}h_{1/2} + \xi_{00-1}h_{-1/2})$. Here the first bracket leads to the above formula $f = \dots$ and the second is converted to lattice derivatives if to account the smoothness of h :

$$\begin{aligned} \xi_{001}h_{1/2} + \xi_{00-1}h_{-1/2} &= [\xi_{001}(h_1 + h_0) + \xi_{00-1}(h_{-1} + h_0)]/2 \\ &= [\xi_{001}h_1 + \xi_{00-1}h_{-1} + h_0(\xi_{001} + \xi_{00-1})]/2 \\ &= [(\delta_l^2 + 2)(\xi h) + h(\delta_l^2 + 2)\xi]/2 = [\delta_l^2(\xi h) + h\delta_l^2\xi + 4\xi h]/2, \quad h \equiv h_0. \end{aligned}$$

This expression multiplied by $d_r c_l^2(r)$ is added to the force f .

The polarization influence on the distance between $\Gamma\Pi$ -pairs is calculated from the $\Gamma\Pi$ -pendulums interaction (15) $\ddot{r} = -f_{rr}\xi_1\xi_2$ (in units of 2γ). It consists of two identical but opposite accelerations of the pair. Therefore the shift a of $\Gamma\Pi_0$ under the adjacent pairs influence is found from

$$\ddot{a} = f_{rr}\xi(\xi_{001} - \xi_{00-1})/2 = f_{rr}\xi\delta_l\xi = f_{rr}\delta_l\xi^2/2,$$

and the distance change between $\Gamma\Pi$ -pairs $h = \delta_l a$ obeys the equation

$$\ddot{h} = f_{rr}\delta_l^2\xi^2/2, \text{ or in usual units: } \ddot{h} = \omega_\gamma^2 f_{rr}\delta_l\xi^2/4 = -d_r c_l^2(r)\delta_l\xi^2/4.$$

Now the equations of polarization and deformation of the environment

$$\ddot{\xi} = [-\omega_0^2 - c^2(\delta_j^2 + \delta_k^2) + c_l^2\delta_l^2 + \omega_\gamma^2\xi^2]\xi + d_r c_l^2[\delta_l^2(\xi h) + h\delta_l^2\xi + 4\xi h]/2,$$

$$\ddot{h} = -d_r c_l^2\delta_l^2\xi^2/4, \quad \omega_0^2 = \omega_\gamma^2 + 4c^2 - 2c_l^2, \quad c^2 = \omega_\gamma^2 U, \quad c_l^2 = (2r^2 - 1)c^2.$$

Here ω_0^2 — the square of the linear oscillation frequency in the $\Gamma\Pi$ -pair,

ω_γ^2 — the same for the $\Gamma\Pi$ -pendulum (14). Minus before c^2 means the reverse transverse transfer and plus before c_l^2 — straight longitudinal one.

The qualitative difference between transverse and longitudinal transfers is determined by the features of the gaen interactions in these directions. Along the longitudinal axis adjacent $\Gamma\Pi$ -pairs are located at a distance $\sim r$ between them. The displaced gaen of the pair attracts the antigaen and repels the gaen of other pair creating in it the polarization similar to own and part of the first pair energy is transferred there. The direct transfer is formed. The neighbors along the transverse axes have superimpose projections of the gaen displacements on the axis l . Here the displaced gaen also attracts the antigaen and repels the gaen of other pair but this cause the opposite polarization and energy transfer. The polarization of adjacent along transverse axes pairs become opposite which give the lowest environment energy. In this case the $\Gamma\Pi$ -environment acquires the **cross-striped polarization** which is taken into account by changing the sign before c^2 :

$$\begin{aligned} \ddot{\xi} &= [-\omega_m^2 + c^2(\delta_j^2 + \delta_k^2) + c_l^2\delta_l^2 + \omega_\gamma^2\xi^2]\xi + d_r c_l^2[\delta_l^2(\xi h) + h\delta_l^2\xi + 4\xi h]/2, \\ \ddot{h} &= -d_r c_l^2\delta_l^2\xi^2/4, \quad \omega_m^2 = \omega_\gamma^2 - 4c^2 - 2c_l^2, \quad c^2 = \omega_\gamma^2 U, \quad c_l^2 = (2r^2 - 1)c^2. \end{aligned} \quad (18)$$

Continuous approximation is obtained by change the lattice deriva-

tives on partial for continuous functions ξ, h

$$\begin{aligned}\ddot{\xi} &= [-\omega_m^2 + \omega_\gamma^2 \xi^2 + c^2(\partial_j^2 + \partial_k^2) + c_l^2 \partial_l^2] \xi + d_r c_l^2 [\partial_l^2(\xi h) + h \partial_l^2 \xi + 4\xi h]/2, \\ \ddot{h} &= -d_r c_l^2 \partial_l^2 \xi^2, \quad \omega_m^2 = \omega_\gamma^2 - 4c^2 - 2c_l^2.\end{aligned}\quad (19)$$

To find the **vector polarization equation** at $h = 0$ need to change the absolute axes-gdims to conditional coordinate axes that coincide with them. This coordinate system may be changed to any other now relative system. But the $\Gamma\Pi$ -environment remains absolute. The polarization vector $\boldsymbol{\xi} = \boldsymbol{\xi}_t + \boldsymbol{\xi}_l$, $\text{div } \boldsymbol{\xi}_t = 0$, $\text{rot } \boldsymbol{\xi}_l = 0$ is entered with transverse $\boldsymbol{\xi}_t$ and longitudinal $\boldsymbol{\xi}_l$ components. The second derivatives $\partial_j^2 + \partial_k^2$ are replaced by the transverse part of the Laplacian $\Delta_t = -\text{rot rot}$ and ∂_l^2 — by the longitudinal part $\Delta_l = \text{grad div}$. Then from (19) follows

$$\ddot{\boldsymbol{\xi}} + \omega_m^2 \boldsymbol{\xi} = c^2 \Delta_t \boldsymbol{\xi} + c_l^2 \Delta_l \boldsymbol{\xi} + \omega_\gamma^2 \xi^2 \boldsymbol{\xi}. \quad (20)$$

The left side of this equation describes the oscillations in $\Gamma\Pi$ -pairs and right — their transfer and nonlinearity. (20) is decomposed into the Klein-Fock-Gordon equations (eqKFG) [11]–[13] for transverse and longitudinal fields

$$\ddot{\boldsymbol{\xi}}_{t,l} + \omega_m^2 \boldsymbol{\xi}_{t,l} = c_{t,l}^2 \Delta \boldsymbol{\xi}_{t,l} + \omega_\gamma^2 \xi^2 \boldsymbol{\xi}_{t,l}, \quad c_t \equiv c. \quad (21)$$

Polarization waves

The **dispersion equation (dispeq)** for ξ -waves is derived from the linear part of (18) after substitution $\xi(\mathbf{x}, t) = \text{Re}[\psi \exp\{-i\omega t + i\mathbf{q}\mathbf{x}\}]$ where $\mathbf{q} = \{q_j, q_k, q_l\}$ — wave vector, $\mathbf{x} = \{j, k, l\}$ — coordinates in numbers of a $\Gamma\Pi$ -pair. Then from $\delta_{\mathbf{x}}^2 \xi = \xi_{\mathbf{x}+1} + \xi_{\mathbf{x}-1} - 2\xi = 2(\cos \mathbf{q} - 1)\xi = -4\xi \sin^2(\mathbf{q}/2)$ follows the ξ -wave dispeq and the group speed vector $d_{\mathbf{q}}\omega \equiv \mathbf{V} = \{V_j, V_k, V_l\}$

$$\begin{aligned}\omega^2 &= \omega_m^2 + 4c^2[\sin^2(q_j/2) + \sin^2(q_k/2)] + 4c_l^2 \sin^2(q_l/2), \\ \omega_m^2 &= \omega_\gamma^2 - 4c^2 - 2c_l^2, \quad V_{j,k} = (c^2/\omega) \sin q_{j,k}, \quad V_l = (c_l^2/\omega) \sin q_l.\end{aligned}\quad (22)$$

In **continuous approximation**

$$\omega^2 = \omega_m^2 + c^2(q_j^2 + q_k^2) + c_l^2 q_l^2, \quad V_{j,k} = c^2 q_{j,k}/\omega, \quad V_l = c_l^2 q_l/\omega \quad (23)$$

where \mathbf{x} are continuous coordinates in units r . Decomposition into equations for transverse $\boldsymbol{\xi}_t$ and longitudinal $\boldsymbol{\xi}_l$ waves give

$$\omega_{t,l}^2 = \omega_m^2 + c_{t,l}^2 q_{t,l}^2, \quad V_{t,l} = c_{t,l}^2 q_{t,l}/\omega_{t,l}, \quad c_t \equiv c, \quad q_t^2 = q_j^2 + q_k^2. \quad (24)$$

Here ω_m^2 determines the wave propagation and the $\Gamma\Pi$ -environment state:

The attraction of Γ^3 and Π^3 inside the $\Gamma\Pi$ -pair prevails over the attraction of adjacent pairs if $\omega_m^2 > 0$. Part of the wave energy remains in this pair and the other is passed to the neighbors. The wave is fading with distance and massive. $\Gamma\Pi$ -environment behaves like a solid — **$\Gamma\Pi$ -solid**.

If $\omega_m^2 = 0$ then the attractions of Γ^3 and Π^3 inside a pair and adjacent pairs are equals. An indifferent state is formed — the boundary of pair decay. All the wave energy is contained in the transfer — the wave becomes massless. The condition $\omega_m^2 = 0$ gives the **boundary distance** r_0 between $\Gamma\Pi$ -pairs.

If $\omega_m^2 < 0$ but not much then the destruction of some $\Gamma\Pi$ -pairs and the subsequent rearrangement of $\Gamma\Pi$ -environment increases r making the decay boundary stable for a small decrease in the distance between the pairs. A relatively small number of free gaens and antigaens are originated which become the bases of elementary particles (see "Particles"). The deviation $r_0 - r$ determines the particle density in Universe. Since it is much less than the $\Gamma\Pi$ -environment density then $r_0 - r \ll r_0$.

If $\omega_m^2 < 0$ then the attraction of adjacent $\Gamma\Pi$ -pairs prevails. Such environment is unstable. Any small perturbation destroys $\Gamma\Pi$ -pairs. Free gaens and antigaens forms a plasma-like environment — **$\Gamma\Pi$ -plasma**. It is not suitable for formation of the ordered world in it.

A **massless wave** is described by the equations (22-24) at $\omega_m^2 = 0$:

$$\begin{aligned}\ddot{\xi}_t &= [c^2(\delta_j^2 + \delta_k^2) + \omega_\gamma^2 \xi^2] \xi_t, & \omega_t^2 &= 4c^2[\sin^2(q_j/2) + \sin^2(q_k/2)], \\ \ddot{\xi}_l &= (c_l^2 \delta_l^2 + \omega_\gamma^2 \xi^2) \xi_l, & \omega_l^2 &= 4c_l^2 \sin^2(q_l/2), \\ V_{j,k} &= \sin(q_{j,k})/M_t, & V_l &= \sin(q_l)/M_l.\end{aligned}\tag{25}$$

Here $M_t = \omega_t/c^2$ and $M_l = \omega_l/c_l^2$ are the masses of moving wave quanta. They relate the speeds $\mathbf{V} = \{V_j, V_k, V_l\}$ and impulses $\mathbf{q} = \{q_j, q_k, q_l\}$ of quanta. The wave speeds are not constant

$$V_t^2 = V_j^2 + V_k^2 = \frac{c^2(\sin^2 q_j + \sin^2 q_k)}{4[\sin^2(q_j/2) + \sin^2(q_k/2)]}, \quad V_l = c_l \cos(q_l/2).\tag{26}$$

The vector equations in the continuum approximation follows from (21, 25)

$$\begin{aligned}\ddot{\xi}_t &= -c^2 \text{rot rot } \xi_t + \omega_\gamma^2 \xi^2 \xi_t, & \text{div } \xi_t &= 0, & \omega_t &= cq_t, & V_t &= c, \\ \ddot{\xi}_l &= c_l^2 \text{grad div } \xi_l + \omega_\gamma^2 \xi^2 \xi_l, & \text{rot rot } \xi_l &= 0, & \omega_l &= c_l q_l, & V_l &= c_l.\end{aligned}\tag{27}$$

Electric field

Let there be an additional gaen Γ^3 between $\Gamma\Pi$ -pairs in $\Gamma\Pi$ -environment at $\omega_m = 0$. Its potential U_γ of the decomposition (12) acts on the nearest pairs and creates a perturbed zone. Stationary massive (see the next section) and constant radial $\xi(R)$ (R — distance from the gaen center) fields near Γ^3 is formed. The equation $\text{grad div } \xi_t = d_R[R^{-2}d_R(R^2\xi)] = 0$ follows from (27) in the continuum approximation. Its solution decreasing with R is $\xi(R) = e/R^2$. The internal radius of the perturbed zone determines the finite field energy.

Maxwell's equations

The linear part of (27) is $\ddot{\xi} = -c^2 \text{rot rot } \xi$ for the massless transverse field $\xi = \xi_t$ in the continuum approximation. Since $\dot{\xi}$ is also a transverse vector, it can be written as the rotor of some vector function $\dot{\xi} = c \text{rot } \mathbf{b}$. Now $\ddot{\xi} = c \text{rot } \dot{\mathbf{b}}$, $\dot{\mathbf{b}} = -c \text{rot } \xi$, $\text{div } \dot{\mathbf{b}} = 0$. No reason to introduce a b -charge allows to write $\text{div } \mathbf{b} = 0$. The resulting equations system

$$\dot{\xi} = c \text{rot } \mathbf{b}, \quad \dot{\mathbf{b}} = -c \text{rot } \xi, \quad \text{div } \xi = \text{div } \mathbf{b} = 0$$

coincides with Maxwell's equations for the electromagnetic field in the void.

The charges in the $\Gamma\Pi$ -environment are the gaens or the antigaens with the field $\xi(R) = e/R^2$. This Coulomb field leads to Gauss's law:

$$\frac{4}{3}\pi R^3 \text{div } \xi = \int \text{div } \xi d^3x = \oint \xi \mathbf{n} d^2x = 4\pi R^2 \xi(R) = 4\pi e = 4\pi \frac{4\pi}{3} \rho R^3$$

where \mathbf{n} is the external normal of the sphere, ρ is the volume charge density inside it. Hence $\text{div } \xi = 4\pi\rho$, $\text{div } \dot{\xi} = 4\pi\dot{\rho} = -4\pi \text{div } \mathbf{j}$, $\dot{\xi} = -4\pi\mathbf{j}$. The continuity equation $\dot{\rho} + \text{div } \mathbf{j} = 0$ (\mathbf{j} — the current density) is used.

The received fields add up and the Maxwell's equations are formed

$$\dot{\xi} = c \text{rot } \mathbf{b} - 4\pi\mathbf{j}, \quad \text{div } \xi = 4\pi\rho, \quad \dot{\mathbf{b}} = -c \text{rot } \xi, \quad \text{div } \mathbf{b} = 0 \quad (28)$$

for the electric field strength ξ and the magnetic induction \mathbf{b} in a space with volume densities of charges ρ and currents \mathbf{j} .

So the **electric field strength** can be identified with the part of polarization including gaen constant radial and transverse massless ξ -fields. Magnetic induction characterizes a change of the ξ -field in time and is not fundamental despite its convenience in use. It can be removed from the field name. Only adjective "electric" remains: electric field and electric wave. The question about the longitudinal part of ξ -field is considered in the next section.

The **electric wave** is a massless transverse ξ -wave. Its wavelength $\lambda > 4$ in units of the distance r_0 between $\Gamma\Pi$ -pairs. If $r_0 \sim 10^{-22}m$ (experimental

electron size [9]) then $\lambda > 4 \cdot 10^{-22}m$ and the wave frequency is less $10^{30}Hz$. Its group speed (26) varies from the speed of light c for long waves to $c/2$ for $\lambda = 4$. But the continuous approximation (26) in which the speed is constant covers all the observed waves.

In accordance with (18) the ξ -field should have a striated structure — alternating directions of polarization in a plane orthogonal to the direction of the field. The distance between the bands is $r_0 \lesssim 10^{-22}m$. This structure is transmitted to an electric field and electric waves. Then the Coulomb field is the sum of oppositely directed and almost equal radial polarizations.

The over-noisy gaen distribution (11) has the spatial dispersion $\langle \phi^2 \rangle \sim 1$ and forms the **polarization noise** $\delta\xi \sim 1$ much larger the electric field. But this noisy background is invisible since opposite fluctuations are mutually destroyed by averaging when observe times much longer their durations.

Our world can exist if the distances between $\Gamma\Pi$ -pairs $r = r_0$ are precisely maintained providing only a geometric polarization attenuation in space. In $\Gamma\Pi$ -solid ($r > r_0$) massive ξ -field quickly fade away source. In $\Gamma\Pi$ -plasma ($r < r_0$) stable polarization is impossible. The thin border between them is our world environment which similar to the hypothetical Descartes' ether as an electric field carrier. It is possible leave this name ("**ether**", E) for our $\Gamma\Pi$ -environment and to call its elements "**etherons**" $et = \Gamma^3\gamma\Pi^3$.

It is almost impossible that such special conditions could be constantly maintained in our Universe. It is more natural to assume that **ether is a 3-dimensional surface in a 4-dimensional environment** which separate $\Gamma\Pi$ -plasma and $\Gamma\Pi$ -solid. Such a surface can be born, change maintaining its quality and disappear. A comparison with our Universe evolution leads to the assumption of a phase transition of 4-d environment from $\Gamma\Pi$ -plasma to $\Gamma\Pi$ -solid which begins from an point seed and continues with an increase of a boundary surface. This transition surface can to have a time-varying curvature represented by the cosmological constant [10] in Einstein gravity.

Massive field

A massless ξ -field exist if the distance r between etherons provide $\omega_m = 0$. The presence of an additional gaen Γ^3 (or Π^3) change r . It attract the antigaen and repel the gaen in the nearby etheron. Attraction is stronger repulsion if their force decrease with distance. The nearest etherons are shifting to the gaen stretching ether behind them and forming a rarefaction

zone with $\omega_m^2 > 0$. A radial and spherically symmetric field can be there only. The polarization have a constant Coulomb part ξ_c and stationary oscillations (transverse ξ_t and longitudinal ξ_l): $\xi = \xi_c + \xi_t + \xi_l$ in the stationarity.

The source of the constant field is the average gaen amplitude. The source of the stationary field is the noise distribution of the gaen (5) which may be represented as a random displacement of the amplitude. It consists of a "rotation" around the gaen center and a radial "movement" that causes similar transverse and longitudinal fields. The transverse field (waves) moving along a sphere around Γ^3 become stationary. The longitudinal field moving along a radius can't be stationary. It does not stand out from the noise and does not affect slow over-noisy processes.

If to assume that almost all ξ -fields are caused by the presence of particles based on gaens then there are two their types: constant ξ_c and transverse ξ_t — stationary massive near the gaen and massless (electric) away from it. But longitudinal field ξ_l from other sources or for other reasons is not excluded.

The massive ξ_t -field becomes non-stationary and not just radial when Γ^3 moves. The equation derived from (21) for the oscillation amplitudes slowly changing over time is used to consider it in a coordinate system moving with the particle. Introduce $\xi_t(\mathbf{x}, t) = Re[\dot{\psi}(\mathbf{x}, t)e^{-i\omega_m(\mathbf{x})t}]$ leaving approximately the radial field only. If to neglect $\dot{\psi}$ and differentiation of ω_m then $\ddot{\xi}_t \approx -(2i\omega_m\dot{\psi} + \omega_m^2\psi)e^{-i\omega_m t}$ and $\text{grad}\omega_m \approx 0$. Further $\xi^2 = |\psi|^2/2$ in the nonlinear part (21) if do not take into account second ξ -harmonics (averaging over the oscillation period). Then

$$-i\dot{\psi} = \Delta\psi/2m + \omega_\gamma^2|\psi|^2\psi/2, \quad m = \omega_m/c^2 \quad (29)$$

where m is the transverse field mass which changes slowly in the space near Γ^3 together with ω_m . The change in the speed of light c can be ignored here. The full derivative (along the path) $d_t\psi = \dot{\psi} + \mathbf{V} \text{grad}\psi$, where \mathbf{V} is the particle speed vector, must to replace the partial $\dot{\psi}$ in the resting coordinate system. But with a small V the second term can be neglected.

The nonlinear Schrödinger equation (**eqS**) [5] is formed if in (29) to change the variable in space mass with some constant \bar{m}

$$-i\dot{\psi} = \Delta\psi/2\bar{m} + \omega_\gamma^2|\psi|^2\psi/2. \quad (30)$$

EqS describe the wave function in quantum mechanics. Here it is equation of the ξ_t -oscillation amplitude near the gaen. Their identity is possible if this ξ_t -field is the basis of particle motion. Then the **wave function** is

the transverse oscillation complex amplitude and the **particle mass** is the some mass \bar{m} of the transverse ξ -field (for example it is the largest mass $\bar{m} = \max_R \omega_m(R)/c^2$ which is reached for the etherons nearest to the gaen).

If to write $\psi = |\psi|e^{i\Phi}$ then $|\psi|$ is the massive ξ -oscillation amplitude and the wave function phase Φ (the action of particle) is their place.

The smallness condition V is written as $\omega_m \gg V/L$ if the particle is a wave packet having the frequency ω_m , the size $L \sim 1/q$, and the wave vector $q \approx \omega_m/c$. Then $V \ll c$. This usual condition for the applicability of eqS is derived here by another way.

Thus the gaen influence causes the ether phase transition to the **III-solid inside the particles** and excite there the massive transverse polarization field creating the particle mass. A similar phenomenon when the particle mass is determined by the surrounding field influence occurs in solid-state physics. The electron polarizes the crystal lattice and excites oscillations there. The formed quasiparticle (Pekar polaron [14]) has the effective mass which can significantly exceed the electron mass.

The **potential energy** is determined by the nonlinearity. Let in (30) the amplitude ψ consists of two parts $\psi = \psi_1 + \psi_2$. If $\psi_1 \ll \psi_2$ then $\psi^2 = \psi_2^2$ and the external field potential $U\psi_1$, where $U = -\omega_\gamma^2|\psi_2|^2/2$, is formed in eqS.

An oscillation with an amplitude of $\psi = 2$ in units of the noise amplitude is taken as the **ξ -oscillation quantum** so that its external energy (impulse) is $\psi\omega_m = \hbar\omega_m$ at $\hbar = 2$. Since $|\psi| \ll 1$ then this energy is not reached in one etheron but in many — the quantum is collective.

The density distribution of the massive ξ -oscillations internal energy is proportional to $|\psi|^2$ and obeys the continuity equation followed from (30). A quasi "probability distribution" is formed if $|\psi|^2$ is normalized by one. But a particle can not be observed in parts. Now $|\psi|^2$ is represented by "the particle detection probability density" as usual in quantum mechanics and not by the internal energy density distribution of transverse massive ξ -oscillations inside the particle as obtained here.

The particle motion is the gaen motion together with the surrounding ξ -field. This gaen moving between etherons attracts the etheron's antigaen and repels its gaen. The first gaen with the antigaen are combined creating the new etheron and the released gaen replaces it in the moving particle supporting the conditions for the massive ξ -field existence. Thus the **particle motion is a perturbation transfer**.

Let's consider in the continuous approximation the propagation of a **transverse field wave packet** (quantum) which is a set of nearest in spec-

trum waves. The polarization direction determines the axis l . The packet moves transversely this axis in the plane jk . The field ξ_t is written as an oscillation at the packet average frequency $\omega(\mathbf{q})$ with a slowly changing amplitude ψ : $\xi_t(\mathbf{x}, t) = Re[\psi(\mathbf{x}, t)e^{i\Phi}] = \psi e^{i\Phi}/2 + kc$

where $\Phi = -\omega t + \mathbf{q}\mathbf{x}$ is phase, $\mathbf{x} = \{j, k\}$, $\mathbf{q} = \{q_j, q_k\}$, kc denotes a complex conjugation. Then neglecting $\ddot{\psi}$:

$$2\dot{\xi}_t = -(2i\omega\dot{\psi} + \omega^2\psi)e^{i\Phi} + kc, \quad 2\partial_j^2\xi_t = \partial_j^2\psi + 2iq_j\partial_j\psi - q_j^2\psi + kc.$$

Also for the axis k . Harmonics $2\Phi, 3\Phi$ are not taken into account.

$$8\xi_t^3 = \psi^3 e^{3i\Phi} + 3\psi^2\psi^* e^{i\Phi} + \dots = 3|\psi|^2\psi e^{i\Phi} + kc.$$

The equation for ψ is find from (19): $-2i\omega\dot{\psi} - \omega_m^2\psi = c^2[\partial_j^2 + \partial_k^2 + 2i(q_j\partial_j + q_k\partial_k) - q_j^2 - q_k^2]\psi + 3\omega_\gamma^2|\psi|^2\psi/8$.

After reduction due to the dispeq (24)remains

$$-2i\omega\dot{\psi} = [c^2(\partial_j^2 + \partial_k^2) + 2i\omega(V_j\partial_j + V_k\partial_k)]\psi + 3\omega_\gamma^2|\psi|^2\psi/8$$

$$= [(\partial_j^2 + \partial_k^2)/2M + 3\omega_\gamma^2|\psi|^2/8]\psi, \quad d_t\psi = \dot{\psi} + (V_j\partial_j + V_k\partial_k)\psi$$

where $\mathbf{V} = \{V_j, V_k\}$ is the group speed vector, $M = \omega/c^2$ is the transverse field mass or the moving particle mass if a particle is a wave packet.

Enter Laplacian $\Delta = \partial_j^2 + \partial_k^2$ in the transverse plane. Then

$$-id_t\psi = (\Delta/2M + 3\omega_\gamma^2|\psi|^2/8)\psi, \quad d_t\psi = \dot{\psi} + (\mathbf{V} \text{ grad})\psi. \quad (31)$$

There are two movements: the wave packet (particle) with the speed (23) $\mathbf{V} = (c^2/\omega)\mathbf{q}$ and internal. This equation turns into eqS (30) when $V \ll c$.

The photon motion is described by (31) for $\omega_m = 0$, $M = q/c$, $\mathbf{V} = \mathbf{q}/M$.

Introduction $\psi = Re(\Psi e^{i\Phi_\psi})$ where $\Phi_\psi = -\omega_\psi t + \mathbf{q}_\psi\mathbf{x}$ allows to write the slow dispeq $\omega_\psi = \mathbf{V}\mathbf{q}_\psi + q_\psi^2/2M + U$ with the potential energy U in an external field. It describes the relationship between energy, impulse, and speed of the wave packet (particle).

Φ_ψ is the amplitude phase or the particle action whose stationarity under variation (the **principle of stationary action**) determines the motion of particles. Phase arose as a consequence of the field nature of particles (including photons and excluding neutrinos). Then the basis for using the principle of stationary action is the polarization field in the ether.

$\mathbf{V} = 0$ in the reference frame accompanying the packet (particle). Then $q = 0$, $\omega = \omega_m$, $M = m$ and the equation (31) returns to eqS (30) with $m = \bar{m}$. The moving particle mass decreases to the rest mass. They are connected by dispeq $\omega^2 = \omega_m^2 + c^2q^2 = \omega_m^2 + \omega^2V^2/c^2 = \omega_m^2/(1 - V^2/c^2)$, or $M^2 = m^2/(1 - V^2/c^2)$. This well-known mass ratio of the Einstein mechanics [2] is obtained here from the consideration of waves in the ether.

The moving quanta mass is related to their rest mass by the dispeq $\omega^2 = \omega_m^2 + c^2q^2$, $V = c^2q/\omega$, $\omega^2 = \omega_m^2/(1 - V^2/c^2)$, $M^2 = m^2/(1 - V^2/c^2)$. This mass ratio of Einstein mechanics [2] is derived from our consideration of waves in the ether. Hence **the mass and motion of a particle** are determined by surrounding its massive ξ -field for which the gaen is a seed.

This also implies a certain time dilation for a moving body if it is understood as a wave packet. To enter a time need to have a duration sample and a comparison with it. Such a sample is the oscillation period $T = 2\pi/\omega$ for a moving body and $T_m = 2\pi/\omega_m$ for a motionless. The times for both bodies in an units of their periods are the same $t/T = t_m/T_m$. But they differ in the units of measurement common to both bodies $t = t_m T/T_m = t_m \omega_m/\omega = t_m(1 - V^2/c^2)^{1/2}$ just like in Einstein's mechanics.

These results differ from the interpretation of the relation between Schrödinger and Klein-Fock-Gordon equations accepted in modern quantum mechanics. In it eqKFG is the relativistic generalization of non-relativistic eqS applied to a wave function. Here eqKFG (25) is the equation of the ether polarization and eqS (30) is the simplified and approximate equation of this complex polarization amplitude.

Gravity

The ether deformation has two causes. This is the polarization ξ which changes the distance \mathbf{r} between the etherons (19) and even part U_G of the interaction potential (10). Etherons are points of space and the ether deformation field is metric. The repulsion at $U_G > 0$ creates conditions for the neutral ether stability, its deformation and the wave propagation in it.

To illustrate consider the following example. Let there be an additional etheron et_0 in the ether at a distance $r/2$ from its neighbors. It is motionless in the symmetry center. The remaining etherons et_l ($l = 1, 2, \dots$ is their numbers counted from et_0 along the radius) are shifted by a_l to $(l - 1/2)r + a_l$. The distance change is $h_{l+1/2} = a_{l+1} - a_l < 0$: $r_{l+1/2} = r + a_{l+1/2}$. Since the ether is not disturbed away from et_0 then $h_{1/2} = -\sum_{l>1} h_{l+1/2}$. The compression volume is much larger the stretching one. The distance change is a vector \mathbf{h} directing along the radius from a point object of influence. The ether deformation field is determined by their vector sum (integral).

The distance change is a vector \mathbf{h} directed along the radius from the object of influence. The ether deformation is these vectors sum (integral).

The ether is compressed at $h < 0$. A space with a gravity field has same property in Einstein's theory [3]. They can be identified if to take the distance change between the etherons \mathbf{h} (in some units) as the vector gravity potential. **Gravity is a special case of an ether deformation.** This provides the rationale for the metric nature of Einstein's gravity.

Electric waves and particles in gravity. Their motion in the ether is a ξ -field perturbation transfer depended on \mathbf{h} . The wave energy is better transferred in the compressed ether that increase the transfer speeds.

The speed vector of the electric wave \mathbf{c} changes its magnitude and direction. The electric wave frequency changes along with the speed. In the 1-d case $\omega(r+h) = c(r+h)q = (c + d_r c \cdot h)q = \omega(r)[1 + (d_r c/c)h]$, $c = c_i(r)$. Since $d_r c < 0$, the speed and frequency of the electric wave increase in the gravity ($h < 0$). The electric wave accelerates towards a larger field.

The motion and properties of a particle, as a wave packet, are determined by the dispeq (24) $\omega^2 = \omega_m^2 + c^2 q^2$, in which the oscillation frequency in the etheron (18) $\omega_m^2 = \omega_\gamma^2 - 4c^2 - 2c_i^2$. The frequencies ω_m and ω together with the particle masses at rest $m = \omega_m/c^2$ and motion $M = \omega/c^2$ decreases, the speed $V = c^2 q/\omega$ and the mass ratio $M^2/m^2 = \omega^2/\omega_m^2 = 1 + c^2 q^2/\omega_m^2$ increases in the compressed by gravity ether compared to uncompressed. The speed vector \mathbf{V} changes its magnitude and direction.

Since the electric wave or particle accelerations are proportional to $\text{grad } h_i$ then \mathbf{h} acts as the gravity potential vector having three parameters h_i . It changes the metrics of each axis, and through these the space curvature and the time metric determined by the wave packet frequency $\omega(\mathbf{h})$. If do not notice the ether then the electric wave and the particle movement occurs as if in a curved empty space-time.

Gravity field equations may be found in the ether model. However the gravity transfer speeds σ is extremely small due to the weak interaction (10) $U_G \ll U_\gamma : \sigma^2/c^2 \sim U_G/U_\gamma \sim S_u/S_0 \lesssim 10^{-50}$.

The ether deformation \mathbf{h} has two parts. These are \mathbf{h}_G generated by the even part of the potential U_G (10) and \mathbf{h}_ξ generated non-linearly by the variable electric field $\boldsymbol{\xi}$ (19). Their relation is $h_G/h_\xi \sim U_G/U_\gamma$, $h_\xi/\xi \sim \xi/r$. The smallness of h_G causes the known weakness of gravity which is able to create noticeable fields for a huge set of particles only.

The h_G -field affects the electric wave (19) and can be carried along with it. But this field is extremely small. And the nonlinearity in (19) lead to the dependence of the deformation transferred in this way on parameters of the electric wave carrying it that makes difficult to predict a result of this

transfer. Then "the gravitational wave accompanied by an electric wave" observed in [15] can be a h_ϵ -field inseparable from an electric wave. It will be very difficult to connect this transfer with gravity perturbations which tried to observe in these experiments.

Matter is electroneutral only for spatial resolutions much larger than the atom size. On a smaller scale there are always variable electric fields. Also the cosmic microwave background is necessarily present if there are no particles. They are quite capable to rearrange gravity fields of moving masses at speed of light that is the necessary for the derivation of Einstein's gravity theory. Gravitons are small and can be ignored. As a result there remains a quasi-constant gravity field of massive bodies which is nonlinearly rearranged by the electric field when bodies move.

Gravity field of bodies is proportional to particles number in them. The body mass too. Then the inertial and gravitational masses are proportional or equal in the appropriate system of units.

A very strong gravity causes a significant decrease in the distance between the etherons leading to a phase transition of the ether into $\Gamma\Pi$ -plasma. There are no polarization field, electric waves and particles in it. This zone looks like a black hole. Then **black holes are $\Gamma\Pi$ -plasma** zones formed in ether under an influence of a strong gravity.

Particles

The main elements of our 3-d world are 3-d gaens $\Gamma^3 = \Gamma_1^1 g \Gamma_2^1 g \Gamma_3^1 g$, their antigaens and a 1-d pairs $\nu_j = \Gamma_j^1 g g \Pi_j^1$ ($j = 1, 2, 3$) which are composed of 1-d gaens Γ_j^1 and its antigaens connected by exchange g-bonds (8, 9). Down quarks [16, 17] and 1-d gaens have similar properties if quark colors [18, 19] are identify with gdims. Then **down quarks** d_j are antigaens Π_j^1 , down antiquarks \bar{d}_j are gaens Γ_j^1 , **quark colors** are gdims responsible for our space dimensions.

Quarks are bound by gluons [19] in hadrons [20] just as Γ_j^1 and Π_j^1 are bound by g-exchanges (8, 9) in Γ^3 , Π^3 and ν_j . Hence **gluons** are g-bonds. But in general they are not wave quanta. A waves are the transfer through adjacent points. But in the multidimensional noise of g-exchanges each Γ_j^1 is connected to all $\Gamma_{i \neq j}^1$ at once. There are no waves in it. 3-d gaens are an exception. In them all Γ_j^1 are neighbors which allows to introduce the concept about gluons as wave quanta into the "color space".

The amplitudes of Γ^3 and Π^3 are threefold greater the amplitudes of Γ^1 and Π^1 that coincides with the charges ratio for an electron and a quark. If the particle charges are associated with the gaen amplitudes then assume: The **electron** e^- has a antigaen in its basis $B_e^- = \Pi^3$, and the positron e^+ has a gaen $B_e^+ = \Gamma^3$. Hence they contain quarks (down) which give them a location point and not a spatial structure. Their structures are determined by surrounding ξ -field yards Y_e^- and Y_e^+ which creates the particle mass.

The 1-d pairs $\nu_j = \Gamma_j^1 g g \Pi_j^1$ of the gdim j have antiphase oscillations and are non-amplitude particles (without charge) but have an internal oscillation energy. There are also 2-d $\nu_j \nu_k$ and $\nu_{jk} = \Gamma_j^1 g \Pi_j^1 g \Gamma_k^1 g \Pi_k^1 g$, 3-d $\nu_1 \nu_2 \nu_3$ and $\nu_{123} = \Gamma_1^1 g \Pi_1^1 g \Gamma_2^1 g \Pi_2^1 g \Gamma_3^1 g \Pi_3^1 g$, and longer combinations. There should be transitions between them based on the g -exchange which leads to the establishment of a detailed balance. 1-d ν_j and their combinations $\nu_j \nu_k$, $\nu_1 \nu_2 \nu_3$ are most stable because the longer chain is easier to break. The only particles they look like are **neutrinos** [21]. Then the transitions between them correspond to the neutrino oscillations [22].

The gaen Γ_j^1 may be represented as having two free g -bonds for interactions with gaens of other gdims or antigaen of own gdim where both bonds are involved. These corresponds to the concept of interactions by gluons.

Gaen pairs from different gdims connected by a single g -bond have doubled amplitude and two free bonds. They are similar to antiquarks \bar{d}_j with the double charge. These are **up quarks** $u_j = g \Gamma_{j+1}^1 g \Gamma_{j-1}^1 g = \bar{d}_{j+1} \bar{d}_{j-1}$ and their anti-quarks $\bar{u}_j = g \Pi_{j+1}^1 g \Pi_{j-1}^1 g$.

The resulting combinations of the 1-d gaens together with photons γ , as quanta of massless ξ -waves, constitute the **first generation of particles**:

$$d_j = \Pi_j^1, \bar{d}_j = \Gamma_j^1, u_j = g \Gamma_{j+1}^1 g \Gamma_{j-1}^1 g, \bar{u}_j = g \Pi_{j+1}^1 g \Pi_{j-1}^1 g, \nu_j = \Gamma_j^1 g g \Pi_j^1, \\ e^{+-} = B_e^{+-} + Y_e^{+-}, B_e^+ = \Gamma_1^1 g \Gamma_2^1 g \Gamma_3^1 g, B_e^- = \Pi_1^1 g \Pi_2^1 g \Pi_3^1 g, \gamma.$$

They are lightest and do not disintegrate.

Neutrinos and electron bases contain the smallest number of g -bound quarks. These g -bonds were the first to stand out from the diminishing noise. Their strength corresponds to a noise level at their birth and is greatest among other interactions. g -bonds combine quarks to closed compounds and are not free. This is represented in (8, 9) by pairs correlations giving linear g -bonds. But in quantum chromodynamics gluon interactions are nonlinear and require taking into account higher-order correlations (7).

Exchanges between g -bonds (gluons) are added in (8, 9). It lead to

$$\begin{aligned}
S_j^\Gamma &= \bar{S}_j^\Gamma + \epsilon_j + gS_j^\Gamma \sum_{i=1}^3 \eta_{ji}(1 + g_1 \sum_{k,l=1}^3 \tau_{ij,kl}\eta_{kl})S_i^\Gamma, \quad \tau_{ij,kl} = -\tau_{kl,ij}. \\
S_j^\Gamma &= \bar{S}_j^\Gamma + \epsilon_j + g[\eta_j(1 + g_1\tau_j\theta_j) + \theta_j(1 - g_1\tau_j\eta_j)]S_j^\Gamma S_j^\Pi, \\
S_j^\Pi &= \bar{S}_j^\Pi + \epsilon_j - g[\eta_j(1 + g_1\tau_j\theta_j) + \theta_j(1 - g_1\tau_j\eta_j)]S_j^\Gamma S_j^\Pi
\end{aligned} \tag{32}$$

where $\tau_{ij,kl}$ and τ_j are exchanges between gluons by noises with dispersion equal to one. For a strong nonlinearity $g_1 \sim 1$ there is a large probability of a fleeting break of g -bonds with a possibility of switching them to other quarks which have a same temporarily broken g -bonds in this place and time.

Next generations contain heavier particles with an internal spatial structure. They consist of quarks but have much larger masses. Consequently quarks are only their bases B and must to be supplemented by their surroundings (**yard**, Y) which give particles mass.

Quark-gluon bases can be of any length. But a probabilities of basis breaking increases with growing length. Particles with the smallest closed bases are presented in the first generation. Their random bond breaks are restored in the same basis. Longer bases break up. **2-d neutrinos** have the smallest length among them $\nu_{ij} = \Pi_i^1 g \Gamma_i^1 g \Gamma_j^1 g \Pi_j^1 g = u\bar{u}$ and spontaneously breaks up 1-d neutrinos. It is also possible that there are 3-d and multi-d neutrinos with a detailed balance between them.

There are particles without charge starting with the neutral pion π^0 . It has a basis $B_\pi^0 = u\bar{u} + d\bar{d}$ reducing to a pair $\Gamma^3 \xi \Pi^3$, and yard Y_π^0 containing neutrinos and massive ξ -field providing the pion mass. The pion existence is supported by internal exchanges (32) with jumps of g -bonds in its yard. It is a dynamic and statistical object. A long-lived and heavier neutron has the same basis $B_n = udd = B_\pi^0$. Assume that all **neutral particles** have the same bases of $\Gamma^3 \xi \Pi^3$ (gaen and antigaen located at a distances greater than a distance r between the etherons and connected by a polarization field) and different yards with which particle differences are associated. A positive pion π^+ has a basis $B_\pi^+ = u\bar{d} = B_e^+$ that coincides with a positron basis. All **positive particles** have the same bases B_e^+ and differed only in yards. **Negative particles** have an electron basis B_e^- and different yards.

The **proton** has the positron basis $B_e^+ \nu$ linked with the neutrino yard by exchanges. This is manifested in the proton reactions $p\nu = e^+ 2\nu$, $p\nu = ne^+$, $pe^- = n\nu$, $n = pe^- \nu$ which necessarily contain neutrinos. The reason for its stability may be found in a yard structure and reactions inside it.

There are two interactions of a gaen with the environment: by means of γ -potential (12) and g -exchange (32). The first prevails in ether the second in neutr. Gaen-neutrino g -exchange is possible to change their locations which causes random movements of the gaen inside yard.

A g -exchange occurs at sufficiently large neutrino density in space. If this density decreases then a closest to the gaen and linked with it part of the neutrino yard retains an initials density and g -bonds. A bonded system is created there and may be relatively stable. Gaen wanderings become limited in space. Perhaps this is how protons and neutrons were born when a neutrino number density decreased in the expanding Universe.

The causes of masses and decays of heavy particles should be sought inside their yards. It is possible that repeated passes of a same places may increase a distances between an etherons up to a certain equilibrium value. Thus a particles could get to obtain a greater mass than have positron.

Gaen wanderings are conforms with the experiments [23] from which it followed that a nucleons have similar distributions of mass and charge densities. They decrease from a center $\sim 10^{-16}m$ to a border $\sim 10^{-15}m$. This zone is much larger the distance between an etherons $\sim 10^{-22}m$.

All heavy particles are described by the scheme basis-yard. Their bases are gaen or/and antigaen. No need to introduce heavy quarks. Three quarks (down) and their antiquarks are sufficient. The differences between the particles are defined by yard structures. Mesons and bosons of the weak interaction do not stand out from other particles except for their participation in the creation of the nuclear matter. Structures of muons and taons has no qualitative differences from hadrons.

The nucleon yards exist together with their bases from nucleons birth at the corresponding time of Universe development. They must have the imprint of that environment. These yards are now a transition zone from the basis through a remnant of their birth environment to modern Universe environment. The yards of other heavy particles are determined by the conditions of their birth in the corresponding reactions.

A gaen and its antigaen only conditionally have one location but they are separated by half of the total space (half a turn in phase). If environments in these places are different (incomplete mirroring) then an interaction of gaens with them will be different also. Then particles founded on such gaens may be different. Since the proton and the antiproton are founded on the gaen and the antigaen then complete symmetry between them may not be.

Difference between fermions and bosons is conditional in particles

having yards. Strictly only gaens are fermions due to their γ -repulsion (12) which does not allow them to be in one place. Only wave quanta are bosons because they freely pass through one another. Particles that have gaens and ξ -fields in their structures cannot be only fermions or bosons although one or another property may prevail.

Spin. The main oscillation with the frequency $\Omega = 1$ in the noise-blurred 2-d or 3-d gaens (5, 6) may be represented as having a noise rotation at the speed $\dot{\varphi} = \Omega = 1$. It produce a rotation moment J around an axis passing through the gaen center. If the oscillation amplitude is S then the rotation radius $\sim 1/S$ and $J \sim S\dot{\varphi} \cdot (1/S) \sim 1 = \hbar/2$. Hence the noise-blurred main oscillation of (2 or 3)-d gaen is the cause of the spin 1/2 for all particles except 1-d quarks. Other spin values are derived from it. Since the gaen amplitudes are the source of the particle charges then the rotation moment J is accompanied by a magnetic moment which is connected by the spin now. The presence of the spin 1/2 and the property of being the fermion have the different reasons for particles.

About the Nambu-Goldstone and Higgs bosons. Their existence require of an imaginary particle mass $m^2/c^4 = \omega_m^2 < 0$ and its very large nonlinear growth with an increase of "Higgs field". However in this case ether passes into $\Gamma\Pi$ -plasma in which polarization and massive ξ -fields are impossible. Therefore the existence of these bosons is doubtful.

It is possible to suggest another **source of all particle masses**. The rest mass of particles is $m = \omega_m/c^2$ (29). It is defined by $\Gamma\Pi$ -pendulum internal energy ω_γ^2 (14) and a decreasing it influence of adjacent $\Gamma\Pi$ -pairs $4c^2 + 2c_\gamma^2$ (22). Then any particle masses connected with the frequency ω_γ and are expressed in terms of it. Since ω_γ is the largest oscillation frequency in $\Gamma\Pi$ -pairs (etherons) then the mass $m_\gamma = \omega_\gamma/c^2$ is largest also. But ω_γ is unreachable due to a lack of the $\Gamma\Pi$ -pairs outside a $\Gamma\Pi$ -environment. Hence there are no particles with mass m_γ . Thus all particle masses are associated with the frequency ω_γ of the $\Gamma\Pi$ -pendulum linear oscillations.

Estimation of the fundamental frequency. The over-noise energy of the gaen is taken estimationly as standard value of a quark energy $\sim 10^{-1}eV$ which is considered to be equals a noise average amplitude energy. But the noise rises above foundation plateau which is on ~ 46 orders of magnitude more it. Then a gaen energy $\hbar\Omega = 7 \cdot 10^{-16}\Omega \sim 10^{45}eV$ which gives an estimate of the fundamental frequency $\Omega \sim 10^{60}Hz$.

The **ether is absolute** because it is in the absolute space of gaen places. Particles (except neutrinos) and fields are ether perturbations. An observer

or a device can move with the particles so with perturbations of ether only. A massive wave group velocity together with a quantum impulse (wave vector) become zero in the attendant coordinate system containing the device. A frequency and mass decrease to a values of rest state at that. A speeds and quanta impulses of other particles (including photons and excluding neutrinos) are counted from zero. Then particle speeds is always less than the limiting transfer speed (of light) and a photon speed is equal to it. Therefore in any moving with a observer system the speed of light is constant and all physical processes are identically — **motion is relative**. The ether absoluteness is hidden behind relativity of the perturbation movement which is basis of physical coordinate systems.

Relativity of gravity. Massive bodies are perturbations of the absolute ether and the gravity fields are adjusted to their motion by means of an electric field. This process is relative which makes it possible to use Einstein's theory of gravity.

Neutrinos are absolute because they consists only of the gaen and the antigaen without ξ -fields and is not a perturbation of ether. Thus neutrinos represents the absolute environment in our relative world.

Classical elements and levels of matter

The Γ -environment state may be differ since it depends on a distances between Γ -pairs and their polarization. There are unperturbed state without a polarization, polarized ether, Γ -plasma and Γ -solid. There are also four classical elements — fire, air, water, earth. It is possible to match these states and classical elements.

Sum of gaen and its antigaen has zero average amplitude and twice the noise dispersion in unperturbed Γ -environment. This state is a located structureless noise and most corresponds to fire. The disturbed ether is a medium between Γ -plasma (ionized gas) and Γ -solid. Then it corresponds to water. It remains to identify Γ -plasma and Γ -solid with air and earth. Now **a noise is fire, the polarized ether is water, Γ -plasma is air, Γ -solid is earth.**

The noises are differ. There are Everything as a total noise, a noise of uncertain magnitude at the selected main frequency taken as one, its infinite division into independent noises of finite dispersions, their change over time to modern noise, and the sum of the gaen and its antigaen in unperturbed

Γ II-pairs. Each of them may correspond to a special fire element. This is the **diversity of fire**.

A noise is not disorder but the basis from which the worlds arise, by which exist, and to which return. It is a conductor of other worlds influence. A world structures are maintained by noise connecting worlds in the chain of life. An interaction within each world is carried out via its noise. Then **fire is the basis of matter and worlds**, a necessary condition for their existence and development.

The polarized ether is water. It is manifested as electric fields. The ether is medium because relatively small influence puts it in other state. A gaen change a distance between etherons by the γ -interaction and puts the ether in Γ II-solid inside particles. Therefore particles and bodies are built of earth. A gravity puts the ether in Γ II-plasma. Then black holes are air.

Seven levels of Existence may be distinguished in a matter structure — each next is the basis and cause of the previous:

1. Dense matter: The Universe, planets, bodies, molecules, atoms, particles.
2. A polarization field of the ether: a massive field inside particles and massless electric field. They define dense matter.
3. A deformation field of the ether: The polarization is determined by a distance between etherons — the metric field of the ether, including a gravity.
4. Etherons: The metric is due to the etheron interaction.
5. 3-d gaens: The etherons (points of our 3-d space) are pairs of 3-d gaens and antigaens.
6. 1-d gaens: The 3-d gaens are assembled from 1-d gaens (quarcs) linked by correlation g -bonds (gluons).
7. Everything that is Nothing (Emptiness, Absolute, One, Ineffable,...), the unity of being and no-being.

Similar levels of man structure are used in esotericism and theosophy [24]:

1. The physical body (Sthula sharira).
2. The etheric double (Linga sharira).
3. The astral body (Kama-loka. animal soul).
4. The mental body (lower mind).
5. The causal body (karmic, higher mind).
6. The body of bliss (Buddha, enlightenment).
7. Atma (Atman is an eternal unchanging spiritual essence, a conscious Absolute, which is identified in this level with Brahman as an absolute Being — Atman is Brahman).

Then:

1. The physical (dense) body is built of particles.
2. The etheric body is the polarization field of ether, which provides and defines dense bodies.
3. The astral body (of desires) is an etheric metric field. Desires attract. And gravity too.
4. The mental body is built of etherons. They define a scheme (matrix) for constructing the following levels.
5. The causal body corresponds to 3-d gaens the interaction of which determines the world structure.
6. The body of bliss consists of 1-d gaens — the basic building blocks of the world.
7. Atma is Everything that is nothing.

Results

There is a concept about "theory of everything" in physics as a goal to be sought by generalization and unification already known theories of interactions and matter structure (existence of particles). The proposed work is also aimed to this goal but in a another way. Instead of further abstraction and complication of mathematical research tools, the main attention is paid to finding a relatively simple foundation of physics.

Such a choice requires an appropriate name for the presented theory. Its name should be similar to the accepted "theory of everything" and differ from it. The expression **panory** has these properties. It consists of two ancient Greek words: "pan" (everything) and "theory" from which the second half of the name is taken. The presented study is just beginning to enter a vast area of new theory. The simplest available models are used and are proposed with the hope of their further development.

The study begins with the statement about the universality of energy understood as the rate of change. The **change** represented by the variables of action and duration is taken as the basis of Everything.

Stationary repeats of Everything are expressed in terms of harmonics in which the initial phase is their relative **place**. The harmonic in variables "action-energy" is called **gaen**, and antiphase one— **antigaen**. The harmonic becomes the main element for the description of matter and substitute the material point.

The harmonic's set of same frequencies (taken as a unit) is selected for representation of Everything. The **noise** at this frequency is taken as the

basic state of the world.

A stable world structure is formed by **over-noisy gaens** aroused when the noise was attenuated with the preservation of some fluctuations. Here-with harmonic's correlations led to the existence of multidimensional gaens. Three-dimensional (3-d) gaens Γ^3 and antigaens Π^3 constituted by 1-d Γ_j^1 and Π_j^1 of different dimensions j together with 1-d pairs $\Gamma_j^1\Pi_j^1$ of each dimension have become elements of our world. Gaens Γ_j^1 are identical to quarks (down) d_j , gaen dimensions **gdims** — quark colours, correlations between dimensions — gluons, pairs $\Gamma_j^1\Pi_j^1$ — 1-d neutrinos.

There is a **gaens interaction via noise**. Its potential depending on the gaen average amplitude consists of odd and even parts. The odd part (γ -interaction) is the cause of polarization, and the even — of gravity.

The space of our world is a set of gaen places. It is closed (cyclic) and has a material basis. **The environment** of our world consists of attenuated noise, a base plateau, and over-noise parts of gaens above plateau.

The over-noisy parts of gaens are assembled into environmental elements and individual particles. $\Gamma\Pi$ -pairs form **$\Gamma\Pi$ -solid**. Free gaens and antigaens form **$\Gamma\Pi$ -plasma**. The medium between them is the environment of our world — **ether** (E) consisting of etherons (3-d $\Gamma\Pi$ -pairs). The other part of the $\Gamma\Pi$ -environment (**neutr** N) consists of neutrinos. Their set is **eneu** (EN). It is assumed that the ether is a 3-d surface in a 4-d $\Gamma\Pi$ -environment and separates $\Gamma\Pi$ -plasma and $\Gamma\Pi$ -solid in it.

$\Gamma\Pi$ -plasma and $\Gamma\Pi$ -solid are represented in the ether by rare inclusions. Black holes are $\Gamma\Pi$ -plasma, and there is $\Gamma\Pi$ -solid inside the particles.

A model of our world environment is proposed. The polarization ξ and dispersion equations are found. Waves in the environment have transverse and longitudinal components. But the last is much weaker the first.

The massless transverse and constant ξ -fields around the particles forms the system of Maxwell's equations. The **electric field** is ether polarization. The magnetic field is its change over time. The electromagnetic wave is a transverse polarization wave in the ether.

There are around the gaen stationary transverse **massive ξ -field** giving the particle mass and a constant ξ -field. Further there is the Coulomb electric field.

The ξ -field is described by the Klein-Fock-Gordon equation. The non-linear Schrödinger equation is derived after the switching to the amplitude description of a stationary massive ξ -field near gaens. The **wave function** is the amplitude of this oscillating field. The equation of a massive ξ -wave

packet is written. The mass and movement of the body are of a field nature.

Gravity is part of the ether deformation. These potential is described by the change in the distance between etherons. It is shown how electric waves and particles move in gravity. Gravitational waves are negligible. Only the gravitational field of bodies remains. There is nonlinear transfer of gravity by an electric field when bodies are moving.

The 3-d gaen forms the basis of positron $B_e^+ = \Gamma^3$ and antigaen — of electron $B_e^- = \Pi^3$. The 1-d electron neutrino is the pair of 1-d gaen and antigaen $\nu_j = \Gamma_j g \Pi_j$ connected by g-bond (gluon). The down quark is 1-d antigaen $d_j = \Pi_j^1$, $\bar{d}_j = \Gamma_j^1$. The top quark u_j is the gaen pair $u_j = \Gamma_{j+1}^3 \Gamma_{j-1}^3$, $\bar{u}_j = \Pi_{j+1}^3 \Pi_{j-1}^3$. **First-generation particles are consisted from quarks** (except the photon). It is necessary to include yards of a massive ξ -field in the positron and electron structures.

All **massive particles** (except neutrinos) contains the gaen basis surrounding by the yard of the polarization field and neutrinos. Proton yard retain an imprint of the Universe environment which was at their birth.

The world is absolute at the gaen level and relative at the level of the polarization fields and particles which are portable etheric excitations.

Our Universe cannot exist on its own. The necessary condition for its existence and development is the **infinite chain of interacting living worlds**.

Thus it is shown that the theories of modern physics can be derived from the representation of matter in the form of variable action.

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