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. In another way it is possible to use only one harmonic of a given frequency and consider an infinitely complex structure of its amplitude distortion, but this is less convenient.

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 (haen)

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
$\ddot{s} \equiv d^2s/dt^2 = -\Omega^2 s, \quad s(t,\varphi) = S\cos(\Omega t + \varphi) = ReSe^{i(\Omega t+\varphi)}$.

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" (haen, H) is formed.

After selecting any haen 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.

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

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

The haen with the place $\varphi \pm \pi$ (shifted by half-turn) is **antihaen** $\bar{H}$. It is represented as a negative-amplitude $(-S)$ haen in the place φ. After the introduction of antihaens 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 H and $\bar{H}$ are mutually replaced. These concepts are relative for each haen. All haens with places other than its place by less than $\pi/2$ are included in its space, the rest – in anti-space. The sum $\bar{H} + H$ gives zero oscillation. But H and $\bar{H}$ do not disappear but hide preserving their energy.

Noise and over-noisy haens

According to the introduction Everything is an infinite set of equals frequency $(\Omega = 1)$ harmonics for which the sum of lower frequencies harmonics describe the midline taken as zero and of higher ones - oscillation distortions.

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 independent ranqu with any probability distributions converges to the Gauss distribution. Now the higher frequencies harmonics sum becomes the equilibrium fluctuations of oscillation amplitude (**noise**) at the selected frequency.

The noise 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 haen 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

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

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

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

This distribution is homogeneous over the place φ. It has no spatial relations other than one-dimensionality (1d).

From the 1d noise (2, 3) and the infinite divisibility of the Gauss distribution follows the 3d 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 haens 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 haens.

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 haens. Since the haen 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, nonexistence, etc.). The noise constancy ensures the world development with the energy preservation. The noise increase looks like an haen amplitude decrease and the absorption of over-noisy world energy. The world plunges (returns) into noise (chaos).

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

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

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 haens are non-stationary**.

After switching to variables S_j and φ_j as in output (3), the spatial distribution is followed: $P_j^H(S_j, \varphi_j) = S_j P_j^H(S_{cj}, S_{sj})$
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,
$-\{...\} = S^2\cos^2\varphi - 2S\bar{S}_c\cos\varphi + \bar{S}_c^2 + S^2 sin^2\varphi - 2S\bar{S}_s\sin\varphi + \bar{S}_s^2$
$= S^2 + \bar{S}^2 - 2S(\bar{S}_c\cos\varphi + \bar{S}_s\sin\varphi)$
$= S^2 + \bar{S}^2 - 2S\bar{S}(\cos\bar{\varphi}\cos\varphi + \sin\bar{\varphi}\sin\varphi) = S^2 + \bar{S}^2 - 2S\bar{S}\cos\mathring{\varphi}$
$= S^2 + \bar{S}^2 - 2S\bar{S} + 2S\bar{S}(1 - cos\mathring{\varphi}) = \mathring{S}^2 + 4S\bar{S}sin^2(\mathring{\varphi}/2)$.
or $-\{...\} = S^2 + \bar{S}^2 - 2S\bar{S}\cos\mathring{\varphi} + \bar{S}^2\cos^2\mathring{\varphi} - \bar{S}^2\cos^2\mathring{\varphi}$
$= (S - \langle S\rangle)^2 + \bar{S}^2\sin^2\mathring{\varphi}$.
The spatial distribution of over-noisy haen is

$$P^H(\mathbf{S}, \mathring{\boldsymbol{\varphi}}) = \prod_{j=1}^{3} P_j^H(S_j, \mathring{\varphi}_j),$$
$$P_j^H(S_j, \mathring{\varphi}_j) = (S_j/\pi)\exp\{-\mathring{S}_j^{\,2} - 4S_j\bar{S}_j\sin^2(\mathring{\varphi}_j/2)\}$$
$$= (S_j/\pi)\exp\{-(S_j - \langle S_j\rangle)^2 - \bar{S}_j^2\sin^2\mathring{\varphi}_j\}$$

where $\mathbf{S} = \{S_j\}, S_j \geq 0, \mathring{\boldsymbol{\varphi}} = \{\mathring{\varphi}_j\}, |\mathring{\varphi}_j| \leq \pi$. 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 $\mathring{\varphi}_j$ to its center. Near it $|\mathring{\varphi}_j| \ll 1$ 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 haens $\bar{S}_j \gg 1$ this distribution is narrow because $\bar{S}_j\sin\mathring{\varphi}_j$ grows rapidly with $\mathring{\varphi}_j$. Then $|\mathring{\varphi}_j| \ll 1$. Exponent indicator omitting indexes j: $\mathring{S}^2 + 4S\bar{S}\sin^2(\mathring{\varphi}/2) = \mathring{S}^2 + S\bar{S}\mathring{\varphi}^2$. And another
$(S - \langle S\rangle)^2 + \bar{S}^2\sin^2\mathring{\varphi} = S^2 - 2S\bar{S}\cos\mathring{\varphi} + \bar{S}^2\cos^2\mathring{\varphi} + \bar{S}^2\sin^2\mathring{\varphi}$
$= S^2 + \bar{S}^2 - 2S\bar{S} + 2S\bar{S}(1 - \cos\mathring{\varphi}) = (S - \bar{S})^2 + 2S\bar{S}(1 - 1 + \mathring{\varphi}/2) = \mathring{S}^2 + S\bar{S}\mathring{\varphi}^2$.
Then

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

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

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

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

Planck constant. 1d haen is the certain oscillation (1) blurred by the noise (3). Its amplitude uncertainty is $\langle \mathring{S}^2 \rangle^{1/2} = 1$. The vertices of the two distributions are distinguishable if the average amplitudes differ by more $\triangle \bar{S} = 2$. 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 haens 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 haen amplitudes. From infinite divisibility it can be represented by multidimensional oscillations formings a dimensions of the places space. Let the set of haens forming a 1d part of its space be called **hdim** (reduction of "haen 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 hdims are originated. an haen and antihaen of each hdim should also be correlated with each other. Their set

$$\langle S_i^H S_j^H \rangle,\ \langle S_j^H S_j^{\bar{H}} \rangle,\ \langle S_i^H S_j^H S_k^H \rangle,\ \langle S_i^H S_i^{\bar{H}} S_j^H \rangle,\ \langle S_i^H S_i^{\bar{H}} S_j^{\bar{H}} \rangle,\ \ldots \tag{7}$$

where S_j^H and $S_j^{\bar{H}}$ — the haen and antihaen amplitudes in the hdim 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 haens blurred by the new noise level. Correlations (7) are passed to them. The amplitudes of over-noisy haens 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 haens of different hdims or between an haen and antihaen of one hdim haves 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 haens from different hdims which can switch to the connections of an haen and antyhaen in the same hdim. They are represented as two free bonds in a gaen to connect with the same bonds in gaen of other hdim or with antyhaen of own hdim where both bonds are involved.

The haens random amplitudes S_j^H and $S_j^{\bar{H}}$ of hdims j from the distribution (5) can be written as noises sums. In this case the paired correlations between 1d haens H_j^1 inside the 3d haen H^3 should be amplitude exchanges that preserve the amplitude sums.

$$S_j^H = \bar{S}_j^H + \varepsilon_j + g S_j^H \sum_{i=1}^{3} \eta_{ji} S_i^H, \quad \eta_{ji} = -\eta_{ij}. \tag{8}$$

The equations for the amplitudes of a 1d haen and antihaen of one hdim which ensure the preservation of the amplitudes sum in paired exchanges and take into account the pairness of bonds have added

$$S_j^H = \bar{S}_j^H + \varepsilon_j + g(\eta_j + \theta_j) S_j^H S_j^{\bar{H}}, \quad S_j^{\bar{H}} = \bar{S}_j^{\bar{H}} + \varepsilon_j - g(\eta_j + \theta_j) S_j^H S_j^{\bar{H}}. \tag{9}$$

Here ε_j is common for an haen and antihaen unit noise in hdim j, η_{ji} is unit noise of amplitude exchange between haens of different hdims, η_j and θ_j are unit noises of amplitude exchanges between haen and antihaen of one hdim, g are coupling coefficients between haens of different hdims or between an haen and antihaen of one hdim, which are taken to be same.

Weakly over-noisy 1-dimensional haens H^1 should appear first when noise is attenuated. They create a 1d haens space of small-capacity. 2d haens $H^2 = H_1^1 g H_2^1 g$, 1d pairs $\nu_j = H_j^1 g \bar{H}_j^1 g$ of hdims $j = 1, 2$ and their 2d sums $\nu_1 \nu_2$ based on H^1 appear further. (Here and after the last g-bond connects last and first haens.) They create a 2d space of haens and two 1d spaces of pairs ν_j. The continued noise attenuation causes the appearance of 1d pairs $\nu_j = H^1_j g \bar{H}^1_j g$, 2d $\nu_j \nu_k$, $\nu_{jk} = H^1_j g \bar{H}^1_j g H^1_k g \bar{H}^1_k g \, (j = 1, 2, 3)$, 3d $\nu_1 \nu_2 \nu_3$, $\nu_{123} = H^1_1 g \bar{H}^1_1 g H^1_2 g \bar{H}^1_2 H^1_3 g \bar{H}^1_3 g$ 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. Haens are its material points, hdims 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 haen and the antihaen 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 haen level from the stored fluctuations of previous. Here the fluctuations haves a width $\sim 1/S$ where $S \sim 2^n$ is their amplitude which summed by n over-noise levels.

The spatial uncertainty of haens is $S\Delta\varphi \sim 2/S$. They do not differ in appearance if the distance between their centers is $r < 2/S$. In this case a level is the haens 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 haens that form the world structure.

Let take the Universe radius $\sim 10^{27}$ m to estimate of the over-noise levels number n. The haen size is no more the electron radius ($\lesssim 10^{-22}$ m [9], see "Particles"). If the Universe occupies the entire space of haen places then along each axis it can have at least 10^{49} haens. This axis capacity is proportional to the haen 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.

Haens interaction

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

An haen is the certain oscillation which is located in the noise and depends on it. The presence of another haen near the first changes the noise and thus affects first haen. The defining parameters of an haen 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 haen preservation requires constancy of Ω and S. Its change may be transmitted to the movement $\dot{\Omega} = \ddot{\varphi}$. Then the haens 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 haen frequency $\Omega = 1$. If $\bar{S}$ is constant in space then the noise is unchanged and other haen in it does not change. an haen is accelerated by the gradient U: $\dot{\varphi} = -\partial_\varphi U$ if the affecting haen have a constant in time distribution. Thus the function $U(\bar{S})$ is the **potential of the haens 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 haen 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
$U(\bar{S}) = U(S_0) + U_S\bar{S}_u + U_{SS}\bar{S}_u^2/2 + \ldots$
where $U_S = d_S U(S = S_0)$, $U_{SS} = d_S^2 U(S = S_0)$. Selecting $U(S_0) = 0$ gives

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

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

After the introduction of antihaens 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 $\mathring{\varphi}$ follows from the distribution (5) changed to
$P_j^H(S_j, \mathring{\varphi}_j) = P_j^H(S_{uj}, \mathring{\varphi}_j) = (S_0/\pi)\exp\{-\mathring{S}_{uj}^2 - \mathring{\phi}_j^2\}, \quad \mathring{\phi}_j = S\mathring{\varphi}_j \approx S_0\mathring{\varphi}_j$.
Since $P_j^H(\mathring{S}_{uj}, \mathring{\phi}_j) = P_j^H(S_{uj}, \mathring{\varphi}_j)/S_0$ then

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

where $\mathring{\mathbf{S}}_u = \{S_{uj} - \bar{S}_{uj}\}$, $\mathring{\boldsymbol{\phi}} = \{\phi_j - \bar{\phi}_j\}$, $\bar{\phi}_j = S_0\bar{\varphi}_j$.
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 haen amplitudes are assumed to be the same $\bar{S}_{uj} = \bar{S}_u$, and $P^H(\mathring{\mathbf{S}}_u, \mathring{\boldsymbol{\phi}})$ changes to $P^H(S_u, \mathring{\boldsymbol{\phi}})$ with the amplitude $S_u \equiv S_{u1} + S_{u2} + S_{u3}$:

$$P^H(S_u, \mathring{\boldsymbol{\phi}}) = \iint P_1^H(\mathring{S}_{u1}, \mathring{\phi}_1) P_2^H(\mathring{S}_{u2}, \mathring{\phi}_2) P_3^H(\mathring{S}_u - S_{u1} - S_{u2}, \mathring{\phi}_3) dS_{u1} dS_{u2}$$
$$= \pi^{-3} \iint \exp\{-\mathring{S}_{u1}^2 - \mathring{S}_{u2}^2 - (S_u - S_{u1} - S_{u2} - \bar{S}_u)^2 - \mathring{\phi}^2\} dS_{u1} dS_{u2},$$

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

$$P^H(\mathring{\boldsymbol{\phi}}) = \int_{-\infty}^{\infty} P^H(S_u, \mathring{\boldsymbol{\phi}}) dS_u = \pi^{-2} e^{-\mathring{\phi}^2} \int_{-\infty}^{\infty} e^{-(S_u - S_H)^2} dS_u.$$

Now the **distribution of the 3d haen**

$$P^H(S_u, \mathring{\boldsymbol{\phi}}) = \pi^{-2} \exp\{-(S_u - S_H)^2 - \mathring{\phi}^2\}, \quad P^H(\mathring{\boldsymbol{\phi}}) = \pi^{-3/2} e^{-\mathring{\phi}^2}. \tag{11}$$

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

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

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

$$U(\mathring{\boldsymbol{\phi}}) \approx U(S_H) \pi^{-2} e^{-\mathring{\phi}^2} \int_{-\infty}^{\infty} e^{-(S_u - S_H)^2} dS_u = U(S_H) \pi^{-3/2} e^{-\mathring{\phi}^2}.$$

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

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

where $\gamma = \gamma_u S_H$, $G = G_u S_H^2$, $\gamma_u = \pi^{-3/2} U_S$, $G_u = \pi^{-3/2} U_{SS}/2$, $|\mathring{\varphi}| \le \pi/2$.

The haen oscillations interact only locally when their places coincide. But the haen 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 **haens interacts by means of the noise**. The potential does not affect on the noise but the certain haen 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 haen repel another haen and attract the antihaen. If $G_u > 0$ then any haens and antihaens are repelled. Such signs correspond to our world.

Consider 1d $\boldsymbol{\gamma}$-interaction of 3d haens H^3 with equal amplitude modules S_H. 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 haens H_1 и H_2.

The coordinate system for symmetrical motion is chosen. The haen places are 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) indexes denote the haen-haen (haen-antihaen) interaction. The specific forces (per unit of amplitude) affecting on the haens are $f_1 = -f_2 = \mp d_\phi U$, and $\ddot{\phi} = \mp 2 d_\phi U$. Since $\ddot{\phi} = d_\phi(\dot{\phi})^2/2$ 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 haen-haen. If $0 < E < 2$ then there is a reflection at the turning point in counter motion. Two identical haens cannot be in the same place (state). This is a property of fermions caused by γ-repulsion at a sufficiently small energy E.

Attraction haen-antihaen ($H\bar{H}$-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 $\omega_\gamma = 2\gamma^{1/2}$.

Interaction of two $\boldsymbol{H\bar{H}}$-pendulums

Let there be two haen-antihaen pairs $H_1\bar{H}_1$ and $H_2\bar{H}_2$ with equal modulus of haen amplitudes. The haen places are $\phi_1^H, \phi_1^{\bar{H}}, \phi_2^H, \phi_2^{\bar{H}}$. Its difference are $\xi_1 = \phi_1^H - \phi_1^{\bar{H}}$, $\xi_2 = \phi_2^H - \phi_2^{\bar{H}}$. The distance between the pair centers is r. The specific forces, acting on the haens and antihaens, are written in the units 2γ and notations (13)

$f_1^H = -f(\phi_1^H - \phi_1^{\bar{H}}) + f(\phi_1^H - \phi_2^H) - f(\phi_1^H - \phi_2^{\bar{H}})$,
$f_1^{\bar{H}} = f(\phi_1^H - \phi_1^{\bar{H}}) - f(\phi_1^{\bar{H}} - \phi_2^H) + f(\phi_1^{\bar{H}} - \phi_2^{\bar{H}})$,
$f_2^H = -f(\phi_1^H - \phi_2^H) + f(\phi_1^{\bar{H}} - \phi_2^H) - f(\phi_2^H - \phi_2^{\bar{H}})$,
$f_2^{\bar{H}} = f(\phi_1^H - \phi_2^{\bar{H}}) - f(\phi_1^{\bar{H}} - \phi_2^{\bar{H}}) + f(\phi_2^H - \phi_2^{\bar{H}})$.

The equations of motion are written in same units

$\ddot{\xi}_1 = f_1^H - f_1^{\bar{H}} = -f(\xi_1) + f(r + (\xi_1 - \xi_2)/2) - f(r + (\xi_1 + \xi_2)/2)$
$- f(\xi_1) + f(r - (\xi_1 + \xi_2)/2) - f(r - (\xi_1 - \xi_2)/2),$
$\ddot{\xi}_2 = f_2^H - f_2^{\bar{H}} = -f(r + (\xi_1 - \xi_2)/2) + f(r - (\xi_1 + \xi_2)/2) - f(\xi_2)$
$- f(r + (\xi_1 + \xi_2)/2) + f(r - (\xi_1 - \xi_2)/2) - f(\xi_2),$
$2\ddot{r} = f_1^H + f_1^{\bar{H}} - f_2^H - f_2^{\bar{H}} = -f(\xi_1) + f(r + (\xi_1 - \xi_2)/2)$
$- f(r + (\xi_1 + \xi_2)/2) + f(\xi_1) - f(r - (\xi_1 + \xi_2)/2) + f(r - (\xi_1 - \xi_2)/2)$
$+ f(r + (\xi_1 - \xi_2)/2) - f(r - (\xi_1 + \xi_2)/2) + f(\xi_2) - f(r + (\xi_1 + \xi_2)/2)$
$+ f(r - (\xi_1 - \xi_2)/2) - f(\xi_2) =$
$= 2[f(r+(\xi_1-\xi_2)/2) - f(r+(\xi_1+\xi_2)/2) - f(r-(\xi_1+\xi_2)/2) + f(r-(\xi_1-\xi_2)/2)].$

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

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
$\ddot{\xi}_\pm = -2\xi_1 - 2f_r\xi_2 \mp (2\xi_2 + 2f_r\xi_1) = -2(1 \pm f_r)(\xi_1 \pm \xi_2) = -2(1 \pm f_r)\xi_\pm$
with the normal frequencies $\omega_\pm^2 = 2(1 \pm f_r)$ in units of $\omega_\gamma^2/2$ where f_r describes the influence of other pair. Since $f_r < 0$ then $\omega_+ < \omega_-$.

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 haen 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.

In the **nonlinear approximation** the equation of the distance change between $H\bar{H}$-pairs is

$$\ddot{r} = -f_{rr}\xi_1\xi_2 = -f_{rr}(\xi_+^2 - \xi_-^2)/4 \qquad (14)$$

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 $H\bar{H}$-pairs interaction** is

$$\bar{f} = -f_{rr}(a_+^2 - a_-^2)/8 \qquad (15)$$

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

If the $H\bar{H}$-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 $H\bar{H}$-pairs oscillate in the same phase $a_-^2 < a_+^2$ then r_0 is the stable equilibrium point.

Matter and chain of worlds

The haens and antihaens by the γ-interaction forms $H\bar{H}$-pairs $H^3\gamma\bar{H}^3$ which under certain conditions bind to the $H\bar{H}$-environment. The relative shift of H and $\bar{H}$ in the pair determines the environment polarization. Else there are 1d pairs $\nu_j = H_j g \bar{H}_j g$ of hdims 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 $H\bar{H}$-pairs and neutrinos mainly. Its density ρ is estimated via the $H\bar{H}$-pair mass (~neutrino mass $\sim 10^{-37}$ kg – see "Particles") and distance r between $H\bar{H}$-pairs (no more the electron size $\sim 10^{-22}$ m [9]). Then $\rho \gtrsim 10^{29}$ kg/m^3 which is much larger the nuclear density $\sim 10^{17}$ кг/м^3 and 55 orders of magnitude more the Universe matter density $\sim 10^{-26}$ kg/m^3. But the $H\bar{H}$-environment only rises above the upper level of the basis which itself is more 49 orders of magnitude more 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 1d haen 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 contain 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 alive 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

3d haens H^3 and antihaens $\bar{H}^3$ by the γ-interaction (12) is combined into $H\bar{H}$-pairs capable to form a stable $H\bar{H}$-environment. Also this interaction shifts H^3 and $\bar{H}^3$ inside a pair (polarization) and changes the distance between pairs.

Each haen 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 H^3 and $\bar{H}^3$ does not stand out outwardly. However rapid noise fluctuations are mutually destroyed by averaging over slow haen 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 $H\bar{H}$-environment which occupies the entire space of places. It consist of $H\bar{H}$-pairs in which the haen and antihaen have the same average amplitudes. They are together in unperturbed state and separated in perturbed. $H\bar{H}$-pairs connected by γ-interaction constitute a simple lattice of a cube and is used as **$H\bar{H}$-environment model**. Hdims (8, 9) are absolute coordinate axes of the space.

The $H\bar{H}$-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 $H\bar{H}_0$ is placed in the coordinate center. It is affected by 6 adjacent pairs $H\bar{H}_{jkl(=\pm1)}$ (two on each axis) located at the distance r from $H\bar{H}_0$. The place projections on axis l of the haen ϕ^H_{jkl} and antihaen $\phi^{\bar{H}}_{jkl}$ from $H\bar{H}_{jkl}$ are located symmetrically relative to the pair center. Their shift (polarization) is $\xi_{jkl} = \phi^H_{jkl} - \phi^{\bar{H}}_{jkl} \ll r$. Polarization of $H\bar{H}_0$ is $\xi = \phi^H - \phi^{\bar{H}}$ where $\xi = \xi_{000}$, $\phi^H = \phi^H_{000}$, $\phi^{\bar{H}} = \phi^{Pi}_{000}$. The change of r have the second order of smallness (14) and is considered as a nonlinear amendment.

The polarization is determined by the γ-potentials (12) acting on haen $U^H = U^H_0 + U^H_{jkl}$ and antihaen $U^{\bar{H}} = U^{\bar{H}}_0 + U^{\bar{H}}_{jkl}$ of $H\bar{H}_0$. They include actions of the neighbor in the pair $U^H_0 = U^{\bar{H}}_0$ and the adjacent pairs $U^H_{jkl} = U^{HH}_{jkl} + U^{H\bar{H}}_{jkl}$, $U^{\bar{H}}_{jkl} = U^{\bar{H}H}_{jkl} + U^{\bar{H}\bar{H}}_{jkl}$. Here the first superscript indicates the haen being affected and second — affecting.

The interaction potential inside $H\bar{H}_0$ $U_0^H = -\gamma e^{-\xi^2}$ determines the forces on the haen $f_0^H = -\partial_\xi U_0^H = -2\gamma\xi e^{-\xi^2} \approx -2\gamma\xi(1-\xi^2)$ and the antihaen $f_0^{\bar{H}} = -f_0^H$. They are decomposed up to ξ^3. Other forces are taken linear.

The potentials U_{jkl}^{HH} and $U_{jkl}^{H\bar{H}}$ are clouse in absolute value and differ in sign: $U_{jkl}^{HH} = U_{jkl}^{HH}(\xi-\xi_{jkl}) = U_{jkl}^{HH}(\xi) - \xi_{jkl}\partial_\xi U_{jkl}^{HH}(\xi,\xi_{jkl}=0)$, $\partial_\xi = \partial/\partial\xi$,
$U_{jkl}^{H\bar{H}} = U_{jkl}^{H\bar{H}}(\xi+\xi_{jkl}) = -U_{jkl}^{HH}(\xi) - \xi_{jkl}\partial_\xi U_{jkl}^{HH}(\xi,\xi_{jkl}=0)$,
$U_{jkl}^{H} = U_{jkl}^{HH} + U_{jkl}^{H\bar{H}} = -2\xi_{jkl}\partial_\xi U_{jkl}^{HH}(\xi,\xi_{jkl}=0)$.
Since the haen place $\phi^H = \xi/2$ then the force on it is $-\partial_{\phi^H} U_{jkl}^H = -2\partial_\xi U_{jkl}^H$. From the lattice symmetry and the haen locations in the $H\bar{H}$-pair it follows that in the linear approximation the opposite force acts on the antihaen. Then the force of the pair $H\bar{H}_{jkl}$ acting on the shift ξ is $\xi_{jkl}F_{jkl}$ where

$$F_{jkl} = 8\partial_\xi^2 U_{jkl}^{HH}(\xi = \xi_{jkl} = 0) \tag{16}$$

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

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 $i = j,k,l$
$\delta_i\xi_{1/2} = \xi_1 - \xi$, $\delta_i^2\xi = \delta_i\xi_{1/2} - \delta_i\xi_{-1/2} = (\xi_1-\xi) - (\xi-\xi_{-1}) = \xi_1 + \xi_{-1} - 2\xi$,
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
$U_{100}^{HH} = \gamma\exp\{-r^2 - (\xi_{100}-\xi)^2/4\}$,
$\partial_\xi U_{100}^{HH} = \gamma(\xi_{100}-\xi)\exp\{-r^2-(\xi_{100}-\xi)^2/4\}/2|_{\xi_{100}=0}$
$= -\gamma\xi\exp\{-r^2-\xi^2/4\}/2$, $F_{100} = -4\gamma\partial_\xi[\xi\exp\{-r^2-\xi^2/4\}]_{\xi=0} = -4\gamma e^{-r^2}$.
Also $F_{010} = F_{100}$. For the longitudinal axis
$U_{001}^{HH} = \gamma\exp\{-[r+(\xi_{001}-\xi)/2]^2\}$,
$\partial_\xi U_{001}^{HH} = \gamma[r+(\xi_{001}-\xi)/2]\exp\{-[r+(\xi_{001}-\xi)/2]^2\}|_{\xi_{001}=0}$
$= \gamma(r-\xi/2)\exp\{-(r-\xi/2)^2\}$, $F_{001} = 8\gamma\partial_\xi[(r-\xi/2)\exp\{-(r-\xi/2)^2\}]_{\xi=0}$
$= 8\gamma[-1/2+(r-\xi/2)^2]\exp\{-(r-\xi/2)^2\}_{\xi=0} = 4\gamma(2r^2-1)e^{-r^2}$.

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) 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 $H\bar{H}$-pairs along the longitudinal axis on the polarization is finded if instead $F_{001} = F_{00-1} = c_l^2(r)$ take

$F_{00\pm1} = c_l^2(r+h_{\pm1/2}) \approx c_l^2(r)+d_r c_l^2(r)h_{\pm1/2}$. 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 $f = \ldots$ and the second is converted to lattice derivatives if to account the smoothness of h:
$\xi_{001}h_{1/2} + \xi_{00-1}h_{-1/2} = [\xi_{001}(h_1 + h_0) + \xi_{00-1}(h_{-1} + h_0)]/2$
$= [\xi_{001}h_1 + \xi_{00-1}h_{-1} + h_0(\xi_{001} + \xi_{00-1})]/2$
$= [(\delta_l^2 + 2)(\xi h) + h(\delta_l^2 + 2)\xi]/2 = [\delta_l^2(\xi h) + h\delta_l^2\xi + 4\xi h]/2,\ h \equiv h_0$.
This expression multiplied by $d_r c_l^2(r)$ is added to the force f.

The polarization influence on the distance between $H\bar{H}$-pairs is calculated from the $H\bar{H}$-pendulums interaction (14) $\ddot{r} = -f_{rr}\xi_1\xi_2$ (in units of 2γ). It consists of two identical but opposite accelerations of the pair. Therefore the shift a of $H\bar{H}_0$ 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 $H\bar{H}$-pairs $h = \delta_l a$ obeys the equation
$\ddot{h} = f_{rr}\delta_l^2\xi^2/2$, 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
$\ddot{\xi} = [-\omega_0^2 - c^2(\delta_j^2 + \delta_k^2) + c_l^2\delta_l^2 + \omega_\gamma^2\xi^2]\xi + d_r c_l^2[\delta_l^2(\xi h) + h\delta_l^2\xi + 4\xi h]/2$,
$\ddot{h} = -d_r c_l^2\delta_l^2\xi^2/4, \quad \omega_0^2 = \omega_\gamma^2 + 4c^2 - 2c_l^2,\ c^2 = \omega_\gamma^2 U,\ c_l^2 = (2r^2 - 1)c^2$.
Here ω_0^2 — the square of the linear oscillation frequency in the $H\bar{H}$-pair, $\omega_\gamma^2 = 2\gamma$ — the same for the $H\bar{H}$-pendulum. 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 haen interactions in these directions. Along the longitudinal axis adjacent $H\bar{H}$-pairs are located at a distance $\sim r$ between them. The displaced haen of the pair attracts the antihaen and repels the haen of other pair creating in it the polarization similar to own and part of the first pair energy is transfered there. The direct transfer is formed. The neighbors along the transverse axes have superimpose projections of the haen displacements on the axis l. Here the displaced haen also attracts the antihaen and repels the haen 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 $H\bar{H}$-environment acquires the **cross-striped polarization** which is taken into account by changing the sign before c^2:

$$\ddot{\xi} = [-\omega_m^2 + c^2(\delta_j^2 + \delta_k^2) + c_l^2\delta_l^2 + \omega_\gamma^2\xi^2]\xi + d_r c_l^2[\delta_l^2(\xi h) + h\delta_l^2\xi + 4\xi h]/2,$$
$$\ddot{h} = -d_r c_l^2\delta_l^2\xi^2/4,\ \omega_m^2 = \omega_\gamma^2 - 4c^2 - 2c_l^2,\ c^2 = \omega_\gamma^2 U,\ c_l^2 = (2r^2-1)c^2. \quad (17)$$

Continuous approximation is obtained by change the lattice derivatives on partial for continuous functions ξ, h

$$\ddot{\xi} = [-\omega_m^2 + \omega_\gamma^2\xi^2 + c^2(\partial_j^2 + \partial_k^2) + c_l^2\partial_l^2]\xi + d_r c_l^2[\partial_l^2(\xi h) + h\partial_l^2\xi + 4\xi h]/2,$$
$$\ddot{h} = -d_r c_l^2\partial_l^2\xi^2, \quad \omega_m^2 = \omega_\gamma^2 - 4c^2 - 2c_l^2. \quad (18)$$

To find the **vector polarization equation** at $h = 0$ need to change the absolute axes-hdims to conditional coordinate axes that coincide with them. This coordinate system may be changed to any other now relative system. But the $H\bar{H}$-environment remains absolute. The polarization vector $\boldsymbol{\xi} = \boldsymbol{\xi}_t + \boldsymbol{\xi}_l$, $\operatorname{div}\boldsymbol{\xi}_t = 0$, $\operatorname{rot}\boldsymbol{\xi}_l = 0$ 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 $\Delta_t = -\operatorname{rot}\operatorname{rot}$ and ∂_l^2 — by the longitudinal part $\Delta_l = \operatorname{grad}\operatorname{div}$. Then from (18) follows

$$\ddot{\boldsymbol{\xi}} + \omega_m^2\boldsymbol{\xi} = c^2\Delta_t\boldsymbol{\xi} + c_l^2\Delta_l\boldsymbol{\xi} + \omega_\gamma^2\xi^2\boldsymbol{\xi}. \quad (19)$$

The left side of this equation describes the oscillations in $H\bar{H}$-pairs and right — their transfer and nonlinearity. (19) is decomposed into the Klein-Fock-Gordon equations (eqKFG) [11]–[13] for transverse and longitudinal fields

$$\ddot{\boldsymbol{\xi}}_{t,l} + \omega_m^2\boldsymbol{\xi}_{t,l} = c_{t,l}^2\Delta\boldsymbol{\xi}_{t,l} + \omega_\gamma^2\xi^2\boldsymbol{\xi}_{t,l}, \quad c_t \equiv c. \quad (20)$$

Polarization waves

The **dispersion equation (dispeq)** for ξ-waves is derived from the linear part of (17) after substitution $\xi(\mathbf{x},t) = Re[\psi\exp\{-i\omega t + i\mathbf{qx}\}]$ where $\mathbf{q} = \{q_j, q_k, q_l\}$ — wave vector, $\mathbf{x} = \{j,k,l\}$ — coordinates in numbers of a $H\bar{H}$-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 $d_{\mathbf{q}}\omega \equiv \mathbf{V} = \{V_j, V_k, V_l\}$

$$\omega^2 = \omega_m^2 + 4c^2[\sin^2(q_j/2) + \sin^2(q_k/2)] + 4c_l^2\sin^2(q_l/2), \quad (21)$$
$$\omega_m^2 = \omega_\gamma^2 - 4c^2 - 2c_l^2, \quad V_{j,k} = (c^2/\omega)\sin q_{j,k}, \quad V_l = (c_l^2/\omega)\sin q_l.$$

In **continuous approximation**

$$\omega^2 = \omega_m^2 + c^2(q_j^2 + q_k^2) + c_l^2 q_l^2, \quad V_{j,k} = c^2 q_{j,k}/\omega, \quad V_l = c_l^2 q_l/\omega \qquad (22)$$

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

$$\omega_{t,l}^2 = \omega_m^2 + c_{t,l}^2 q_{t,l}^2, \quad V_{t,l} = c_{t,l}^2 q_{t,l}/\omega_{t,l}, \quad c_t \equiv c, \quad q_t^2 = q_j^2 + q_k^2. \qquad (23)$$

Here ω_m^2 determines the wave propagation and the $H\bar{H}$-environment state:

The attraction of H^3 and $\bar{H}^3$ inside the $H\bar{H}$-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. $H\bar{H}$-environment behaves like a solid — $\boldsymbol{H\bar{H}}$**-solid**.

If $\omega_m^2 = 0$ then the attractions of H^3 and $\bar{H}^3$ 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** $r_0 \approx 1.6$ between $H\bar{H}$-pairs.

If $\omega_m^2 < 0$ but not much then the destruction of some $H\bar{H}$-pairs and the subsequent rearrangement of $H\bar{H}$-environment increases r making the decay boundary stable for a small decrease in the distance between the pairs. A relatively small number of free haens and antihaens 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 $H\bar{H}$-environment density then $r_0 - r \ll r_0$.

If $\omega_m^2 < 0$ then the attraction of adjacent $H\bar{H}$-pairs prevails. Such environment is unstable. Any small perturbation destroys $H\bar{H}$-pairs. Free haens and antihaens forms a plasma-like environment — $\boldsymbol{H\bar{H}}$**-plasma**. It is not suitable for formation of the ordered world in it.

A **massless wave** is described by the equations (17, 21) at $\omega_m^2 = 0$:

$$\begin{aligned} &\ddot{\xi}_t = [c^2(\delta_j^2 + \delta_k^2) + \omega_\gamma^2 \xi^2]\xi_t, \quad \omega_t^2 = 4c^2[\sin^2(q_j/2) + \sin^2(q_k/2)], \\ &\ddot{\xi}_l = (c_l^2 \delta_l^2 + \omega_\gamma^2 \xi^2)\xi_l, \quad \omega_l^2 = 4c_l^2 \sin^2(q_l/2), \\ &V_{j,k} = \sin(q_{j,k})/M_t, \quad V_l = \sin(q_l)/M_l. \end{aligned} \qquad (24)$$

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 $\boldsymbol{V} = \{V_j, V_k, V_l\}$ and impulses $\boldsymbol{q} = \{q_j, q_k, q_l\}$ of quanta. The wave speeds are not constant

$$V_t^2 = V_j^2 + V_k^2 = \frac{c^2(\sin^2 q_j + \sin^2 q_k)}{4[\sin^2(q_j/2) + \sin^2(q_k/2)]}, \quad V_l = c_l \cos(q_l/2). \tag{25}$$

The vector equations in the continuum approximation follows from (20, 24)

$$\ddot{\boldsymbol{\xi}}_t = -c^2 \operatorname{rot}\operatorname{rot}\boldsymbol{\xi}_t + \omega_\gamma^2 \xi^2 \boldsymbol{\xi}_t,\ \operatorname{div}\boldsymbol{\xi}_t = 0,\ \omega_t = c q_t,\ V_t = c, \tag{26}$$
$$\ddot{\boldsymbol{\xi}}_l = c_l^2 \operatorname{grad}\operatorname{div}\boldsymbol{\xi}_l + \omega_\gamma^2 \xi^2 \boldsymbol{\xi}_l,\ \operatorname{rot}\operatorname{rot}\boldsymbol{\xi}_l = 0,\ \omega_l = c_l q_l,\ V_l = c_l.$$

Electric field

Let there be an additional haen H^3 between $H\bar{H}$-pairs in $H\bar{H}$-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 haen center) fields near H^3 is formed. The equation grad div $\boldsymbol{\xi}_l = d_R[R^{-2}d_R(R^2\xi)] = 0$ follows from (26) 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 (26) is $\ddot{\xi} = -c^2 \operatorname{rot}\operatorname{rot}\boldsymbol{\xi}$ for the massless transverse field $\boldsymbol{\xi} = \boldsymbol{\xi}_t$ in the continuum approximation. Since $\dot{\boldsymbol{\xi}}$ is also a transverse vector, it can be written as the rotor of some vector function $\dot{\boldsymbol{\xi}} = c\operatorname{rot}\mathbf{b}$. Now $\ddot{\boldsymbol{\xi}} = c\operatorname{rot}\dot{\mathbf{b}}$, $\dot{\mathbf{b}} = -c\operatorname{rot}\boldsymbol{\xi}$, $\operatorname{div}\dot{\mathbf{b}} = 0$. No reason to introduce a b-charge allows to write $\operatorname{div}\mathbf{b} = 0$. The resulting equations system
$\dot{\boldsymbol{\xi}} = c\operatorname{rot}\mathbf{b}, \quad \dot{\mathbf{b}} = -c\operatorname{rot}\boldsymbol{\xi}, \quad \operatorname{div}\boldsymbol{\xi} = \operatorname{div}\mathbf{b} = 0$
coincides with Maxwell's equations for the electromagnetic field in the void.

The charges in the $H\bar{H}$-environment are the haens or the antihaens with the field $\xi(R) = e/R^2$. This Coulomb field leads to Gauss's law:

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

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

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

$$\dot{\boldsymbol{\xi}} = c\operatorname{rot}\mathbf{b} - 4\pi\mathbf{j},\ \operatorname{div}\boldsymbol{\xi} = 4\pi\rho,\ \dot{\mathbf{b}} = -c\operatorname{rot}\boldsymbol{\xi}, \quad \operatorname{div}\mathbf{b} = 0 \tag{27}$$

for the electric field strength $\boldsymbol{\xi}$ 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 haen 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 $H\bar{H}$-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 (25) varies from the speed of light c for long waves to $c/2$ for $\lambda = 4$. But the continuous approximation (25) in which the speed is constant covers all the observed waves.

In accordance with (17) 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 haen distribution (11) has the spatial dispersion $\langle \mathring{\phi}^2 \rangle \sim 1$ 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 $H\bar{H}$-pairs $r = r_0$ are precisely maintained providing only a geometric polarization attenuation in space. In $H\bar{H}$-solid ($r > r_0$) massive ξ-field quickly fade away source. In $H\bar{H}$-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 $H\bar{H}$-environment and to call its elements **"etherons"** et$=H^3\gamma\bar{H}^3$.

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 3dimensional surface in a 4dimensional environment** which separate $H\bar{H}$-plasma and $H\bar{H}$-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 4d environment from $H\bar{H}$-plasma to $H\bar{H}$-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.

The ether emergence should be accompanied by the generation of haens and antihaens which are not connected in the pairs.They will spread in the ether approximately preserving their number. This spread is noticed (unlike to the ether expansion) and determines the observed substance of the Universe the size of which does not exceed the ether 3d surface size..

Massive field

A massless ξ-field exist if the distance r between etherons provide $\omega_m = 0$. The presence of an additional haen H^3 (or $\bar{H}^3$) change r. It attract the antihaen and repel the haen in the nearby etheron. Attraction is stronger repulsion if their force decrease with distance. The nearest etherons are shifting to the haen 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 haen amplitude. The source of the stationary field is the noise distribution of the haen (5) which may be represented as a random displacement of the amplitude. It consists of a "rotation" around the haen center and a "radial movement" that causes similar transverse and longitudinal fields. The transverse field (waves) moving along a sphere around H^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 haens then there are two their types: constant ξ_c and transverse ξ_t — stationary massive near the haen 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 H^3 moves. The equation derived from (20) for the oscillation amplitudes slowly changing over time is used to consider it in a coordinate system moving with the particle. Introduce $\xi_t(\mathbf{x}, t) = Re[\psi(\mathbf{x}, t)e^{-i\omega_m(\mathbf{x})t}]$ leaving approximately the radial field only. If to neglect $\ddot{\psi}$ 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 $\mathrm{grad}\,\omega_m \approx 0$. Further $\xi^2 = |\psi|^2/2$ in the nonlinear part (20) if do not take into account second ξ-harmonics (averaging over the oscillation period). Then

$$-i\dot{\psi} = \Delta\psi/2m + \omega_\gamma^2|\psi|^2\psi/2, \quad m = \omega_m/c^2, \tag{28}$$

where m is the transverse field mass which changes slowly in the space near H^3 together with ω_m. The change in the speed of light c can be ignored here. The full derivative (along the path) $d_t\psi = \dot{\psi} + \mathbf{V}\,\mathrm{grad}\,\psi$, 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 (28) to change the variable in space mass with some constant $\bar{m}$

$$-i\dot{\psi} = \Delta\psi/2\bar{m} + \omega_\gamma^2|\psi|^2\psi/2. \tag{29}$$

EqS describe the wave function in quantum mechanics. Here it is equation of the ξ_t-oscillation amplitude near the haen. 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 haen).

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 haen influence causes the ether phase transition to the ***$H\bar{H}$*-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 (29) 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 (29). 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 haen motion together with the surrounding ξ-field. This haen moving between etherons attracts the etheron's antihaen and repels its haen. The first haen with the antihaen are combined creating the new etheron and the released haen 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 spectrum 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 $\Phi = -\omega t + \mathbf{qx}$ is phase, $\mathbf{x} = \{j, k\}$, $\mathbf{q} = \{q_j, q_k\}$, kc denotes a complex conjugation. Then neglecting $\ddot{\psi}$:
$2\ddot{\xi}_t = -(2i\omega\dot{\psi} + \omega^2\psi)e^{i\Phi} + kc, \quad 2\partial_j^2\xi_t = \partial_j^2\psi + 2iq_j\partial_j\psi - q_j^2\psi + kc.$
Also for the axis k. Harmonics $2\Phi, 3\Phi$ are not taken into account.
$8\xi_t^3 = \psi^3 e^{3i\Phi} + 3\psi^2\psi^* e^{i\Phi} + ... = 3|\psi|^2\psi e^{i\Phi} + kc.$
The equation for ψ is find from (18): $-2i\omega\dot{\psi} - \omega^2\psi + \omega_m^2\psi =$
$c^2[\partial_j^2 + \partial_k^2 + 2i(q_j\partial_j + q_k\partial_k) - q_j^2 - q_k^2]\psi + 3\omega_\gamma^2|\psi|^2\psi/8.$
After reduction due to the dispeq (23)remains
$-2i\omega\dot{\psi} = [c^2(\partial_j^2 + \partial_k^2) + 2i\omega(V_j\partial_j + V_k\partial_k)]\psi + 3\omega_\gamma^2|\psi|^2\psi/8$
$= [(\partial_j^2 + \partial_k^2)/2M + 3\omega_\gamma^2|\psi|^2/8]\psi, \; d_t\psi = \dot{\psi} + (V_j\partial_j + V_k\partial_k)\psi$
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

$$-id_t\psi = (\Delta/2M + 3\omega_\gamma^2|\psi|^2/8)\psi, \quad d_t\psi = \dot{\psi} + (\mathbf{V}\,\mathrm{grad})\psi. \tag{30}$$

There are two movements: the wave packet (particle) with the speed (22)

$\mathbf{V} = (c^2/\omega)\mathbf{q}$ and internal. This equation turns into eqS (29) when $V \ll c$. The photon motion is described by (30) for $\omega_m = 0$, $M = q/c$, $\mathbf{V} = \mathbf{q}/M$.

These results differ from the interpretation of the relation between Schrödinger and Klein-Fock-Gordon equations accepted in quantum mechanics, where eqKFG is the relativistic generalization of eqS. Here eqKFG (24) is the polarization equation and eqS (29) is the simplified equation of complex polarization amplitude. The relativistic generalization of eqS is (30) which differs from eqS by the total time derivative and the moving quanta mass.

Introduction in (30) $\psi = Re(\Psi e^{i\Phi_\psi})$ 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).

The amplitude phase Φ_ψ is the particle action whose stationarity under variation (the **principle of stationary action**) determines the motion of particles. It 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.

In the reference frame accompanying the packet (particle, body) $\mathbf{V} = 0$, $q = 0$, $\omega = \omega_m$, $M = m$ and the equation (30) returns to eqS (29) with $m = \bar{m}$. The moving and rest body masses are connected by the 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 $M^2 = m^2/(1-V^2/c^2)$.

The proper time of a moving body $t \sim 1/M$ because mass is an external energy (oscillation impulse) which is inversely proportional to the passage of time. On the other hand to enter the time you need to have a sample of a duration a comparison with which gives it. In a wave packet, such a sample is the oscillation period $T = 2\pi/\omega$ for a moving body and $T_m = 2\pi/\omega_m$ for a resting one. Their times in the units of periods coincide $t/T = t_m/T_m$, where t_m is the proper time of a motionless body. But in the common units they differ $t = t_mT/T_m = t_m(1-V^2/c^2)^{1/2} \sim 1/M$.

The same number of wavelengths, which are proportional T, is placed inside the wave packet at any its speed. Then the moving body size $L \sim t$ or $L/L_m = T/T_m = (1-V^2/c^2)^{1/2}$, where L_m is the rest body size.

The body velocities addition is determined by the dispeq (23) and its change during the transition to a reference system moving with a body. Let body 1 move at a speed v relative to body 2, which has a speed u in the resting frame of reference 0. The dispeq of the body 1 relative motion is $\omega^2 = \omega_m^2 + c^2q_1^2$. Its speed is $v = c^2q_1/\omega$. At the transition to the frame 0, this dispeq changes to $(\omega + k_1u)^2 = \omega_m^2 + c^2q^2$, where $u = c^2q_2/\omega$, q_2 and

$q = q_1 + q_2$ — wave vectors of bodies 2 and 1 in this frame. The particle 2 velocities sum is $V = d\omega/dq = c^2 q/(\omega + q_1 u) = (u + v)/(1 + uv/c^2)$.

These relations for mass, time, size and velocity are derived here from the consideration of massive polarization waves. They coincide with the theory of relativity relations [2].

A particle motion is the haen motion together with the surrounding ξ-field. The haen attracts the antihaen of the etheron and repels its haen. It combines with the antihaen to a new etheron. The released haen replaces it in the moving particle and supports the conditions for existence of a massive ξ-field. Thus **a particle motion is a perturbation transfer**.

Gravity

The ether deformation has two causes. This is the polarization ξ which changes the distance $\mathbf{r}$ between the etherons (18) 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 $r_0/2$ from its neighbors. It is motionless in the symmetry center. The remaining etherons et_l ($l = 1, 2...$ is their numbers counted from et_0 along the radius) are shifted by a_l to $(l-1/2)r_0+a_l$. The distance change is $h_{l+1/2} = a_{l+1} - a_l < 0 : r_{l+1/2} = r_0 + a_{l+1/2}$. 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. They 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 1d case $\omega(r_0 + h) = c(r_0 + h)q = (c + d_r c \cdot h)q = \omega(r_0)[1 + (d_r c/c)h]$, $c = c(r_0)$. 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 (23) $\omega^2 = \omega_m^2 + c^2q^2$, in which the oscillation frequency in the etheron (17) $\omega_m^2 = \omega_\gamma^2 - 4c^2 - 2c_l^2$. 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 $V = c^2q/\omega$ and the mass ratio $M^2/m^2 = \omega^2/\omega_m^2 = 1 + c^2q^2/\omega_m^2$ 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 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 $\mathbf{h}_\xi$ generated non-linearly by the variable electric field $\boldsymbol{\xi}$ (18). 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 (18) and can be carried along with it. But this field is extremely small. And the nonlinearity in (18) 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_ξ-field inseparable from an electric wave.

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 $H\bar{H}$-plasma. There are no polarization field, electric waves and particles in it. This zone looks like a black hole. Then **black holes are $\boldsymbol{H\bar{H}}$-plasma** zones formed in ether under an influence of a strong gravity.

Particles

The main elements of our 3d world are 3d haens $H^3 = H_1^1 g H_2^1 g H_3^1 g$, their antihaens and a 1d pairs $\nu_j = H_j^1 gg \bar{H}_j^1$ $(j = 1, 2, 3)$ which are composed of 1d haens H_j^1 and its antihaens connected by exchange g-bonds (8, 9). Down quarks [16, 17] and 1d haens have similar properties if quark colors [18, 19] are identify with hdims. Then **down quarks** d_j are antihaens $\bar{H}_j^1$, down antiquarks $\bar{d}_j$ are haens H_j^1, **quark colors** are hdims responsible for our space dimensions.

Quarks are bound by gluons [19] in hadrons [20] just as H_j^1 and $\bar{H}_j^1$ are bound by g-exchanges (8, 9) in H^3, $\bar{H}^3$ 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 H_j^1 is connected to all $H_{i \neq j}^1$ at once. There are no waves in it. 3d haens are an exception. In them all H_j^1 are neighbors which allows to introduce the concept about gluons as wave quanta into the "color space".

The amplitudes of H^3 and $\bar{H}^3$ are threefold greater the amplitudes of H^1 and $\bar{H}^1$ that coincides with the charges ratio for an electron and a quark. If the particle charges are associated with the haen amplitudes then assume: The **electron** e^- has a antihaen in its basis $B_e^- = \bar{H}^3$, and the positron e^+ has an haen $B_e^+ = H^3$. 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 1d pairs $\nu_j = H_j^1 gg \bar{H}_j^1$ of the hdim j have antiphase oscillations and are non-amplitude particles (without charge) but have an internal oscillation energy. There are also 2d $\nu_j \nu_k$ and $\nu_{jk} = H_j^1 g \bar{H}_j^1 g H_k^1 g \bar{H}_k^1 g$, 3d $\nu_1 \nu_2 \nu_3$ and

$\nu_{123} = H_1^1 g\bar{H}_1^1 g H_2^1 g\bar{H}_2^1 H_3^1 g\bar{H}_3^1 g$, and longer combinations. There should be transitions between them based on the g-exchange which leads to the establishment of a detailed balance. 1d 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 haen H_j^1 may be represented as having two free g-bonds for interactions with haens of other hdims or antihaen of own hdim where both bonds are involved. These corresponds to the concept of interactions by gluons.

Haen pairs from different hdims 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** $u_j = gH_{j+1}^1 gH_{j-1}^1 g = \bar{d}_{j+1}\bar{d}_{j-1}$ and their anti-quarks $\bar{u}_j = g\bar{H}_{j+1}^1 g\bar{H}_{j-1}^1 g$.

The resulting combinations of the 1d haens together with photons γ, as quanta of massless ξ-waves, constitute the **first generation of particles**:
$d_j = \bar{H}_j^1$, $\bar{d}_j = H_j^1$, $u_j = gH_{j+1}^1 gH_{j-1}^1 g$, $\bar{u}_j = g\bar{H}_{j+1}^1 g\bar{H}_{j-1}^1 g$, $\nu_j = H_j^1 gg\bar{H}_j^1$,
$e^{+-} = B_e^{+-} + Y_e^{+-}$, $B_e^+ = H_1^1 gH_2^1 gH_3^1 g$, $B_e^- = \bar{H}_1^1 g\bar{H}_2^1 g\bar{H}_3^1 g$, γ.
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

$$S_j^H = \bar{S}_j^H + \varepsilon_j + gS_j^H \sum_{i=1}^{3} \eta_{ji}(1 + g_1 \sum_{k,l=1}^{3} \tau_{ij,kl}\eta_{kl})S_i^H, \quad \tau_{ij,kl} = -\tau_{kl,ij}.$$

$$S_j^H = \bar{S}_j^H + \varepsilon_j + g[\eta_j(1 + g_1\tau_j\theta_j) + \theta_j(1 - g_1\tau_j\eta_j)]S_j^H S_j^{\bar{H}}, \tag{31}$$

$$S_j^{\bar{H}} = \bar{S}_j^{\bar{H}} + \varepsilon_j - g[\eta_j(1 + g_1\tau_j\theta_j) + \theta_j(1 - g_1\tau_j\eta_j)]S_j^H S_j^{\bar{H}},$$

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. **2d neutrinos** haves the smallest length among them $\nu_{ij} = \bar{H}_i^1 g H_i^1 g H_j^1 g \bar{H}_j^1 g = u\bar{u}$ and spontaneously breaks up 1d neutrinos. It is also possible that there are 3d 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 $H^3\xi\bar{H}^3$, and yard Y_π^0 containing neutrinos and massive ξ-field providing the pion mass. The pion existence is supported by internal exchanges (31) 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 $H^3\xi\bar{H}^3$ (haen and antihaen 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 an haen with the environment: by means of γ-potential (12) and g-exchange (31). The first prevails in ether the second in neutr. haen-neutrino g-exchange is possible to change their locations which causes random movements of the haen inside yard.

A g-exchange occurs at sufficiently large neutrino density in space. If this density decreases then a closest to the haen 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. haen 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.

haen 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 haen or/and antihaen. 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.

an haen and its antihaen 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 haens with them will be different also. Then particles founded on such haens may be different. Since the proton and the antiproton are founded on the haen and the antihaen then complete symmetry between them may not be.

Difference between fermions and bosons is conditional in particles having yards. Strictly only haens 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 haens 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 2d or 3d haens (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 haen 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 haen is the cause of the spin $1/2$ for all particles except 1d quarks. Other spin values are derived from it. Since the haen 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. Also the **spin is the cause of electric waves and particle masses**. The presence of the spin 1/2 and the property of being the fermion have the different reasons for particles.

Estimation of the fundamental frequency. The over-noise energy of the haen 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 an haen 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 haen 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 haen and the antihaen 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 $H\bar{H}$-environment state may be differ since it depends on a distances between $H\bar{H}$-pairs and their polarization. There are unperturbed state without a polarization, polarized ether, $H\bar{H}$-plasma and $H\bar{H}$-solid. There are also four classical elements — fire, air, water, earth. It is possible to match these states and classical elements.

Sum of haen and its antihaen has zero average amplitude and twice the noise dispersion in unperturbed $H\bar{H}$-environment. This state is a located structureless noise and most corresponds to fire. The disturbed ether is a medium between $H\bar{H}$-plasma (ionized gas) and $H\bar{H}$-solid. Then it corresponds to water. It remains to identify $H\bar{H}$-plasma and $H\bar{H}$-solid with air and earth. Now **a noise is fire, the polarized ether is water, $H\bar{H}$-plasma is air, $H\bar{H}$-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 haen and its antihaen in unperturbed $H\bar{H}$-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. an haen change a distance between etherons by the γ-interaction and puts the ether in $H\bar{H}$-solid inside particles. Therefore particles and bodies are built of earth. A gravity puts the ether in $H\bar{H}$-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. 3d haens: The etherons (points of our 3d space) are pairs of 3d haens and antihaens.
6. 1d haens: The 3d haens are assembled from 1d haens (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 3d haens the interaction of which determines the world structure.
6. The body of bliss consists of 1d haens — 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 seeked 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 **haen**, and antiphase one— **antihaen**. 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 haens** aroused when the noise was attenuated with the preservation of some fluctuations. Herewith harmonic's correlations led to the existence of multidimensional haens. Three-dimensional (3d) haens H^3 and antihaens $\bar{H}^3$ constituted by 1d H^1_j and $\bar{H}^1_j$ of different dimensions j together with 1d pairs $H^1_j\bar{H}^1_j$ of each dimension have become elements of our world. haens H^1_j are identical to quarks (down) d_j, haen dimensions **hdims** — quark colours, correlations between dimensions — gluons, pairs $H^1_j\bar{H}^1_j$ — 1d neutrinos.

There is a **haens interaction via noise**. Its potential depending on the haen 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 haen 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 haens above plateau.

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

$H\bar{H}$-plasma and $H\bar{H}$-solid are represented in the ether by rare inclusions. Black holes are $H\bar{H}$-plasma, and there is $H\bar{H}$-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 haen 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 nonlinear Schrödinger equation is derived after the switching to the amplitude description of a stationary massive ξ-field near haens. 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 nonlineary transfer of gravity by an electric field when bodies are moving.

The 3d haen forms the basis of positron $B_e^+ = H^3$ and antihaen — of electron $B_e^- = \bar{H}^3$. The 1d electron neutrino is the pair of 1d haen and antihaen $\nu_j = H_j g \bar{H}_j$ connected by g-bond (gluon). The down quark is 1d antihaen $d_j = \bar{H}_j^1$. The top quark u_j is the haen pair $u_j = H_{j+1}^1 g H_{j-1}^1$.

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 haen 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 haen 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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