Energy Nature of Configurational (mixing) Entropy, its Interconnection with Matter and Physical Vacuum and the Possibility of Generation of entropy and Anti-entropy flows –*English version*

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ABSTRACT

It is shown, that the entropy of mixing is of the energy nature (not only statistical one, as the probability of state). Energetic entropy processes (in ideal mixing) are not observable, because of their hidden nature (simultaneously occurs the emission and absorption of heat). But they are reflected in the changes of energy condition of Physical Vacuum (PV).

A hypothesis is proposed, in which changes in the entropy of mixing are analyzed as linked with the interaction between matter and Physical Vacuum. Experimental results were carried out of interaction between Physical Vacuum and material bodies in different energetic exposures, including distanced, which resulted in body mass reduction due to increase in energetic density of Physical Vacuum around them. The same effect is observed during the increase of mixing entropy - it points out on its energetic nature, not only the measure of disorder. So, the second law of thermodynamics, when applied to open systems, i.e. matter plus Physical Vacuum, gets additional physical meaning as the law of energy conservation. A hypothesis is conceived to explain the anti-gravity effects from the conducted experiments.

There was an attempt to find correlation by the use of Lenz's Rule between the rise in entropy and Universe expansion, and also some particularities of Universal expansion with possibility to exceed the speed of light.

A physical explanation of Nikolai Kozyrev's experiments is proposed. Methods of entropy and anti-entropy stream (flow) generation, arising in the forced mode use of vortex heat generators, were tested, as were practical uses of received effects for purification of solutions from additives and for metals melting at lower temperatures. Probable energetic effects that appear at fast changes in Physical Vacuum density are analyzed.

CONTENT

1. Introduction

Thermodynamics, with its fundamental first and second laws, lay in the in the foundation of all physical theory. At the same time, these principles are often wrongly interpreted. As the result, thermodynamics carry the nature of a purely mathematical theory, the formulas of which allow, in the words of Maxwell, "predict the consequences from these laws", but in the physical sense don't offer a view of internal link between all phenomena.

The need to not just mathematically describe and use the physical laws, but to also feel their physical sense and internal link, prompted one of the founders of quantum electrodynamics, an outstanding XXth century physicist and a Nobel laureate, Richard Feynman, states explicitly about thermodynamics in his The Character of Physical Law [1]: «So it has often been said that Carnot's logic was wrong. But his logic was quite correct. Only Clausius's simplified version, that everybody read, was incorrect».

The first law of thermodynamics states: in all processes happening in the closed system, the internal energy of the system, being a sum of kinetic energies and energy of interaction (potential energy) between particles of the system, remains constant. At that, the closed system includes the system itself and environment around it [2-4].

$$\Delta U = Q - W \quad (1),$$

Where ΔU is the increase in the internal energy of the system, Q- the heat put into the system from the surroundings, and W is work done by the system.
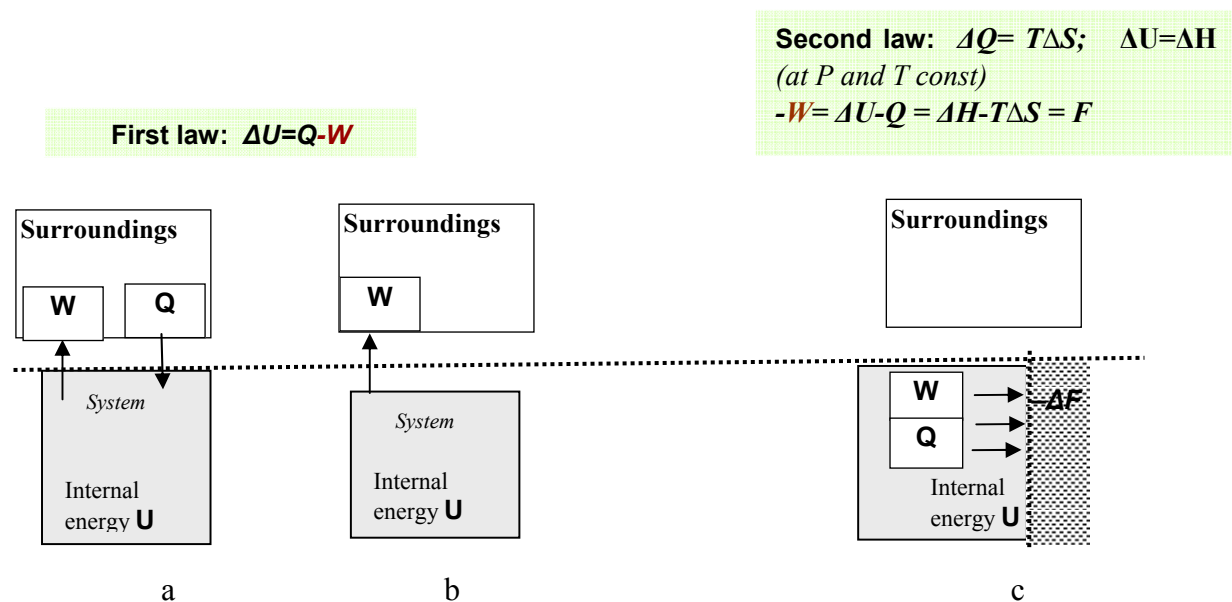
The traditional graphical representation of the First Law is presented in fig.1a [4]. This scheme explains *reversible* processes well.

One of the universal principles of the nature is - *any system seeks the minimum of energy to achieve the most stable condition*. For example, the electrons seek to fill the lower energetic levels in atoms, or the creation of more stable chemical compounds occurs. In all of these processes the heat (energy) emission occurs (fig. 1b), *the internal energy decreases* and the system achieves the more stable state.

But some processes, for example, mixing, can *spontaneously* occur **even when the energy of the system increases** [2]. The cooling of the body can occur and, therefore, the difference between temperatures and the environment, *without the observable work* done by the system. For example, the dissolution of glycerin, sugar or sugar syrup in the water always correlates with the temperature decrease in the mixture. If we wanted the temperature during dissolution to stay the same, we would have needed to transfer energy to the mixture. From this comes that at the spontaneous dissolution of some substances the *internal energy of the system increases*. So some kind of invisible and not calculated work inside the system is done, and it causes the increase in the internal energy of the system, or, more accurately in the energy capacity of the system, that can be represented through the increase of the average heat capacity.

Same happens during the dissolution of most other substances (those, which dissolubility increases with the increase in temperature). In all similar cases the energy of the mixture becomes more than the internal energy of original components at the same temperature, taken separately. It is obvious that there exists a contradiction with the main principle of system striving to the minimum of the internal energy. Although in this case the processes are described by the second law of

thermodynamics, which, as it is used now, determines only the direction of energy processes, but not the energy balance, and describes not only reversible, but also irreversible processes (fig. 1b). And the main criteria are not the change in internal energy as in the first law, but the change in free energy, its reduction at all spontaneous process and also the increase in entropy. But really free energy does not have a physical-energetic meaning and does not directly correlate with the first law of thermodynamics.

First law: $\Delta U = Q - W$

Second law: $\Delta Q = T\Delta S;$ $\Delta U = \Delta H$
(at P and T const)
$-W = \Delta U - Q = \Delta H - T\Delta S = F$

a   b   c

ΔU – *change of the internal system energy*
Q – *heat that the system got from the surroundings*
W – *work, done by the system on the surroundings*
ΔS – *change of entropy*

Fig. 1. Main laws of thermodynamics a, b - the first law (the law of energy conservation) and its graphical interpretation, c - second law in the Cahn interpretation and its graphical expression in the new interpretation: increase of internal energy due to the increase of heat capacity (mixture of components) - system has done work to increase energy capacity - average heat capacity and at the same time has filled it with the heat energy. With that the value of internal energy has increased [3]

The visible contradiction between the first and the second laws of thermodynamics mostly arises from the unclear physical meaning of the free energy and its main component, entropy, most of all, the **entropy of mixing (configurational entropy)**. Its quantum mechanics interpretation as the number of system states, with all of its intuitive precision, does not reveal the energy nature of entropy. So it feels that the main regularity common to the nature - the striving of each system to minimum energy, is not respected during mixing. But it is not true. We observe only the change of internal energy of the subsystems, for example, component A and B at the ideal mixing. But we don't take into account the energy of interaction of these subsystems (A and B) with each other at mixing or diffusion. But this energy is always presents, if the spontaneous irreversible process occurs. It is need to be determined, as frequently is the simultaneous occurrence of two opposite processes - energy emission due to strengthening of interatomic bonds and simultaneously energy absorption due to the increase of system capacity, in this case, average heat capacity [3]. Therefore

the free energy decreases, accompanying the spontaneous process (in ideal mixing represented by entropy part of the equation), is also a type of energy and the abstract meaning of these terms should be filled by the real physical energy content, not just mathematical description.

Famous scientist Robert Cahn in the second edition of his book "Physical Metallurgy" tried to connect the first and second laws of thermodynamics, deducing the second law from the first. We have tried to show the physical meaning of his approach on fig. 1c [3]. In Cahn's interpretation, **free energy is the work,** taken with the opposite sign, that system could have potentially done at the constant temperature [4]. So, factually, he directed to the energy meaning of the free energy and, therefore, entropy. But in the following editions his students have taken this paragraph out, perhaps, judging it unnecessary and without interest.

Cahn's interpretation of the second law has foundational meaning, as it opens the way to understand the physical nature of the second law, free energy and entropy. Energy interpretation of the free energy as the useful work is also known in the thermochemistry (chemical thermodynamics), but, as with Cahn's, this idea has not been developed further.

Should be noted that the classics of thermodynamics, such as Gibbs, Chan, Swalin, Yum-Rosary, Neyman-Kopp and others in their earlier works have tried to rethink the physical meaning of many abstract provisions of thermodynamics, particularly the entropy [2, 4-6]. It is not coincidental that in choosing the very term "entropy" *(transformed energy)* Clausius underlines the following: "I have purposefully selected the word "entropy" as closely resembling the word "energy", as both values corresponding to this terms are so close in their essence that in my opinion they require homologous naming" [4]. But their attempts to fill the main principles of thermodynamics with physical meaning have not been put into the system, and, sadly, are forgotten.

In fact, we nowadays do not have a single notion of entropy. In thermodynamics of alloys there is one approach to entropy and free energy, in chemical thermodynamics there is another, in mechanics and thermal processes there is a third one etc. There are also various modifications of entropy not connected to each other such as information entropy, star entropy, the entropy of the Big Bang and the extension of the universe. The abundance results in confusion. Whenever people want to make a new phenomenon sound more scientific they connect it with a new kind of entropy.

The mathemization of physics, the loss and uselessness of the understanding of the physical laws, processes and occurrences, their "internal connection", made Richard Feynman to state: "Today our physical theories and laws of physics are multiple disconnected parts, badly matching each other. Physics are not yet a united system where every part is in its place. At the moment all we have is multiple parts (details) that are difficult to put together" [1].

We have tried to approach the understanding of the physical-energy nature of entropy, which appears in the increase of the internal energy and, therefore, the energy capacity of the system. If inside the closed system this process is hard to affix in the short temperature range (if, for example, the emission or absorption of heat (energy) is not observed and the calorimeter measurements are needed, starting from the cryogenic temperatures), it is identified in the open system - matter - Physical Vacuum (PV). In this article we observe and experimentally confirmed the entropy value change in physical-chemical processes as a result of matter interacting with Physical Vacuum (PV), and other processes occurring in open systems [7].

2. Hidden energy processes, occurring at mixing

Some factors identifying the energy nature of mixing entropy.

Let's observe the mixing process of salt and fresh water. There is no energy emission (we don't catch its change during the change in temperature). But the process occurs spontaneously, as the mixing entropy increases, and, therefore, the free energy decreases.

In fact, the energy always emisses in spontaneous process, but it is **hidden**. The proof of that is the appearance of osmotic pressure, when the fresh water passes through the half-penetrable membrane dividing salt and fresh water, and mixes with salt water (fig. 2a).

In any mixing occurs the mutual diffusion of the solvent particles and the particles of the diffusing substance. The moving force of the diffusion is the decrease of free energy of the system or the decrease of chemical potential of every diffusing component. If we only mix fresh and salt water, we can't observe any hidden effects. If we do this with the half-penetrable membrane, through which only solvent molecules can go through, an osmosis takes place (from Greek - push, pressure) - the process of one-sided diffusion of solvent molecules to the side of higher concentration of the diffused substance (lower concentration of solvent) through the half-penetrable membrane. The osmosis pressure occurs due to the striving of particles to equally distribute by the whole volume [8]. The osmosis pressure value (P_{osm}) is proportional to the solution concentration (C) in modally-volume shares, and temperature (T), is determined by the Van't Hoff equation:

$$P_{osm}=RTC \quad (2)$$

Theoretically, the osmosis pressure between salt and fresh water can achieve the maximum of 26 atmospheres, which correlates to the difference in their levels of 270 meters. In Norway, Statkraft company prepares to launch a power plant that is going to produce energy from the described process (fig. 2b) [9].
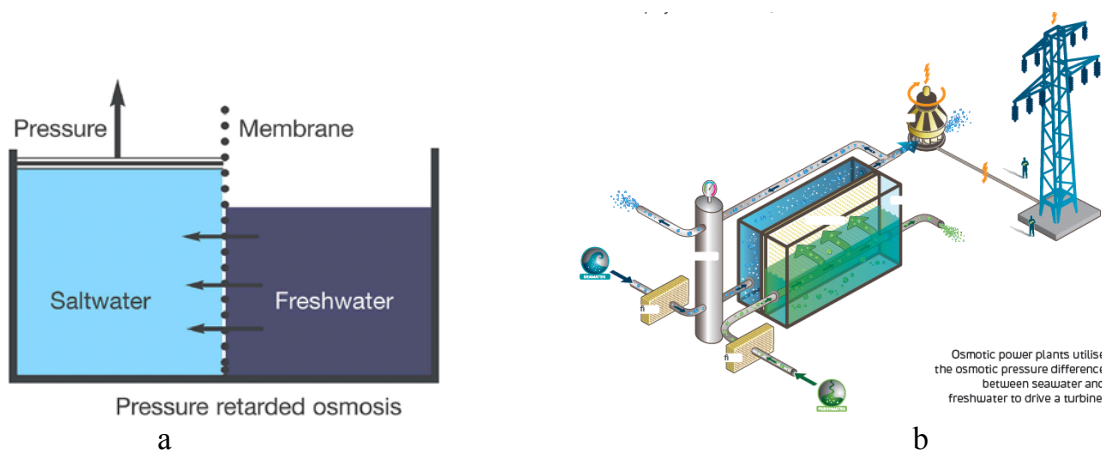

Fig. 2. Occurrence of osmosis pressure in mixing (salt and fresh water (a) and usage of mixing processes in osmotic power plants (b) [9]

So, the **increase in mixing entropy** is not only accompanied by energy emissions, but can do **useful work** itself.

Another example: if we put salt (or saltwater) on ice, it would thaw. Energy would be spent on thawing, because the freezing temperature of saltwater is lower than of the fresh one. So, again, we only change the entropy of mixing and, as a result, the energy is emitted.

Here is the question. Where did the energy go and how it can be used - there are a lot of natural processes accompanied by rising entropy. And can the mixing process be reversed by using energy and cleaning the solution from admixtures (the reverse osmosis used now does not provide a quality cleaning).

In our opinion, the hidden characteristic of free energy lies in the simultaneous processes, moving in opposite directions and compensating each other in the ideal mixing. For example, simultaneous heat emission and intake, or heat emission and its work inside body or system, directed on increasing the average heat capacity, as shown in our works [3, 10] and the scheme (fig. 3).
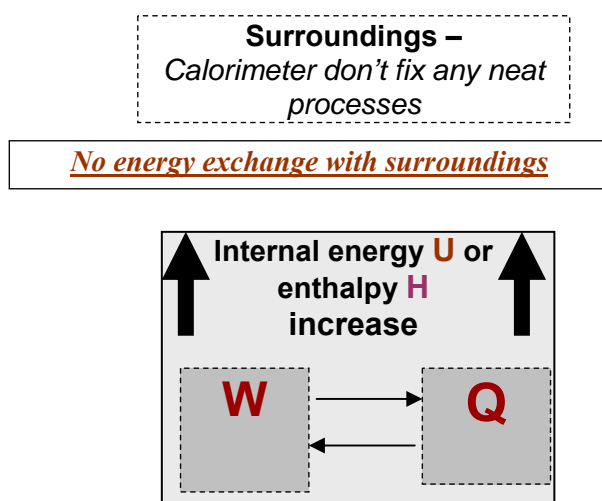
Surroundings –
Calorimeter don't fix any neat processes

No energy exchange with surroundings

Internal energy U or enthalpy H increase

W   **Q**

Fig. 3. *The scheme of hidden processes, compensating each other in the material system: simultaneous heat emission and intake* **Q,** *or heat emission and its work inside body or system* **W,** *directed, for example, on increasing the average heat capacity. As the result, the internal energy increases, but is not fixated by the calorimeter. For example, the mixing processes, described by the second law of thermodynamics*

And if because of this diametrically opposed, compensated each other energy processes are hardly observable in the closed system - heat emission or intake - they can be detected in an open system - by their reflection in the environment - Physical Vacuum. In that case, the energetic nature of physical processes, described by the second law, is revealed. Additional factor proving this hypothesis is that the mathematical description of **entropy** is nothing else but the **average heat capacity**, describing the average energy of atom oscillations ($S = Q/T = {_0\int^T} dQ/T = {_0\int^T} CpdT/T = \hat{C}$).

We have done a number of simple experiments, easy to replicate in a laboratory, that prove the hypothesis about energy nature of the entropy of mixing. It should be noted, that the energy nature of entropy was also shown in the experiments of Nikolai Kozyrev, in which the arrow of rounding weights and sensors reacted not only to the energy processes (heating of bodies, acetone evaporation), but also to the entropy ones, for example, sugar dissolution [11, 12].

3. Mechanism of interaction between the Physical Vacuum and matter

Modern physics refers to the space surrounding us in different ways [13-16]. It is known that "the nature does not tolerate emptiness", but, nevertheless, the space of the Universe created in the Big Bang is considered empty by many physicists. With that, they refer to the special theory of relativity by Albert Einstein. But Einstein himself did not deny the existence of some energy environment in the space. He did not need the environment for mathematical explanation of his special theory of relativity. At the same time, his general theory of relativity needed some energy medium filling the space.

The contemporary physics often suggests that the Physical Vacuum or ether as it was known earlier is not an empty space but a specific energy conducting medium where matter exists. Waves and interactions of different nature – gravitational, electromagnetic etc. can also happen here. James Maxwell developed his famous thermodynamic equations considering the PV. Paul Diraque regarded the PV as a compensated state of an electron-positron pair, which will appear spontaneously due to energy fluctuations in the PV.

Quite recently, PV has also been described as possessing energy [16]. Even the **Higgs field**, which has supplanted the ether, is in terms of energy similar to the PV, and every modification brings this concept closer.

As we understand it, the Physical Vacuum, filling all space in the Universe, is not purely ether, but structured energy clots, forming a resilient space lattice (fig. 4) [18, 19]. Therefore, the PV (ether) is of material nature only in the energy sense by having "pseudo mass". We consider the PV node structure to be a *double toroid*, with right-hand screw and left-hand screw, which causes the positive and negative polarity of PV. Due to the pressurization of toroids, the PV polarity is almost **compensated** in the absence of the external impact, with a slight move into the negative space. *Toroid twisting of a PV node is responsible for electromagnetic integration, circled - for gravitational interaction. Therefore, it is logical, that with circled twisting of a PV node at a higher speed, its radius is lower and the PV density is higher (the space is compressed).* With that, as known from the theory of whirlpool movement and gasodynamics, the vortex energy is proportional to its speed squared (V^2) and inversely proportional to the vortex radius (R).
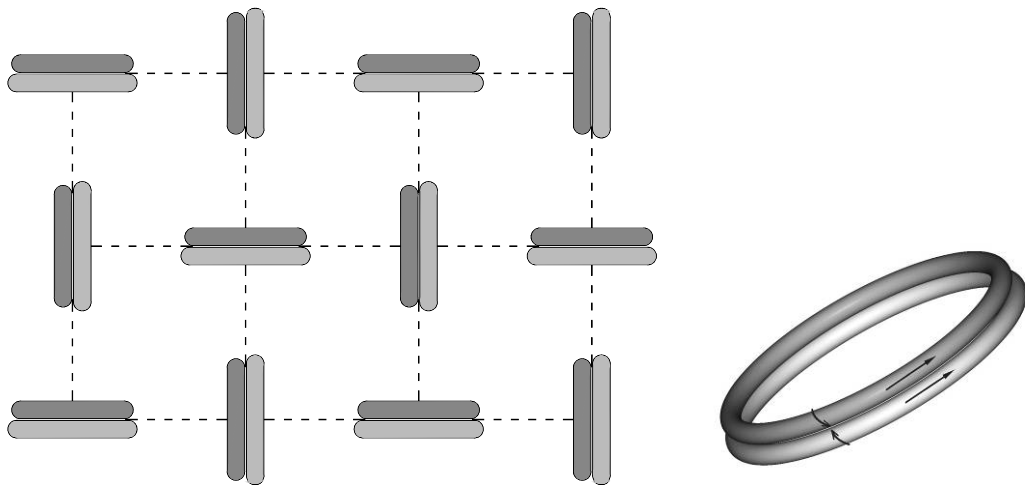

Fig. 4. Schematic image for node structure of the Physical Vacuum

Therefore, our understanding of PV is close to the structure proposed by Paul Diraque.

It is known, that Universal expansion occurs not by the way of explosion, where matter pieces flow out in different directions (despite the process named as the Big Bang in modern physics) but by the way of inflation (as points on the two-dimensional surface of a ball when viewed as an analogue for three-dimensional space) (fig. 5) [11, 13, 15]. With that, it is commonly considered that only large material constellations (Galaxies) move away from each other, but nothing occurs inside them. But coming from a presumptive structure of the PV it is obvious that universal expansion should happen not by the spraying mechanism of star constellations and galaxies, but by the inflation of the **energy environment** - PV by reduction in ring speed of a toroid (energy loss) and, therefore, the increase in its diameter (PV is expanding). This considered, of course, coming from a PV node structure, the loss of the Big Bang energy at universal expansion, which is considered to be proportional to volume increase, would depend not on the R^3 space or PV node, but only on R (linear, not cubic dependence). Of course, anything connected with PV, any material bodies would move away from each other, not only Galaxies, as it is accepted now.

Although at the first look to understand the effects of PV interacting with matter, it is not important to know **what it consists of**. It is important that it exists (ether, PV or the Higgs field, etc) and is of energy nature.
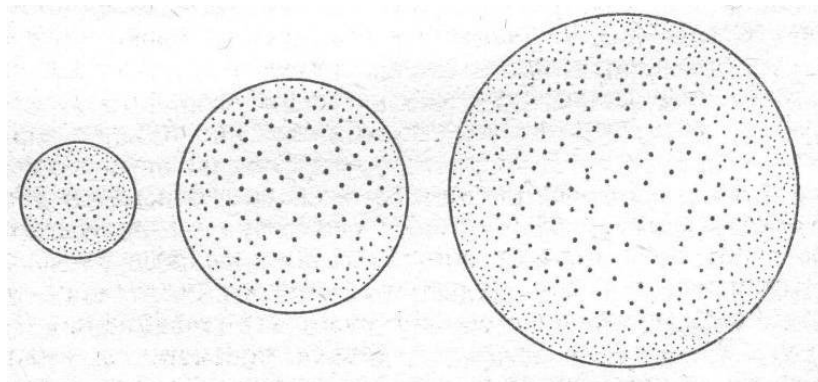

Fig. 5. 2D scheme of expanding Universe as an inflating sphere by expansion (swelling) mechanism. When the sphere expands, points representing Galaxies move away from each other (2D surface - analogue of the 3D space [13, 15, 17].

In this logical chain: (Big Bang - Time - Space - Energy - Matter) internal physical link naturally exists (as energy transitioning to matter or inverse annihilation of electron and positron). Therefore, it can be hypothised that the matter created in the Big Bang (at Big Bang or electron-positron pair born out of gamma quantum) remains linked to it. Therefore, any energy exposure on the matter - deformation, heating etc through atoms fluctuation cause the rise in ripple intensity of the energy nodes in the Physical Vacuum lattice and, therefore, the rise in energy density of the latter (lattice shrinkage). This effect should cause the reduction in body weight (not mass) like the hydrostatic weighting effect in the increased energy density environment (fig.6). Material body as if is rising up

in this environment [9, 20]. With that, likely, at the same weight the less dense bodies should fill the larger PV volume and affect it more, what was proven in our experiments.
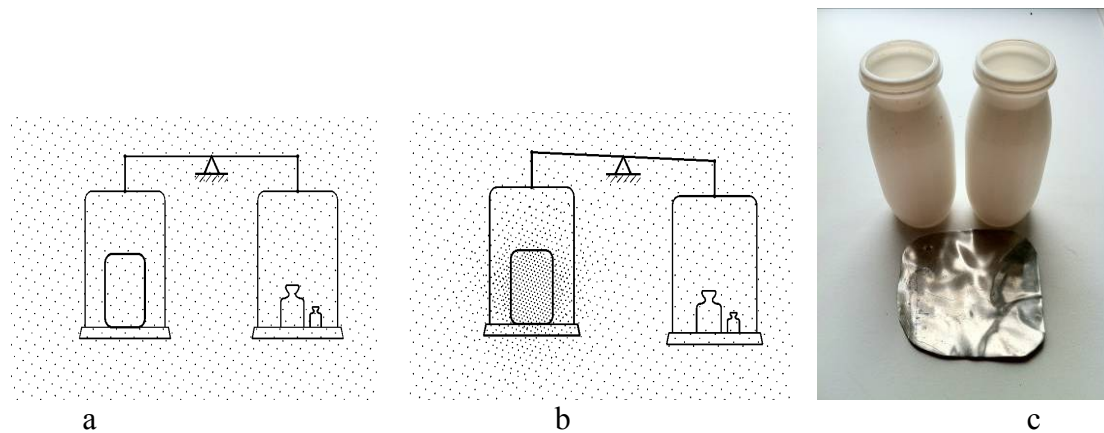

Fig. 6. Scheme explaining the weight reduction at the Physical Vacuum energy density increase, a - original state, b - after introducing energy into PV through body by deformation, c - exterior of some analyzed samples [9, 20]

4. Change in body weight at interaction with the Physical Vacuum.

First person to discover the effect of body weight change at deformation was astrophysicist N. Kozyrev [11, 12], who considered it to be an effect of the so-called "timestream". Thus, he mostly researched the **secondary effects** of the "timestream" on the bodies that are way less intense, not the energy stream (flow) itself. Due to this he thought, that because of the direct energy impact the body mass changes, not weight. Naturally, pure mass (**m**) can't change that dramatically, because it is directly connected to the energy. Another body weight (**P**), equal on Earth to **P=mg**, where **g** - standard acceleration of gravity.

Also, our experiments did not confirm his statement that the reverse deformation (elastic deformation) does not cause the weight change. Unique experiments of N. Kozyrev, regretfully, are little-known to this day, because the weight change effects were miniscule (0.001 - 0.005% of body weight) and there was no theoretical explanation of this effect.

In our experiments we have accomplished to increase the body weight change effect - to 0,03-0,07% of body weight. We observed body weight change effects in various energy impacts on material bodies - at heating and freezing of samples, condenser discharge, ice thawing, crystallization of the Wood alloy, lit up light bulb, sand glass work, and also at the elastic and plastic deformation of various materials. Because various factors affected the experiments, the first group of experiments was done to achieve the quality effect - weight change into either direction. In every conducted experiment after introducing energy into a body (heating, deformation etc) the weight reduced, in the reverse processes (freezing, crystallization) - increased, which proved the aforementioned hypothesis about the body weight change alike to the hydrostatic weighting effect

in the low or high energy density environment. Most drastic weight changes were observed at the heating of the bodies (up to 0,2% of sample weight).

Experiments concerning the deformation impacts were methodically easier with minimal influence on clarity of the results, so they were conducted on the material of varying density - lead, stainless steel, aluminum and plastic. Scheme of the experiment is provided in fig.7.

Because the weight reduction effect turned out to be stronger on the less dense bodies - aluminium and plastic - more throughout experiments were conducted on the aluminum slates weighting 4,6 g and plastic cylinders weighting 6,9 g. Most measurements were conducted on the VLR-200 weights with the 0.00005 g margin of error and various electronic weights. Aluminum slates were affected with plastic deformation, plastic cylinders - plastic and elastic deformation for 10-15 seconds. Maximum weight change of the slates was 0.0014 g, cylinders - 0.0048 g, or 0.03% and 0.07% respectively. Results of one of the tests are shown on the fig.8
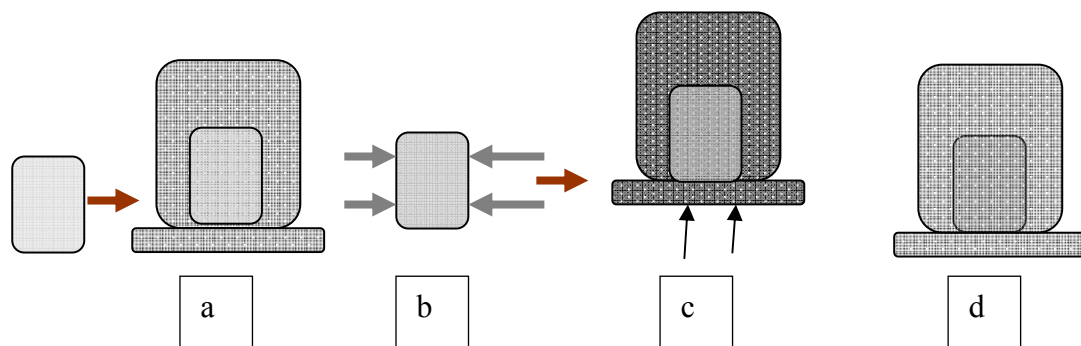

Fig. 7. Scheme of the weight change experiment, a - sample was previously weighted, b – then deformed, c - weighted (weight reduced), d - weight restored after 15 minutes.

The sample had been preliminary weighted, later underwent deformation for 10-15 seconds and weighted again. Further, for the duration of the experiment, the sample was not taken out from the weights. Maximum reduction in weight was observed in the first seconds after deformation. Later, the weight was restored in the span of 10-15 minutes, proving the clarity of the experiment (fig. 8) [9].

Weight restoring over time occurred due to the restoration of the energy density in PV - reduction in fluctuations intensity.

Weight reduction occurred as after resilient, as well as after plastic deformation. In the first evaluations, weight change value depended not mostly on the energy impact value but on its power.

Should be noted that registered weight change almost doubly order exceeds the margin of error.
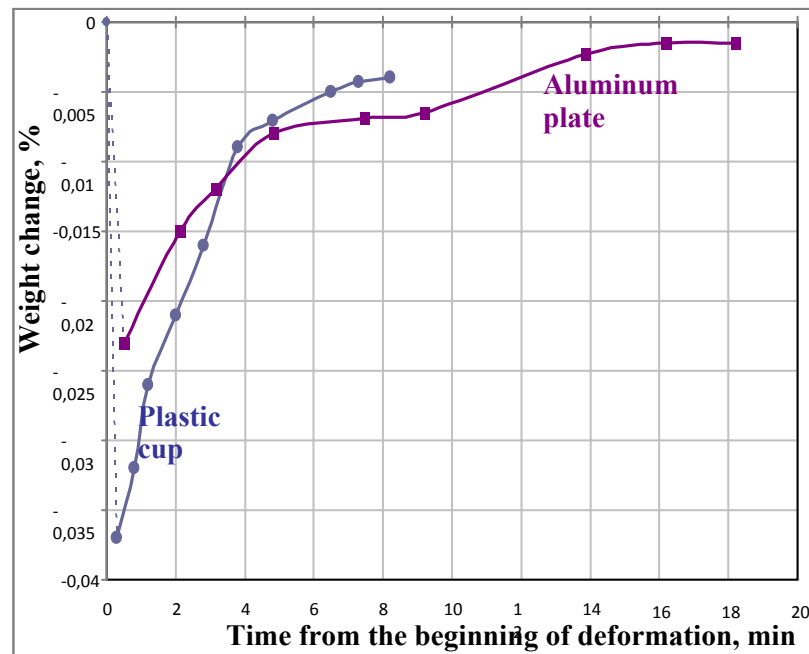
Fig. 8. Weight change in bodies of various densities after resilient and plastic deformation.

An interesting effect was also discovered. With repeated deformation the weight change effect was expressed more drastically 9fig. 9). With experiment conducted again on the same sample there is a super-compensation process going on - weight restoration over the original value (right side of the graph), if the deformations are planned in cycles. A body that underwent stress as if predicts the coming deformation and resists it (right side of the graph), prepares for it (left side of the graph), if it undergoes an experiment after a significant pause (over an hour), when the body has already restored the original weight. These strange effects are moderate, but they were repeated regularly and they demanded serious consideration, requiring an explanation. Most likely this effect can be explained by the Lenz's Rule - *when energy impacts the system, a power appears in it, precluding the impact.* Seemingly, this rule, or rather a universal natural law, works on the informational or thin matter level. With that on the thin matter level an event occurs earlier. According to S. Lazarev [21], on the thin level a reverse "timestream" is possible, from future to the past, meeting in the given time point (in the present). Naturally, it is an empirical approach, but predicting the future by particular prognosticators points to the factual possibility of such process. Furthermore, in a small time frame, as in out experiments, it is possible to try and study the pre-action effect by choosing one sample for future deformation from a number of samples, standing simultaneously on several weights.
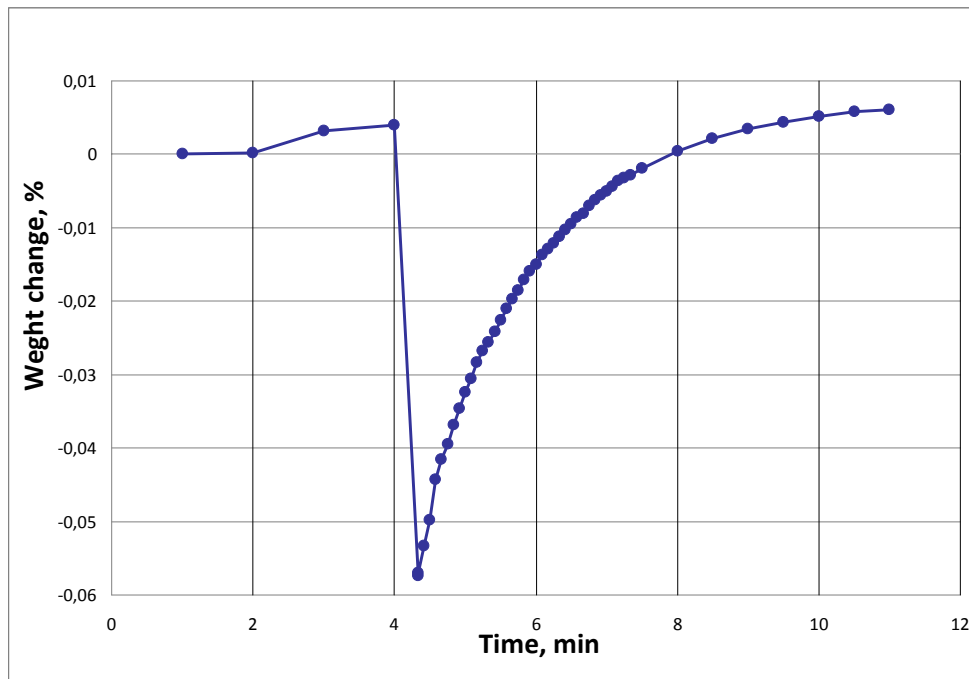
Fig. 9. Weight change due to repeated deformation of the plastic cup - pre-action and post-action effects.

Should be noted that when Nikolai Kozyrev conducted his entropy stream experiments – effect of evaporation of acetone-soaked cotton ball on the deviation of the rotating weights arrow- he also observed the super compensation effect, and its "tail end" - prediction of the energy impact [20, 22]. Immediately prior to the experiment the rotating weights arrow leaned in the opposite direction.

In the entropy stream experiments of his followers [23] a similar pre-action effect was observed - there was a slight deviation to the opposite side in the system readings.

5. Body weight change at the distant impact

Distant impact experiments on the body deformed in advance turned out to be even more interesting. If we would like to follow our hypothesis about short-time increase in the energy density of the PV around the deformed body, if the second deformed body is held near the first, the **overall density** of the surrounding PV would **increase even further**, and we would observe another jump in body weight reduction. Precisely that occurred in our experiments. Scheme of the experiments is provided in fig.10, results - in fig.11.
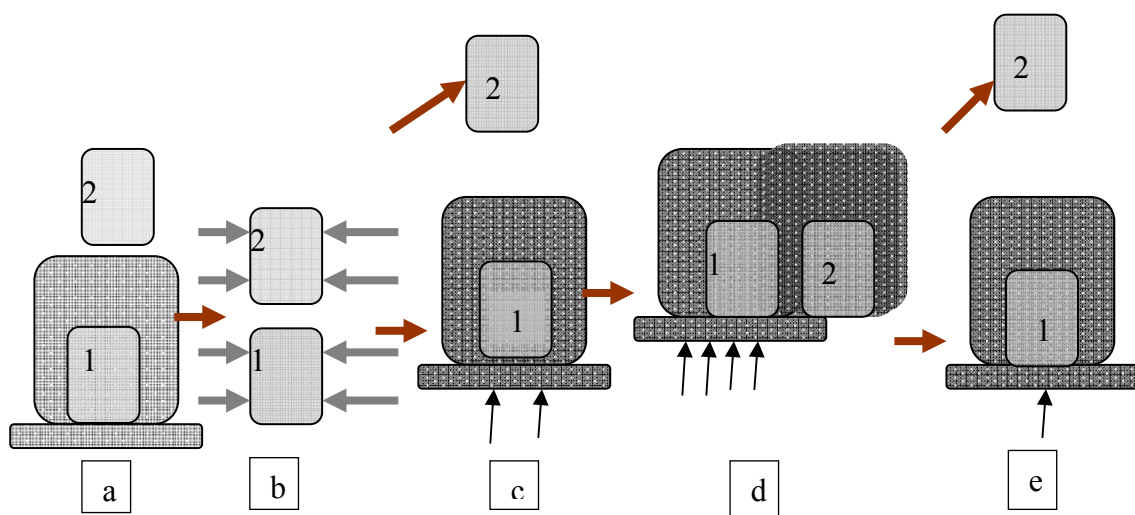
Fig. 10. Scheme of the distant impact experiment with jump-like weight reduction of the sample; a - sample number one weighted in advance; b - later deformed, as was the sample two; c - weighted again (weight reduced), with gradual restoration of weight; d - second sample is held near the first, but not put on the weights, weight of the first sample bounced down; e - second sample is put away, and the weight bounces up, etc.
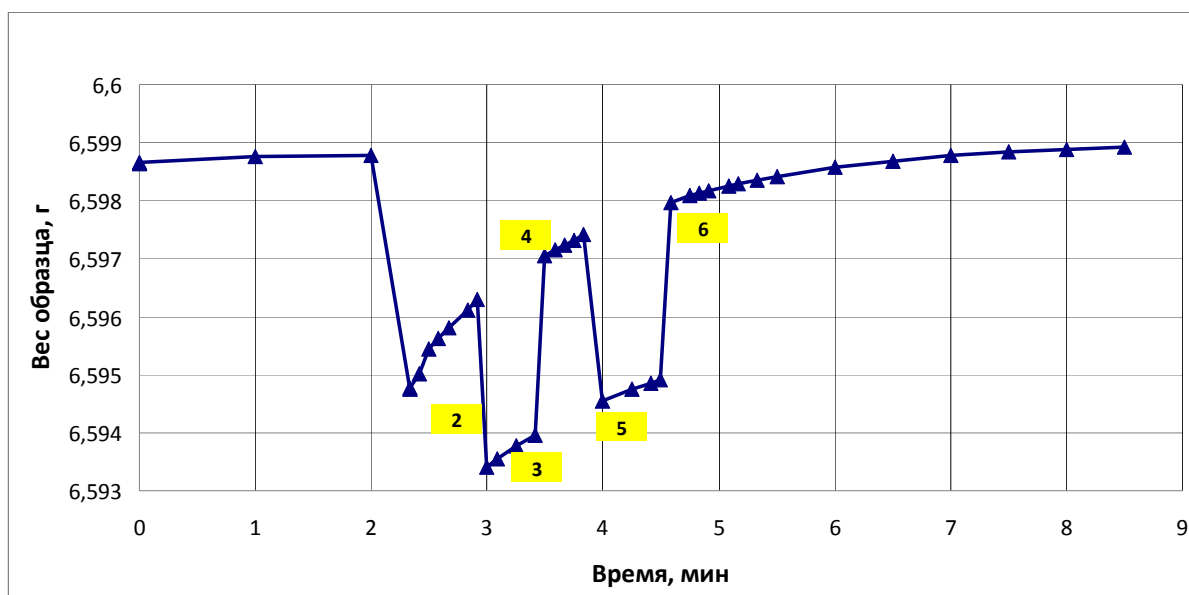
Fig. 11. Body weight change due to distant impact of the second sample

Sample one (plastic cup of 6,6 g weight) was weighted in advance, then deformed, put on the weights with one door open. As usual, sudden weight reduction with gradual restoration was registered, just as with previous experiments. Later, without closing the side door, a freshly deformed sample 2 - plastic cup - is put nearby, but not on the weights. Instantly, the weight of sample 1 bounced down (line 2 on fig.11) and later, as usual, the weight gradually restored (line 3). After around 30 seconds sample 2 was put away and the weight of sample 1 instantly increased, matching the value that it had in the absence of the sample 2 (line 4). Later, we hold sample 2 near

the weights and it repeats - the weight of sample one suddenly goes down (line 5). When we put sample 2 away, the weight of sample one again goes up by line 6.

Should be noted that if the samples are separated by a glass door of the weights, there is no impact, because the door served as a screen.

If we turn to the Nikolai Kozyrev's concept regarding energy "time-streams" of the Universe, he noted that the "timestream" weakens and is screened by a variety of materials, particularly glass. Most likely, the change in the energy density of PV is somehow **connected** to the Kozyrev's "timestream".

Regrettably, our proposed cycle of distant impact experiments was interrupted in the very beginning. For those who decide to repeat and continue these experiments, I provide the full planned program:

1. Dependency of the effect from the distance

2. Dependency from the placement (up, down, side)

3. Dependency from the volume and mass of the material

4. Dependency from the material composition (first and second samples).

5. Dependency from the deformation state of the original sample and its time on the weights.

6. Dependency from the power of an energy stream (hold several deformed samples near the weights)

7. Dependency from the screen material

8. Energy stream concentration from the second sample by the Kozyrev's mirror type.

9. Distant impact by the special generated entropy and anti-entropy streams (flows) (see ch. 11).

6. Physical mechanism of the experimentally achieved anti-gravity effects.

Physical mechanism of weight changing effects is currently researched and is not suitable for any known matter and energy field interaction mechanism. Of course, some analogies should exist. It should not be confused with the process of mass transitioning into energy and thus losing weight. In our case the weight changes, not mass, so the process is best described by the Pythagorean law rather than by the Einstein equation ($E=mc^2$). Thus, the Einstein equation should not be applied to the resulting difference in weight. This is also not anti-gravity in its pure form, while effects are felt and the creation of anti-gravity devices is possible (look at parts 8 and 9 of experiment plan) with even the minimal financing. Most likely, such effects appeared in Viktor Schaumberg's whirlpool experiments [24].

Artificial creation of denser state of Physical Vacuum (PV) is possible by using variety of in-phase radiation with 180 degrees phase shift, which, in the line with Relic Radiation, should exist as the result of Big Bang, interacting with the matter only in particular mode. It is possible that it correlates to the radiation called "timestream" by N.A. Kozyrev, distributing instantly.

Because the distant impact experiments have not been finished, we don't know about the dependence of fading power of anti-gravitational effects from the distance. Are they proportional to the squared distance, as it goes for a usual gravitational or electromagnetic field, or is this dependence more complicated.

We would try to explain the derived "anti-gravitational" effect in detail. Previously, gravitation was considered to be a deformation of ether or Physical Vacuum, caused by matter existing in it. Later, Albert Einstein interpreted gravitation as a time-space distortion, which is roughly the same in the energy-based approach (power or energy is necessary to get the warp in time-space). That is, the born matter is connected to the energy field that crated it - PV and they affect each other. Thus the mass should be seen as a complex, as pure mass and field mass. Pure mass is formed from a gamma quantum and does not change. Field mass is created due to matter interacting with Physical Vacuum in energy interactions, in acceleration and slowing down of the bodies, includes relativity mass, created by accelerating to sub-speed of light. Field mass is a part of excited PV and depends on the level of interaction with it. With that the total mass is the single entity and is divided into pure mass and field mass only nominally.

The excessive PV energy is condensed into matter during expansion and cooling of the Universe [13-17]. The denser and closer to matter (from energy viewpoint) PV gets, the less the body deforms it and, therefore, the less would be the gravity for the body. Naturally, on the early stages of universal expansions (fig.3) the PV density was higher, energy difference between it and the matter was lower and, therefore, it was less deformed by the matter.

But the dense PV itself around material bodies is going to be attracted too, because it deforms the standard density PV. In total sum deformation (mass) would turn out the same, but inside this area of PV the body weights less and the gravitation is weaker too (fig.12). The law of energy and mass conservation is fulfilled.

a   b   c   d
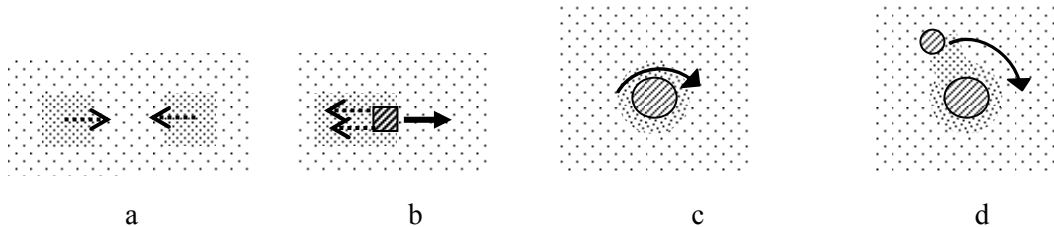
Fig. 12. Schematic picture: a) Creation of attraction between higher density PV spaces; b) creation of inertia forces during body acceleration (left arrows - PV dense in the opposite direction from the acceleration as the reaction according to Lenz's Law); c) PV densing in the center of the body during revolving or d) circle motion.
Bold arrows show the body movement direction, dotted lines - attraction forces.

It can be compared to a complex system consisting of a glass of water and a body in it. Body in the water weights less (mass stays the same), but the whole system as a whole does not change its mass and gravitational pull.

Gravitation is connected to the total mass, not the body weight. Total mass in the total volume of the Universe remains unchanged. Only the body weight changes in the localized deformation area of PV, causing local anti-gravitational effects that can be generated and used.

From this position such effects as inertia and the absolution of revolving movement can be explained. This effects cause the excess density of PV in case of body acceleration - behind the body, pulling it and not letting accelerate. In case of revolving movement with a pull center - in the

center, not letting the body take off and behind the body, not letting it fall. Thus the weightlessness is created, despite acceleration and the need for inertia power. Should be noted that these effects are born due to the universal Lenz's Rule - energy application on the system creates a power precluding this affection. One of its consequences - Third Newton's Law, and also Le Chatelier's principle in physical chemistry as well as self-induction effect.

Thus, it is possible to create **levitation** or remove inertia by artificially creating asymmetrical density of PV around a body. There are various methods to achieve that, but it is a theme for another work.

7. Body weight change at the mixing entropy increase

According to our hypothesis, the increase of mixing entropy, due to its energy nature, should cause the increase of energy density of PV - unlike previous experiments, irreversibly. Thus, the following experiments studied weight change during sugar syrup dissolution in water. Syrup concentration - 50 g/liter, total volume of the mix 20 ml (10 ml syrup 10 ml water).

This process almost does not change the internal energy value of the system (the emission or absorption of hear is absent), causing only the increase of mixing entropy.

Unlike previous experiments, the weight of the mixture decreased gradually along with the diffusion process (fig. 13), [19, 20, 25]. Around after 5 minutes' weight reduction reached the value of 0.04% and remained unchanged. This shows the irreversibility of the process and the fact that PV moves to a higher energy state during mixing entropy increase due to receiving excessive energy, and saves this state for the whole existence of the mixture.
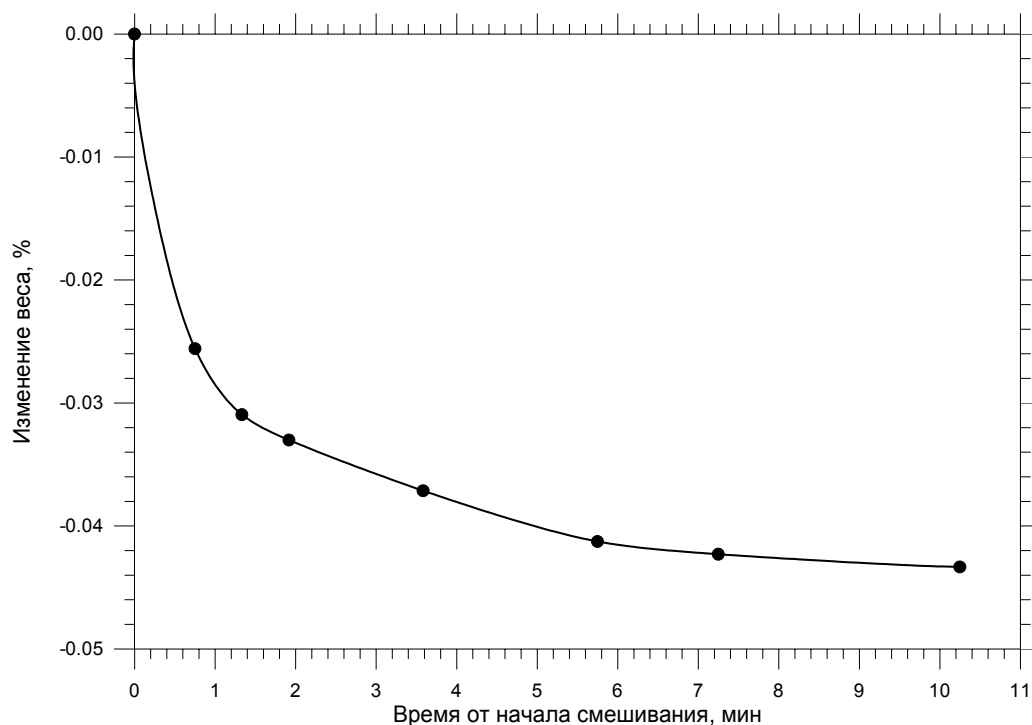

Fig. 13. Weight change at the mixing entropy increase (at syrup dissolution in water)

So it is made clear that even an ideal mixing is the energy process, where mixing entropy does the job of increasing heat capacity of the system [25]. This is the increase of internal energy, increase of PV density and, as shown in the next chapter, increases of gravity.

First person to use the energy effect caused by mixing entropy was A.N. Kozyrev in his experiments regarding the study of "time streams" [11, 12, 22]. Sensors and revolving weights arrows reacted to the sugar dissolution process in the water. The sensors reaction was the same in case of sugar dissolution and in case of purely energy exposure, for example, in evaporation of acetone from cotton wool.

8. Physical-Energetic nature of mixing entropy

Achieved experimental results require answering two questions. What is the mechanism of increasing the energy density of PV by increasing mixing entropy and what is the physical nature of mixing entropy?

First of all, entropy, including mixing entropy, has the energy meaning, what is proven, besides our experiments and the experiments of Nikolai Kozyrev, by the known effect of creating osmotic pressure in mixing processes, for example, in mixing fresh and salt water. With this, there are no heat effects and the work is done only by increasing the mixing entropy [10, 25]. On the basis of this effect using only the mixing process of fresh and salt water the first osmotic power station was built in Norway [9]. The created osmotic pressure is transferred to a turbine and transformed into electric energy. Thus, the mixing entropy can conduct work and has the energy nature, what was not considered before. How can it happen and what is entropy itself?

The classical approach to entropy was best expressed by Cottrell in his book "Structure of metals and alloys" [28]. He writes: "The internal energy does not define the equilibrium state of the system by itself. Another characteristic of the system defining the equilibrium is entropy. In thermodynamics entropy of the system is determined in abstract way. It is expected, that the system of absolute temperature T absorbs the infinitely small value of heat, not undergoing any other changes. That way, the entropy increases for the value dS=dQ/T"

Let's cite Cottrell further: "There is another interpretation of entropy, taken from statistical mechanics, allowing compiling the physical representation of entropy" ... "Statistical factor allows for disorder, connected to atoms oscillations in the crystal, and atoms arrangement disorder, appearing by smelting the crystal or liquid evaporation." The measure for system disorder is W - the number of distributions, belonging to the system.

The disorder is valued numerically,

$$S=klnW \qquad (3)$$

where **W** - the number of distributions, belonging to the system, **K** - Boltzmann's constant.

Further Cottrell writes: *"Formally, both entropies are thermodynamic measures of one system property and statistical entropy is identical to the formal entropy. Therefore the statistical factor acts as a <u>numerical expression </u>of energy relating to temperature, e.g. vibrational entropy."*

In out opinion, this conclusion is fundamental to understand the physical nature of entropy. Schematically this approach is represented in fig. 14.

Vibration entropy ΔSvib
$dS=dQ/T$
The system with absolute temperature T absorbing an infinitely small heat value and not changing in any other way

Mixing entropy ΔSmix
$S_{mix}=k·lnW$
W – the number of distributions in the system,
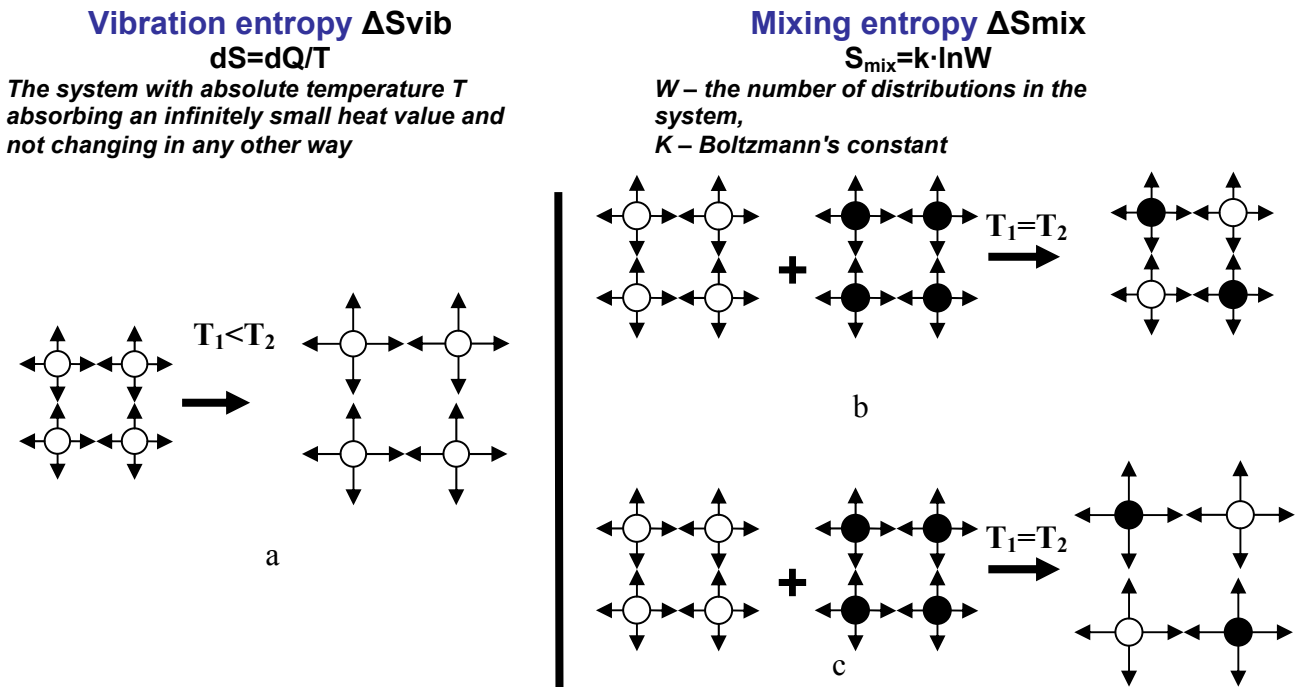*K – Boltzmann's constant*

Fig. 14. Scheme illustrating the change in entropy: at heating - vibrational entropy (a), at mixing: b - traditional approach (no energy effects at the ideal mixing), c - classical approach (Cottrell) - mixing entropy transforms into the increase of vibrational entropy - our approach [3, 10]

Further, Cottrell attempted to answer the main question of the connection between mixing entropy and the energy and, therefore with vibrational entropy. "Why so? How the effect defined solely by the number of distributions is connected to entropy? In can be answered by the following statements:

1. Various distributions have various internal energies.

2. There are unequal opportunities for distributions with various energies, i.e. various thermodynamical probabilities." *What this means is the more the thermodynamic probability, the more are various internal energy states.*

In other words, as the result of mixture, additional energy levels appear - energy degradation - (their creation wastes energy), which are then filled (energy emission). These processes are connected with the heat oscillations of atoms. As he writes further: "Every disorder is connected to the absorption of heat energy, defining the heat capacity (heat disorder)"

Thus, Cottrell attempted to show the way to answer how mixing entropy is connected with the energy and with vibrational entropy. If we expand Cottrell's version, it appears that two processes occur simultaneously during mixing, but in opposite directions: the absorption of heat energy due to internal work done to increase the heat capacity, and heat emission due to electrons transferring to lower energy levels.

Let's try and review these interconnections, fill them with the physical meaning and answer the main question: **How can the increase of state probability be connected to energy?**

Let's look at the ideal mixing, where no heating energies are observed, because the connection power of alike and unlike atoms is considered equal. Any increase in alloy states leads to level splitting of the valent electrons, namely, to the expansion of these levels, including energetically viable. Naturally, due to the first law of thermodynamics, "everything tends to a minimum of energy", electrons strive to fill these levels. As a result, it **creates the excessive energy and interatomic bond is strengthened**, which is a property of all alloys, but this energy or heat does not leave the system for the surroundings, because **simultaneously** the alloy undergoes the entropy increase, i.e. the average heat capacity (not specific heat), absorbing this heat. The average heat capacity increases first of all due to lowering of Debye's temperature [25, 29]. Debye's temperature decreases from the increase of the entropy disorder, which is accompanied by the decrease in maximum atom oscillation frequency. Richard Swalin [2] looks into the ideal crystal lattice with intersected foreign atoms. He writes: *"Every atom oscillates near its place. If a foreign atom is introduced into crystalline lattice, the disorder arises and, therefore, the entropy proportional to the atom oscillations amplitude. Thus the fluctuation amplitude would be bigger than in the ideal space of the crystal. The defect would affect the oscillation frequency of nearby atoms. As the result there would be a decrease of maximum allowed frequency of harmonic oscillators, allowing the positive vibrational entropy, connected to this defect"*.

Further he writes: *"The introduction of dissolved atom into crystal decreases the oscillations frequency of nearby atoms in dissolved solution and makes a positive contribution to the oscillation entropy (ΔS_{vib}).*

The same is true for liquid solutions, charactering not the long-range order as for solid solutions, but the short-range order, i.e. structural areas, where this regularity persists.

Therefore, by mixing, the surface area increases under the curve of thermal capacity dependency from temperature, defining the absorbed heat or enthalpy value (fig. 15).

As known, Debye temperature is not only proportional to maximum oscillation frequency, but also depends on melting temperature, i.e. the less is maximum oscillation frequency in a crystal, the less is melting temperature, which is proven experimentally by the formation of solutions and eutectics.

Thus, the system work at mixing spent (transformed) into the average heat capacity increase, i.e. enthalpy (fig. 15, 16).
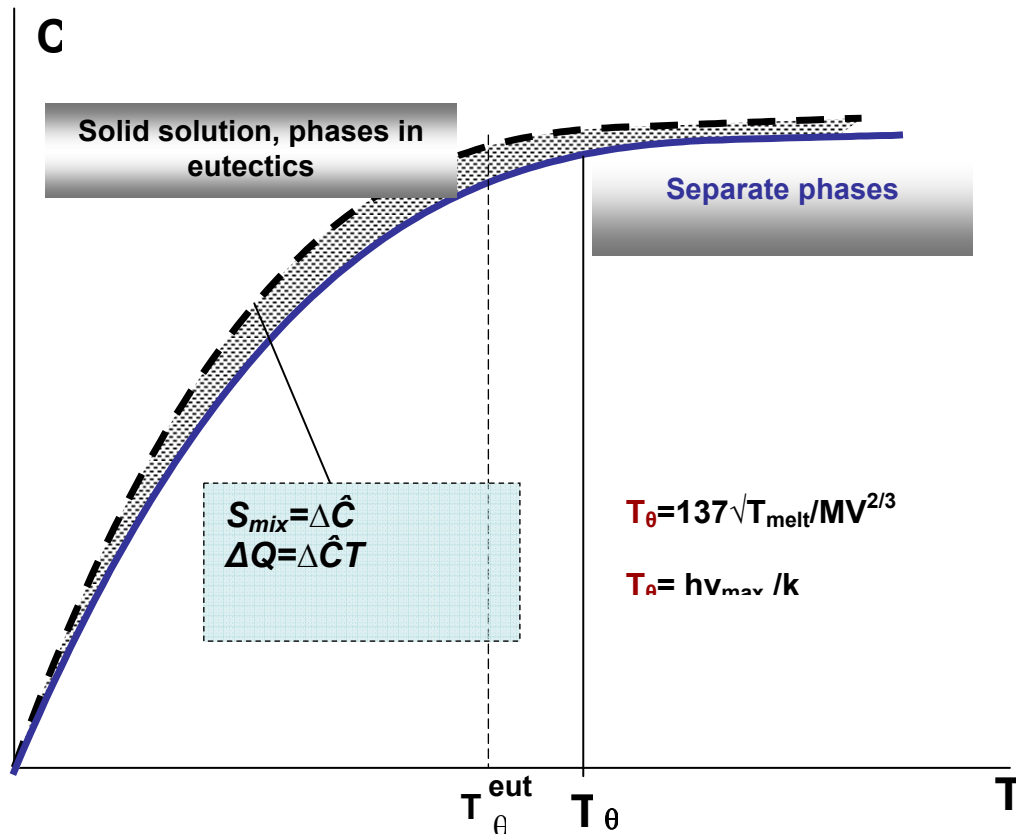
Fig. 15. Specific heat changes at the ideal mixing, solid curve - original isolated phases (average values), dotted curve - solid solution.

This change is usually undetected, because the measurement is made at the working temperatures that are often higher than the Debye temperature. **But this change** is reflected in PV by the aforementioned weight change mechanism [10, 23]. The traditional misunderstanding that there are no energy changes at the ideal mixing, is caused by measurement method for heat effects. Usually only specific heat is measured in the narrow temperature range of enthalpy change. In the measurement limits this change is not detected, because the main change of original components heat capacity versus its mixture goes under the Debye temperature. In order to measure the average heat capacity or enthalpy, **the body should be heated from zero degrees Kelvin**, which is very difficult and makes seldom. But if the enthalpy of alloy and its initial components are measured from zero degrees Kelvin, we can detect this change.

$$\Delta H = \Delta H_{measured} + \Delta H_{latent}$$
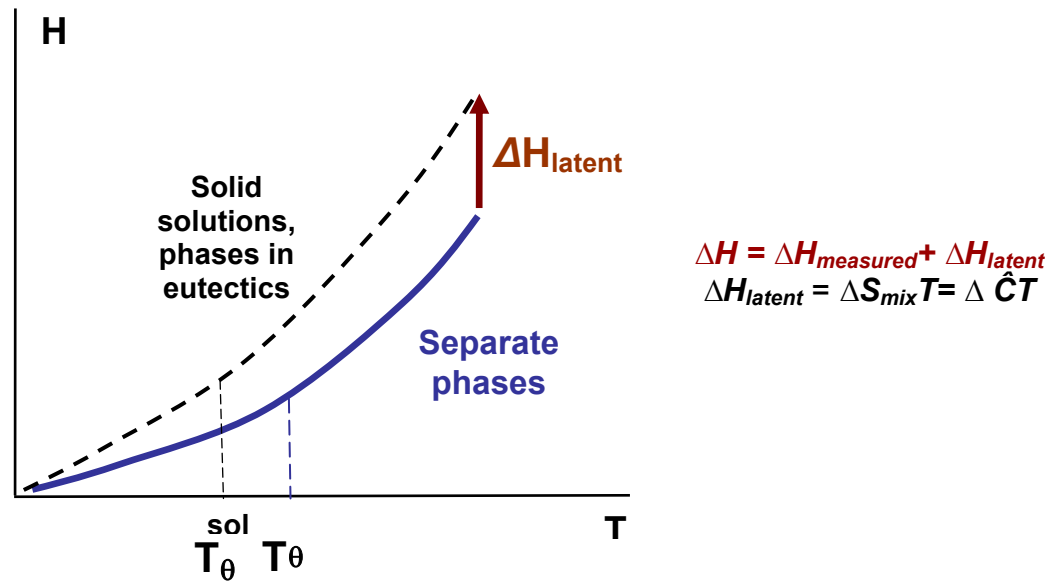$$\Delta H_{latent} = \Delta S_{mix}T = \Delta \hat{C}T$$

Fig. 16. Enthalpy (heat capacity) change depending on a temperature arising at ideal solutions formation (black dotted line) from the mechanical mixture of original phase-components (solid blue line – reduced average values)

Fig. 16 – schematically illustrates the dependency of enthalpy **H** (heat capacity **Q**) versus temperature at the constant pressure of the alloy and comprising it initial components (mechanical mixture). In accordance with the heat capacity change (fig. 14) at the heating, the heat capacity arises at the heat increase - at first slowly, to the Debye temperature, then faster and from some temperature, almost in a linear way.

Solid solutions and alloys enthalpy increase correlates with corresponding specific heat graphs on the fig. 16.

Internal energy processes, occurring in the mixture, are schematically represented on the fig. 17, which is interpreted from the first law of thermodynamics **ΔU=ΔQ-ΔW**.

At the ideal mixture **ΔQ=0**, and **ΔF= -ΔW** as in the Cahn interpretation (see introduction). As the result we get **ΔU= -ΔW= ΔF**, pictured on fig. 17b on the right as the internal energy increase **ΔU** or the same as enthalpy **ΔH** (at the constant pressure) in the mixture. Due to work being done not on the surroundings (no visible heat effects), but remaining inside the system, it causes the increase of internal energy.

This new graphical representation of the second for law irreversible processes make the physical and energy representation of such abstract definitions as mixing entropy and free energy. With that our approach is based only on the classical interpretation of the second law of thermodynamics, which was simplified by the traditional thermodynamics. As a result as we mentioned, the hidden and opposing energy processes have been left ignored.
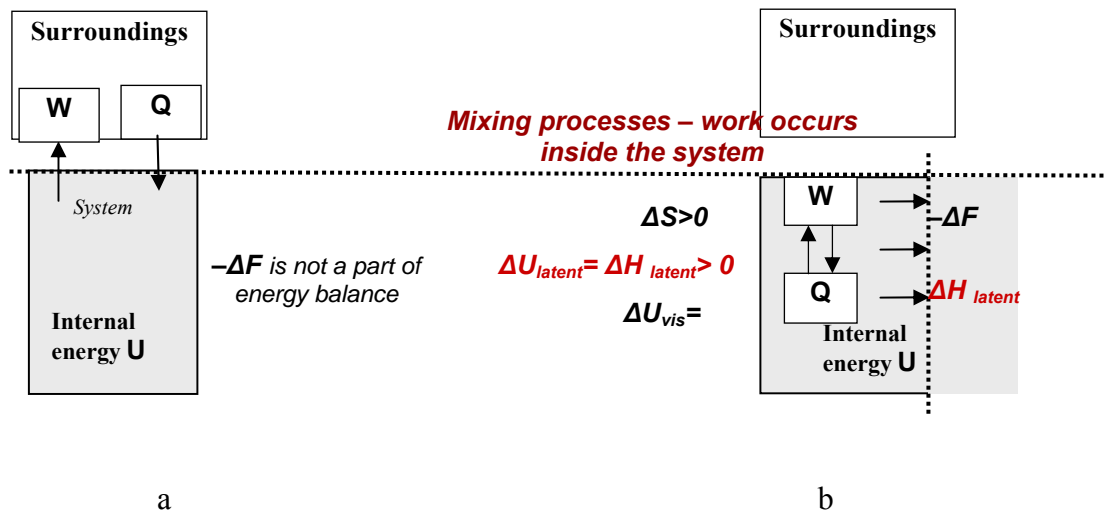
Fig. 17. Graphic presentation of the second law of thermodynamics in the ideal mixing: a – traditional view (free energy is not a part of energy balance – no internal energy change and heat effects, therefore not corresponding to the first law of thermodynamics [4]; b – according to classic thermodynamics (Cahn), where statistical entropy is identical to formal entropy. Internal energy increase through the increase of heat capacity (mixing of the components) – the system did work to increase heat capacity - average heat capacity and simultaneously filled it with thermal energy. With that the internal energy value has increased

Physical Vacuum immediately reacts to the energy processes in the system, particularly, to the average heat capacity increase, in other words, to the vibrational energy of the atoms by increasing its energy density. Hence, during mixing occurs the emission of excessive energy in the material body and the reaction to this process in the PV surrounding the material body and interconnected with him. Absorption of excessive body energy by the Physical Vacuum saves the total energy of an open system (matter plus Physical Vacuum).

Therefore, when applied to the open system (matter + PV), the second law gets additional physical meaning as **an energy conservation law,** and not only as a law of thermodynamic equilibrium (fig. 18) [9, 20].
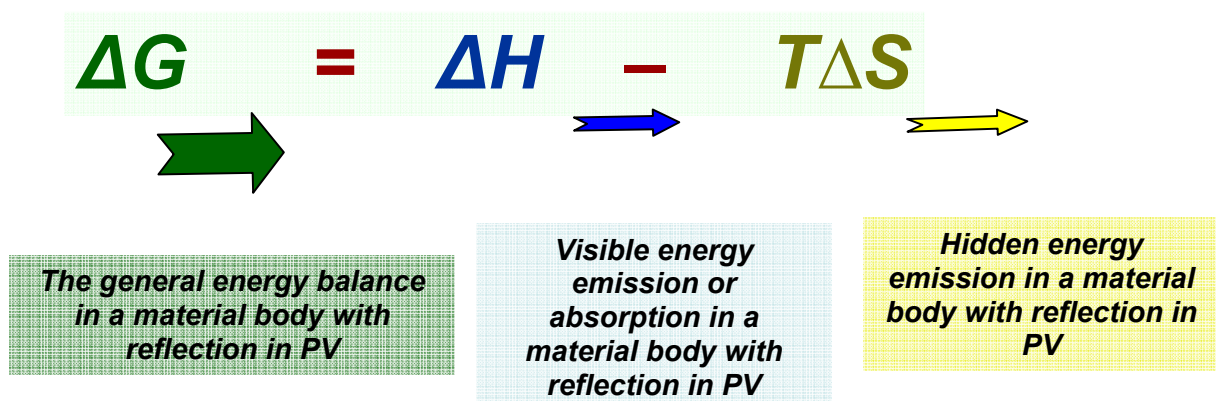

Fig. 18. Scheme of energy processes occurring in the mixture and reflected in the second law of thermodynamics as applied to the open systems, illustrating its additional meaning as an energy conservation law [11]

Free energy value **ΔG** defines the general energy equilibrium (balance) taking into account energy changes of Physical Vacuum, **ΔH** – visible energy emission or absorption in the physical-chemical process, **TΔS** – hidden energy emission in a material body, with a reflection in PV.

One regularity should be noted. Processes with material bodies involved, entropy increase, all types of revolving movements of spontaneous nature, cause the increase of energy density in PV. PV in these processes sort of comes back in time to a denser state according to Lenz's rule (this will be analyzed in the following chapter). From this comes the connection between entropy and gravity, because both factors affect the energy density of PV.

The complexity of mixing processes lies also in that they more frequently occur in **liquid** or **gaseous** state, but the real changes are **only reflected in the solid state** - this concerns the melting enthalpy and temperature reduction, and increase of the average heat capacity and the character of atomic oscillations. Thus, by mixing, we change the **legacy** nature of the processes. Therefore, to deeply understand the creation processes of alloys, mixtures and solutions, the occurrence must be studied not only under room or working temperatures, but from zero degrees Kelvin, learning the whole "biography" of it.

9. Expansion of the Universe and Lenz's law - driving forces of entropy. Interrelation between entropy and gravitation

It is known, that all equilibrium processes in nature spontaneously cause the decrease of free energy and the increase of system entropy. It is not clear what this law is based on. It may be assumed that due to universal expansion (fig.19) and, therefore, to constant decrease in the energy density of PV, according to Lenz's rule (if an external impact is made on the system, there appears in this system a force to counter this impact- include the self-induction EMF and the oscillating circuit, etc), there should be a process increasing the energy density of PV. Spontaneous **increase of entropy** causes the **increase in PV density and precludes the Universe expansion**, as it does the number of other processes - orbital movement of bodies, rotation of bodies etc. Therefore, the expansion of the Universe, or, more accurately, its swelling, is the main cause for entropy.
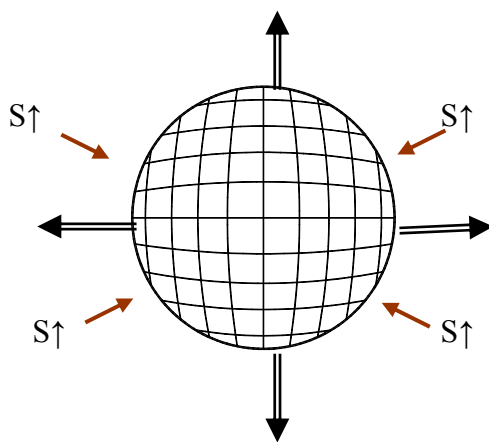

Fig. 19. Schematic representation of the Universe expansion due to energy environment (Physical Vacuum) expansion with the decrease in energy density, and the creation of entropy increase process with PV density increase, opposing the expansion, according to Lenz's rule

It turns out that the Universe expansion itself (not mix with the processes inside the Universe) should occur not with the increase in entropy, as it is accepted now, but with the entropy decrease.

Because the Universe inflation speed varies on separate stages of evolution, so should be the speed variations of physico-chemical and biological processes. Therefore, live creatures should not be expected to time travel (favorite and unending theme of science fiction) safely. It is unlikely that they survive. If we look to the Philadelphia experiment, conducted by the USA in 1944 with a short temporal disappearance of the Destroyer "Eldridge", it is known that almost all participants died either immediately or some time later due to the unknown biological processes in their bodies.

In some time, there will come the next development phase of the Universe - its compression (collapse) - Brahma's breath in the ancient Hindu mythology - natural and infinite breathing process: inhale - exhale. At that time all physico-chemical processes are going spontaneously to go in the opposite direction - not into the mixing, but to separation. Although even in this case the second law of thermodynamics is going to work and define the direction of these processes, but with the increase of free energy. Thus, the mixing would occur only in the exothermic processes (energy emission) with the overlaps of the entropy part of the TΔS equation, because the entropy change would be a negative value (as would the survived at this cataclysm journalists say - everything leads to the decrease in entropy).

10. Relationship between entropy and gravitation Anti-entropy mechanism of Universe expansion

Another conclusion of the proposed model - finding out the relationship between entropy and gravitation. Partly in chapter 6, while explaining the experimentally achieved weight reduction effects, we proposed the existence of a relationship between increasing density of PV and increase in the localized gravity. With the increase in entropy, the PV density also increases (look ch.7) Therefore, inside the increased entropy zone there should be some anti-gravitational effects, but as we have noted, they are localized, because gravity is caused by the complete mass and it, consisting of the body mass and field mass, does not change.

But in *the commonly* approved concept, entropy, for some reason, is *placed against gravity* [13-17]. For example, our Sun and stars exist in a state of fragile equilibrium between gravity effects and entropy. Gravitational force supports integrity of the Sun and pulls its content to the center, In the absence of opposing forces, gravitation would have collapsed the Sun, turning it into a black hole not more than few km in diameter. The collapse is stopped by pressing forces, coming from the center to the surface, balancing out the gravitation and preserving the Sun. Pressure forces exist because of the nuclear reactions that create energy and entropy, causing the chaotic movement of particles inside the Sun, saving its whole structure. As an example of an unending battle between gravitation and entropy we can take the evolution of Universe itself. With the flow of time, the Universe expands and becomes more blurred. This direction of evolution is opposed by gravity, striving to collect the sprawling matter in one. Thus, the gravity and the entropy work in the opposite directions, contrary to our hypothesis.

But the *existing concept has some inaccuracies*.

Firstly, the nuclear reactions in the Sun are described by the second law of thermodynamics. Energy emission from a reaction causes the decrease of free energy and defines the direction of the process. But entropy of the thermonuclear reaction can also decrease, because four hydrogen atoms as the result of synthesis create one atom of helium. The stabilization of the structure is obvious.

Secondly, the expansion process cannot be interpreted as spontaneous, increasing entropy without taking into account the space that exists outside the boundaries of our Universe. Thus, out Universe is an open, not closed system, and this should be noted. Taking these two systems into an account, the mutual entropy can increase. But particularly in our Universe, the entropy decreases while it is expanding (we review the global Big Bang entropy, not the common reaction entropy).

Let's take a look at some moments of the Big Bang and universal expansion.

1. Organized structure of matter, stars and galaxies forms out of the chaos of mixed particles and energy. There is a life being created, which, according to Prigozhin, always carries the anti-entropy seed.

2. Gradual cooling of the Universe, according to Clausius, is an entropy reduction process.

3. Absence of signs pointing to the "heat death" of the Universe, signifying the entropy increase.

4. And finally, out studies have shown that the material body entropy increase leads to the increse of PV density and, thus, to compression, not expansion of the Universe. Therefore, the Universe expansion process should be accompanied by the reduction of entropy.

The only fact supporting the common views is the classic expansion process, which, on *the first look*, is equal to the process of compressed gas filling an empty space. Or gas diffusion. Let's not waste time on finding out, how has compressed gas, or ether, denied by science, appeared in this model. But in this case it is not an open system (which is our expanding Universe fits into) explored, but a closed system, consisting of two aforementioned parts. This, expanding space of our Universe, where the energy gets reduced, and, therefore, entropy and compressing space outside of our Universe, where entropy increases. As a result, total entropy of this closed system increases (as with gas), but the entropy of the first part of our closed system - our Universe - will decrease.

Schematic representation of this process is represented on fig.20.
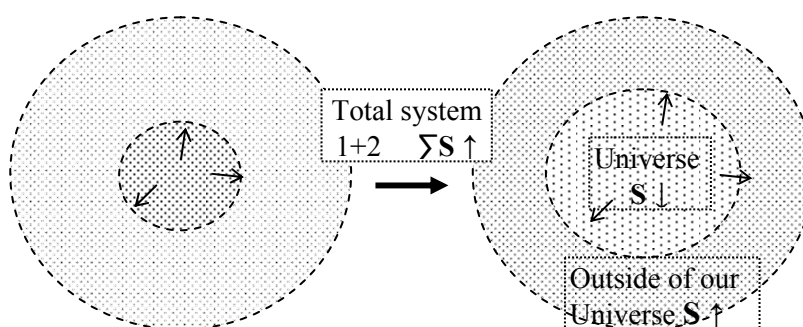

Fig. 20. *Schematic picture of Universe expansion stages for the open system. Swelling (inflation0 of our Universe goes on with the reduction of entropy, but total entropy remains positive.*

Thus forms the normal scientific approach to the Universe expansion process. It can be assumed, that the Universe swelling occurs not according to the Big Bang model, where every material part

of the Universe moves away from in the emptiness, but in the one where exist formed and connected material bodies. With that, gravitational forces, due to their miniscule nature in comparison to the PV energy, can not oppose it. As a result, this interpretation of the universal expansion (so obvious that it should have been proposed by someone earlier) should be interesting to astrophysicist, because its conclusions touch on a lot of Universe creation aspects.

Another consequence of the swelling model is **the possibility of faster than light speeds**. If the Universe swells every moment through the synced increase of every energy node in the Physical Vacuum structure, we get a mechanism allowing not only to transfer information or signal (as Nikolai Kozyrev says), but instant transfer of energy to any point in the Universe. For that the impact should be done **in resonance with the Universe expansion**, not in the electromagnetic wave mode. Electromagnetic wave gradually deforms the PV nodes, which perform as a common fluctuating circuit with defined induction and capacity, limiting the energy transfer speed by the speed of light. Resonance mode of PV and how it can be realized, can be determined from its structure. But this is an issue for another article.

Coming from this approach, it appears that the Universe itself should expand in some space, if we accept that every system should be open. In our equations for simplicity we often artificially close the system to make them simpler, but then forget about these limitations and leave them, throwing a baby out with the water. Thus, the physical meaning of the process is lost.

What happens in that space or in the other Universe, maybe it compresses from the expansion of our Universe? Thus, looked on together, the entropy of this new system, as we have noted, would grow. Thus, by analogy with the process of cold and hot bodies touching and the leveling out of the two body system temperature. The hot body cools down and its entropy decreases. The cold body heats up and its entropy rises. But the total entropy of two bodies remains positive.

11. A physical interpretation of Nikolai Kozyrev experiments.

Using the proposed interpretation of the entropy definition, let's try and explain some well-known experiments of the famous astronomer and naturalist N.A. Kozyrev and his followers [19-26].

His experiments regarding the effects of astronomical bodies on material bodies as well as various physical processes, conducted in the span of 1950-1978, still remain unexplained and unrecognized. His followers, who repeated some of his tests as well as conducted some new experiments in this direction, have not succeed in understanding the concluded effects. This is also not helped by the difficulty of understanding the works of N.A. Kozyrev [21].

In order to systematize the results of his experiments, Kozyrev has introduced the abstract definition of time emission and absorption. According to Kozyrev, time is "a grand stream, encompassing all material processes of the Universe, all processes occurring in these systems are sources feeding into the general stream". He writes about the intensity or density of this stream, about energy that it carries, about its emission or absorption, direct nature of its expansion, about reflection from preclusions or its absorption by the matter [21].

Time is absorber by a cause and is compressed in the place where the consequence stands... Each process can spend or create time.

Kozyrev notes the stark contradiction between the second law of thermodynamics, bringing closer the heat and radiation death of the Universe, and the absence of any sense of balance in the observable Universe. The Universe and its subsystems are not isolated, i.e. there is no necessary required condition for the second law, "there are constants in the universe opposing entropy.

According to Kozyrev, physical processes, emitting time, increase entropy of the system. It includes deformation, heating, light absorption, dissolution or mixing, non-light radiation of astronomical objects, friction, evaporation etc. In our interpretation, processes increasing the energy density of PV. Opposing them are processes absorbing time, causing the decrease of system entropy - cooling of the bodies, change in the aggregate state by cooling, wilting of plants. It is experimentally registered, that the processes increasing entropy (emitting time), push out the revolving weights lever from the process and rotate the disc clockwise. By decreasing entropy (energy absorption) the lever and the disc move in the opposite direction.

It was experimentally found out, that the stream can be screened and absorbed by the matter, reflected etc. All of it is reflected in the Levich's review [21], who tried to substantially interpret Kozyrev's findings.

In his experiments, Kozyrev **created the entropy process in the center** by heating bodies, evaporating acetone, dissolving sugar in the water etc. By various means, including the rotating weights, he measured an impact of this process on the environment. In all entropy processes - heating, dissolution etc, the rotating weights arrow leaned away from the process (fig. 21 b).

These effects can be generally explained the following way [20, 27].

A **body must react to any energy process** or move away from the zone of its influence, like the weights arrow in Kozyrev's experiments (fig. 21 b), or, if the body is affixed, decrease this effect according to Lenz's law - there must be a stream opposing the change of system state (fig. 21 c).

The source of the entropy process is switched off

The source of the entropy process is switched on

Repultion

The source of the entropy process is switched on

Resistance to the entropy stream due to the internal body state change (Lenz's rule)
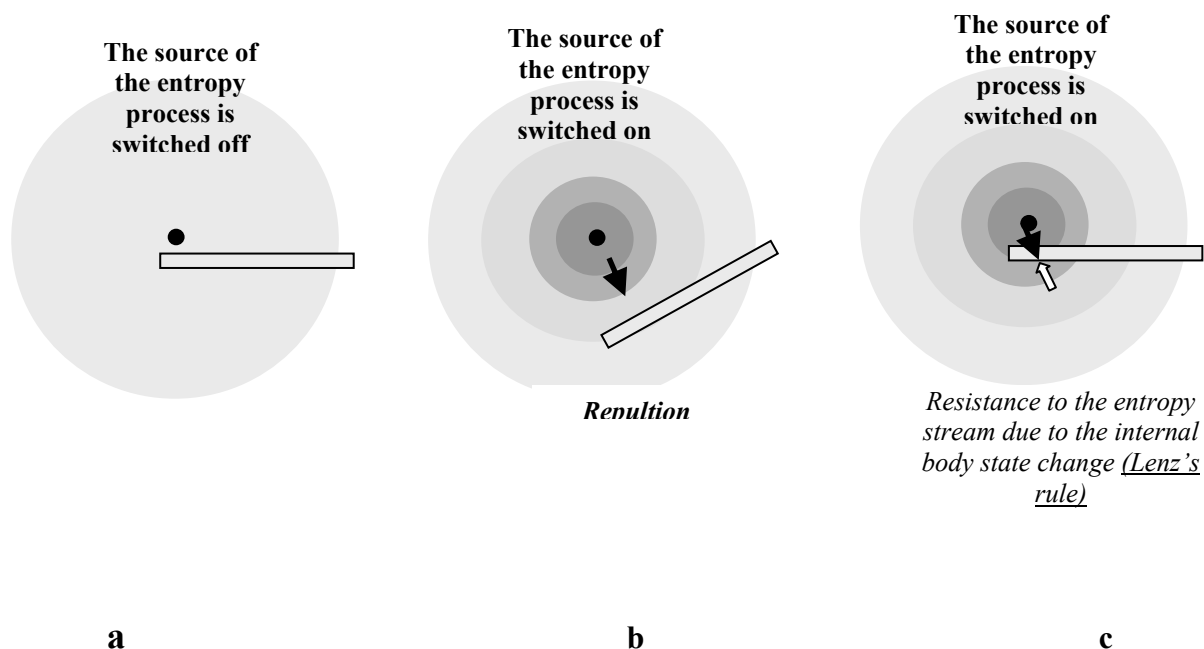
a   **b**   **c**

Fig. 21. Material body reaction to the entropy process: (a) original state, (b) arrow movement from the process, (c) opposition to the entropy stream due to the internal body state change (Lenz's rule)

There is an **increased energy density** of PV around the source of entropy, which causes the decrease in body weight. An energy concentration gradient forms from the entropy source to the body, at that the energy density of PV must decrease by the square law. Rotating weights arrow with its surrounding (fake mass) falls into denser energy state of PV, uncommon for the arrow, and is pushed out from it. So, it moves to the area, where the energy state has not changed, i.e. from the process (like the pressure gradient forces the separator to move).
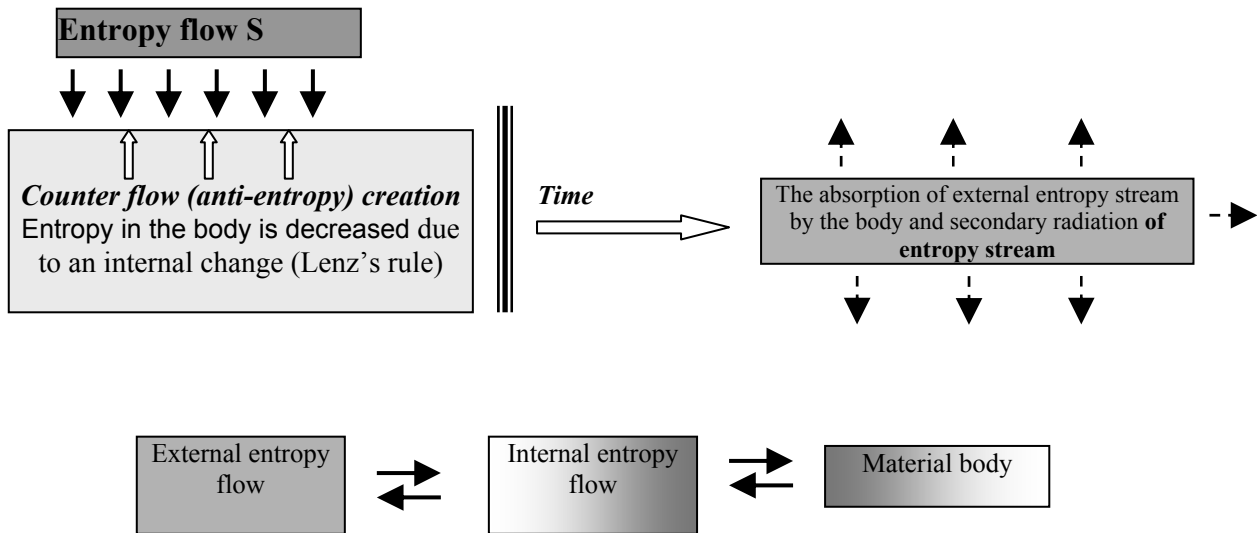
Entropy flow S

Counter flow (anti-entropy) creation
Entropy in the body is decreased due to an internal change (Lenz's rule)

Time

The absorption of external entropy stream by the body and secondary radiation **of entropy stream**

External entropy flow ⇌ Internal entropy flow ⇌ Material body

Fig. 22. Counteraction to the entropy stream in a material body due to an internal change (Lenz's rule).

If this does not happen - the body or the arrow are fixed in the position - the material body in the affectation zone of the entropy stream must interact with it (fig. 22.). It happens this way.

The state of PV surrounding a body correlates to the state of higher entropy than at that moment in the material body of a lower energy state. PV of the material body starts to absorb the external entropy stream. In order to counteract this process according to Lenz's law, i.e. to decrease the PV density, the anti-entropy processes occur in the bodies - the physical-chemical processes are slowed down - in Kozyrev's experiments the time passage is slowed down, along with the water electric resistance and tightness, the speed of biological and chemical processes are slowed down. etc, which is connected to the decrease in the average heat capacity. This causes the decrease in the energy density of the PV around the body and, according to Lenz's rule, the anti-entropy counter stream is created.

If an external entropy effect is sufficiently energetic, then, according, to the second law, the first part of the equation can be used - the enthalpy change, i.e. heat emission or absorption, rebuilding of the crystal lattice can occur in the body itself.

Let's get back to fig. 22. After some time has passed, when the external effect is removed or the balance is achieved, the reverse processes start, i.e. the body turns back to the original state of the surrounding PV, even higher in energy due to the creation of densification of energy density by him. In order to achieve balance, the physical-chemical and entropy processes are sped up and it turns into a secondary source of entropy radiation.

In the experiments of Kozyrev and his followers, the interactions are probably carried by low-energy neutrino and anti-neutrino, including Relict neutrino, - particles that don't carry a charge, but responsible for the mass change. But neutrinos almost never interact with the matter.

Therefore, an analogy with neutrons is more suitable. Fast neutrons are weakly held by matter, while the slow ones have a larger cross section of interaction.

In the case of neutrino, aside from high-energy neutrino that are weakly held by matter, there are low-energy and relict neutrino that can react with the matter, especially if the material body or PV surrounding it are unbalanced. Neutrino (we mean the neutrino-anti-neutrino pair) **creates a varied density of PV** around the energy processes and the bodies themselves. Materials bodies participating in the process emit neutrino by exciting PV, other material bodies nearby absorb the neutrino energy through the surrounding PV.

Therefore, **entropy increase** in one place **causes its decrease** in the surrounding environment. This leads to an impossibility of the heat death of the Universe, which is concluded from the Nikolai Kozyrev experiments and **was proven by him multiple times**.

The rising entropy law works in the isolated system. In the non-isolated system with PV the other law works - the rise of energy density of PV fluctuations in the entropy processes and the simultaneous absorption of these fluctuations by the matter, which causes the entropy decrease in the surrounding matter. These processes are mutually opposed and occur in any physical events, including the rotation of bodies and star systems, causing the highest change in PV fluctuation density. As Kozyrev has shown I his experiments, these processes also affect the speed of physical-chemical reactions and the vitality of plants and microorganisms. Because the rotations and movements of the star systems have a cyclical nature, it allows to partially accept the use of astrological predictions.

12. Experiments to create high-powered entropy and anti-entropy streams

The entropy stream definition is used here nominally. The first one to introduce the definition of such stream was Nikolai Kozyrev, calling it a "timestream". In Kozyrev's findings, it was caused by entropy-rising processes - heating of bodies, dissolution of matter in the water etc. The rotating weights arrow reacted to these processes by moving away from the process. Regarding the anti-entropy processes, in Kozyrev's interpretation it is the "time-consuming processes" - cooling, thawing, etc. You can read about it in the A. Levich review [21].

Entropy and anti-entropy stream generation experiments were conducted on the specially constructed stand that consisted of 2 whirlpool hydraulic generators (VGTG) NTK-3 produced by NOTECA with the total **power 37 kilowatts.** Stand exterior is pictured on fig.23, complete circuit scheme of the stand - on fig.24 [7, 27-29].

Water under the pressure around 5 atmospheres, created by the centrifuge pump, arrives into the snail alike to Pythagorean spiral, curved leftward, After the curve, the water is slowed down. As a result of whirlpool processes, cavitation and friction, the water is heated up.
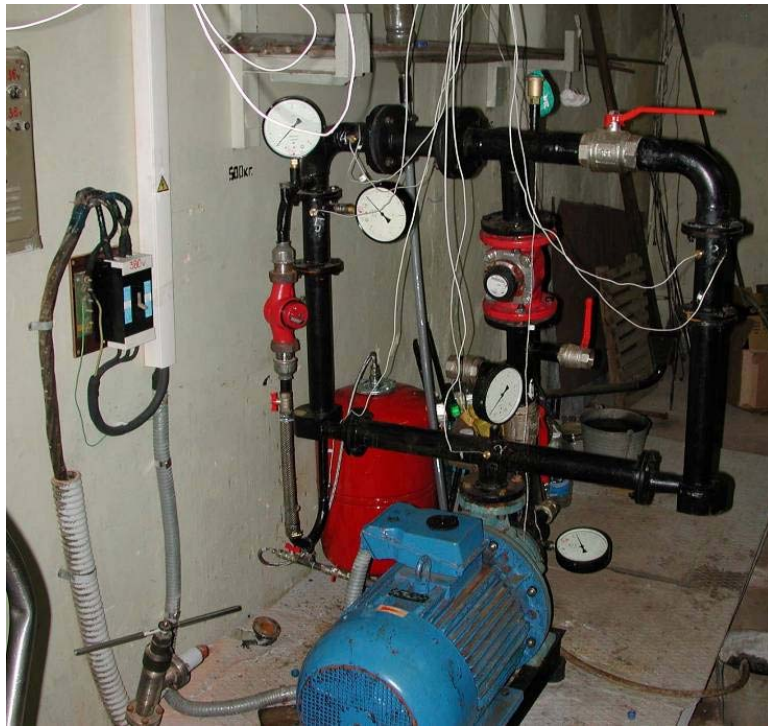
Fig .23. Testing stand exterior [7, 27-29]

Stand is comprised of three circuits. The first circuit is the main one, the second and the third are there to connect various heat loads - thermostat, batteries etc.

There are two VGTG in the first circuit of the test stand - one standard and one experimental, allowing for various working modes, changing energy, speed and the form of whirlpool and the water. A bypass is also implemented to create a counter stream akin to the Rank pipe. In order to get complete information and conduct various experiments, the stand is outfitted with temperature, pressure, water use sensors, stream regulation and water intake devices to analyze its physical-chemical, bacteriological and radioactive properties. There are also pipe separators to affect the water by electric, magnetic and electromagnetic field of varying intensity. Temperature sensors are placed in all sections of the stand, at the input and output of VGTG, in the whirlpool generator, bypass pipe of the reverse counter stream, and at the back side of the VGTG to register temperature changes due to probable radiation. Absolute margin of error in temperature measurements - 0.10C. Temperature, depending on the number of acting sensors, is registered after 2-15 seconds, the results go into the computer, which allows to observe the process dynamic and register any heat effects in the various stand sections.
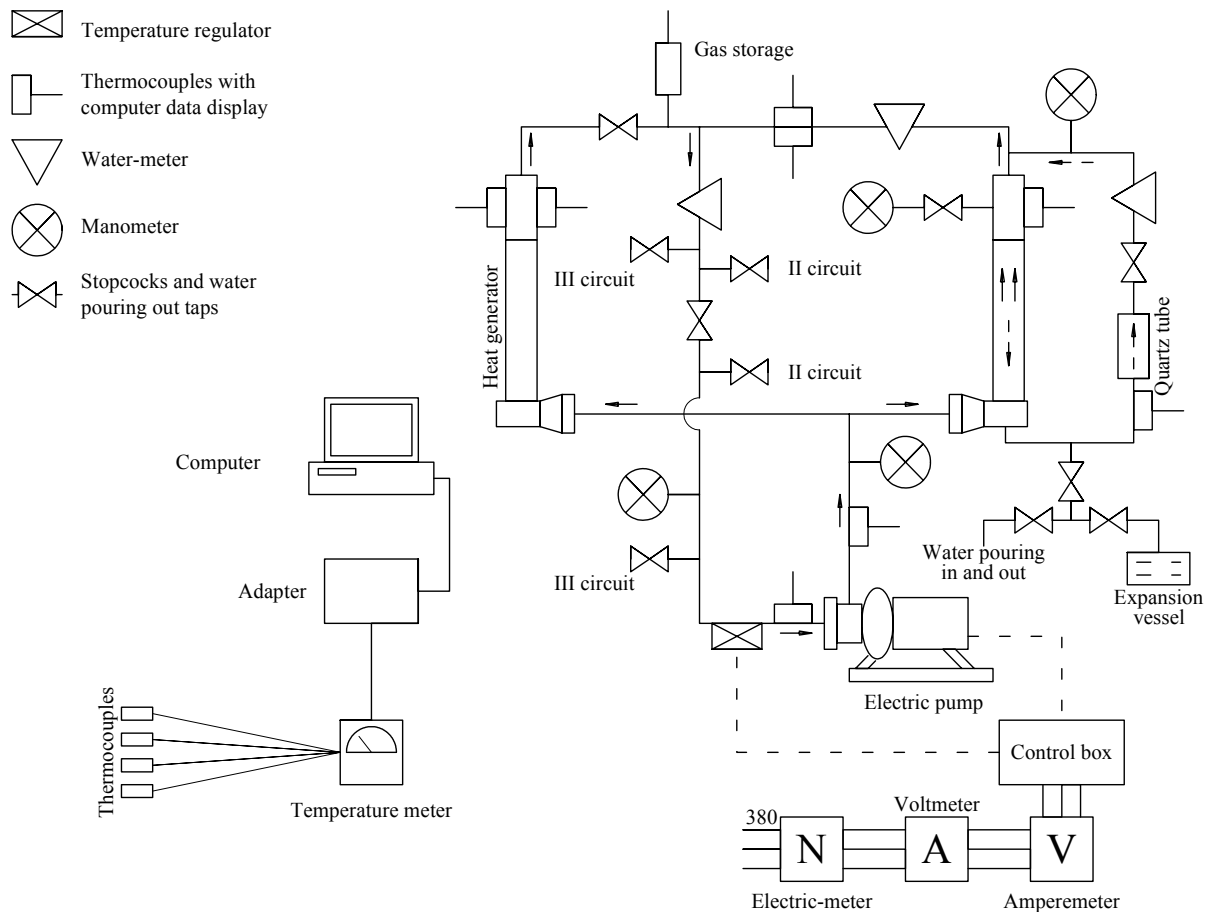
Fig. 24. Complete scheme of the first circuit of the test stand

Aside from the main goal - to detect excessive heat emission in the VGTG, as was declared in various newspapers and magazines, purely scientific research was also planned.

Additionally, it was planned to:

- study the whirlpool processes at various stand modes, with the after-action effect - energy emission after turning the pump off;

- study the influence of design solutions (whirlpool form change, reverse water stream speed) on the whirlpool generator efficiency;

- study the influence of a water with various additives, changing the hydrogen connections energy, electrical conductivity, heat conductivity and other physical and chemical properties of the water, and also to use electrolytic solutions;

- study the influence of electric, magnetic and electromagnetic fields of variations intensity on the properties and effectiveness of whirlpool generator;

- study the physical, chemical and bacteriological water properties at various stand modes;

- study the possible "radiation" and streams forming in the VGTG work.

Later, the program was substantially corrected.

Originally, the stand was created to verify effects, created in the whirlpool hydraulic heat generators (VGTG), particularly the ones regarding the generation of additional energy. It is known, that physical processes, whose energy exceeds the energy spent on their generation, are common in

the artificial and natural whirlpools. A number of publications on VGTG pointed at the detection of unusual heat emission (radiation) [7, 27-29]. It is unusual in the sense that it received more heat (energy) in the heat exchange than was spent on the whirlpool support in the circuit. But first preliminary results had shown so many new physical occurrences - short-timed but significant rise and decrease of water temperature, spontaneous water heating after turning off the pump, heat emission of unknown nature, the change of physical-chemical water properties, - that the study of unusual heat emission became tertiary.

(Preliminary test results are collected and will be compiled later). In short - anomalous heat emission has not been found in commonly produced VGTG, especially no more than 400% as was stated in Potapov's findings [30]. But in some working modes, including the change of water composition, and the properties of whirlpool generation, there was a short-timed anomalous heat-emission, no more than 20-30%. Most likely that the stand started to work in the heat pump mode, which is an interesting occurrence by itself, because it makes additional coolant redundant. There were some exceptions. In one resonance mode, there was generated more than 20% for a short time, which is hardly explained by traditional theories. This effect requires additional study and verification, because anomalies causing additional energy generation cause harsh reaction from traditional science. It would be logical to study these effects together and if the effect repeats, verify it.

What is clearly determined - this effect can't be explained by the cold thermonuclear synthesis hypothesis, because the *α, β and γ radiation was not found in any points of stand, neither were high-frequency electro-magnetic and magnetic radiation. Later in chapter 12 we propose a hypothesis about a mechanism of this kind of heat emission, that seems to be common in the Sun and stars.*

The liquid whirlpool (water with various additives) was created in the working part of whirlpool generator by a Rank pipe principle (fig. 24A), which was then curved into a toroid ring. Most likely, its structure resembles fig. 25b.
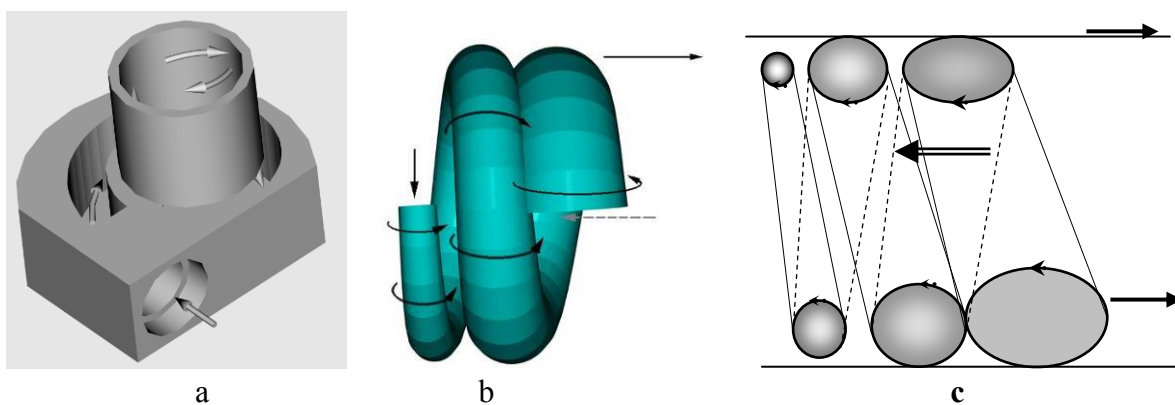

a   b   c

Fig. 25. Scheme of creation of toroid whirlpool in the hydraulic generator pipe (a); whirlpool structure (b) and the creation of a reverse counter stream; cross-section of the whirlpool (c).

In the process of studying various energy effects on the water (whirlpool effects, cavitation, hydro strike, various resonance occurrences, creation of oversaturated solutions in the water,

stabilizing at energy affection), it was possible to create powerful **anti-entropy** and **entropy streams** in the water. We got an enormous amount of data requiring analysis, and unusual effects that need to be explained, but this is an issue for another article.

Let's look closer at the means of entropy and anti-entropy streams generation, and accompanying physical effects.

At first, lets clarify what we consider entropy and anti-entropy streams. The first definition of an entropy stream was made by Nikolai Kozyrev, calling it a "timestream". In Kozyrev's findings, it was caused by entropy-rising processes - heating of bodies, dissolution of matter in the water etc. The rotating weights arrow reacted to these processes by moving away from the process. Regarding the anti-entropy processes, in Kozyrev's interpretation they are "time-consuming processes" - cooling, thawing, etc. You can read about it in the A. Levich review [21].

In our physical understanding, an entropy stream is the increased energy density of PV in the particular point from some affect. Because a density gradient is created by distancing from the source, it can be interpreted as a stream, especially if the source continues to work. Therefore, an anti-entropy stream is created, when it needs to absorb energy from environment, and it must be connected to the decrease of PV energy density around the source.

Anti-entropy process in the water was generated after adding 3-15% air of whole volume. In the first 30 seconds of VGTG working, the air was forced to dissolve in the water with the creation of complex connections with nano-bubbles of air, causing the phase change in water contents (possible with the capillary water structure). Capillary water has huge surface tension and its creation requires a lot of energy. Thus, in the first 30 seconds, all energy was absorbed by water, and it was not heating up. In other words, citing Kozyrev, there were powerful anti-entropy processes occurring in the water.

Entropy stream was created in a similar way. At first about 3-15% air of volume was added. Then, about 100 g of transformator oil. Due to centrifuge pump and whirlpool processes, the air also created nano-bubbles, but the oil prevented the creation of capillary water (it covered the nano-bubles). Then, there was sudden air dissolution in the water. This exothermic process was accompanied by heat emission. As a result, the water heated up faster and an entropy stream was being generated.

Now, to the results.

1. When generating a strong anti-entropy stream, according to Lenz's rule, we got a strong entropy stream. With cold water, in the first 30 seconds, thermo-pairs registered 80-degree jumps upwards in the temperature of surrounding pipe walls, correlation to the higher temperature state of the body with a higher atom oscillation amplitude, even while it felt cold still (fig. 26).

At first, we decided that it was some unknown electromagnetic or heat emission (radiation). But we have not felt any heat when touching the walls - they remained cold while thermo-pairs showed 80^0C. Later, we came to the conclusion, that the state of pipes correlated to the higher level of entropy, which, as it is known, decreases the Debye temperature and the melting temperature (quicksilver melts at the lower temperature, than aluminum). This was the real state of a thermo-pair and pipe correlates to the 80^0C, formed according to Lenz's law. If at that moment we would have guessed to place some easily melt metal, like gallium, or Wood's alloy, they would have melt at a lower temperature.

Therefore, it is possible to **melt metals at a room temperature**, which is important for chemically active materials, particularly actinides. For example, eutectics melt at a lower temperature than phases that they consist of due to a higher average thermal capacity, lower Debye temperature and higher atoms oscillation amplitude [3, 27]. Therefore, lower energy and temperature are required to destroy their structure. A similar effect is known as *«depressed melting»*, when thin layers of metal or nano-powders due to surface tension have a lower melting point than the metal itself. With that, they have a higher atom crystal lattice oscillation amplitude (high vibrational entropy) compared to a massive metal.
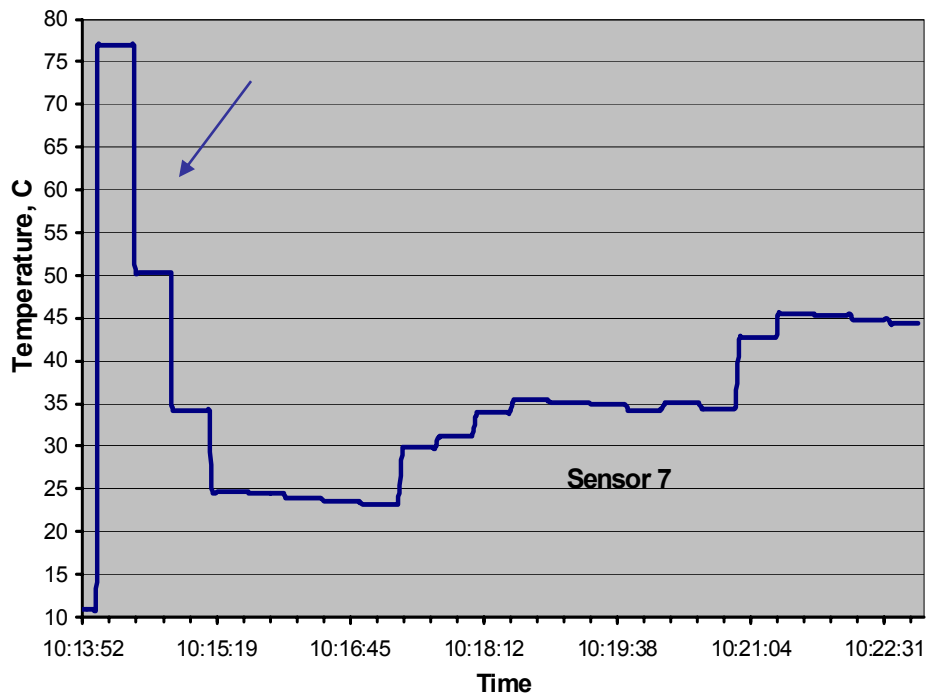

Fig. 26. Jump-like (entropy) rise of pipe walls temperature at a sudden phase change in the water.

In relation to this, it can help to explain the unusual properties of the Holy fire, occurs on the Orthodox Easter and doesn't burn your hands. In order to create and support it, there need to be hundreds of entropy degrees in a large space for a long period of time, which requires enormous power of an anti-entropy stream, caused by the faith energy of the believers.

An interesting effect was discovered after switching the pump off while it worked it the mentioned mode. It expressed itself in a spontaneous, directed jumps in water and pipes walls temperatures. This effect proves the hypothesis of inducing the secondary entropy stream according to Lenz's law, Le Chatelier's principle and Nikolai Kozyrev's experiments. How can this happen in our case?

The anti-entropy energy saved in the water in the form of thermodynamically unstable state of capillary water spontaneously gets free after some time (20 seconds). The system turns back to a thermodynamically balance according to the second law of thermodynamics. Capillary water has about two times lower average thermal capacity than the common water, therefore a lot of heat is consumed by its phase change to the simple water and it cools by ~5 degrees. Cooling is an anti-

entropy process. In a response to this process, there is a jump-like rise of temperature in the pipe walls according to thermo-pair data.

It should be noted that these processes could be registered by common devices and measures thanks to using powerful generating machinery (power of the pump was 37 kW) and creation the condition of passing such processes with intensive power. Therefore, it is very difficult to sense these processes at a simple cooling or heating up, very sensitive devices should be used, like in the Nikolai Kozyrev's experiments. Even in the basic mode, VGTG generated entropy and anti-entropy streams, but of significantly lower power.

2. **By generating the entropy stream** under the aforementioned method (adding oil and air) a fast rise in temperature occurs, while the pipes cooled down due to the anti-entropy stream that formed according to Lenz's law and La Chatelier's principle (fig. 27). This process repeated several times in similar conditions.

This interesting effect can be used in order to create pure chemical materials and compounds. The conditions to reduce the mixing entropy are created - the state of the original components becomes more valuable than the mixtures. Cleaning from additives and the separation of isotopes - possible uses of this effect.
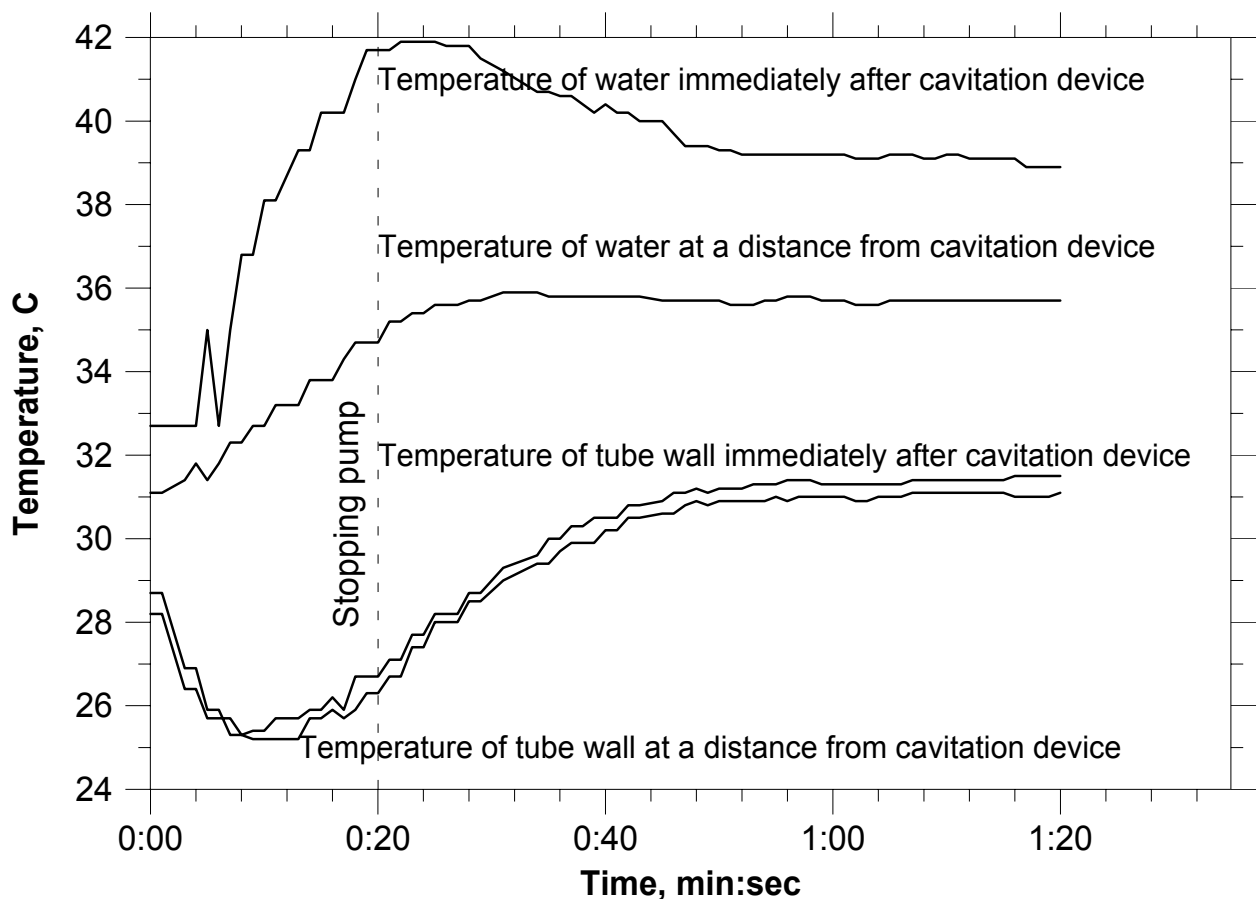

Fig. 27. Heat transfer effect from a cold body to hot during to the passing of water mixture through a whirlpool cavitator.

3. Additional effects

A number of interesting effects were also observed in the water by pumping energy into it (water circulation in the first circuit was made by a centrifuge 37 kW pump) that created additional cavitational effects, plus two VGTG with cavitators, creating cavitational and whirlpool effects.

Studies were conducted in the constant and stage heating modes (fig. 28). New effects mostly occurred exactly during the interrupted heating.

First experimental data discovered a number of new, previously unknown physical occurrences, rising in various places and changing depending on the stand mode. The final verification will be made after their additional repeats. We can definitely say the following.

3-1. Depending on a mode, direct and reverse water counter stream was observed in a bypass pipe. At some modes a jump-like rise of temperature was observed, most likely due to water direction change in a bypass pipe (fig.28, sensor 6). Short jumps were observed in the other parts of the stand, particularly, after the whirlpool stream generator (fig. 28, sensor 4).
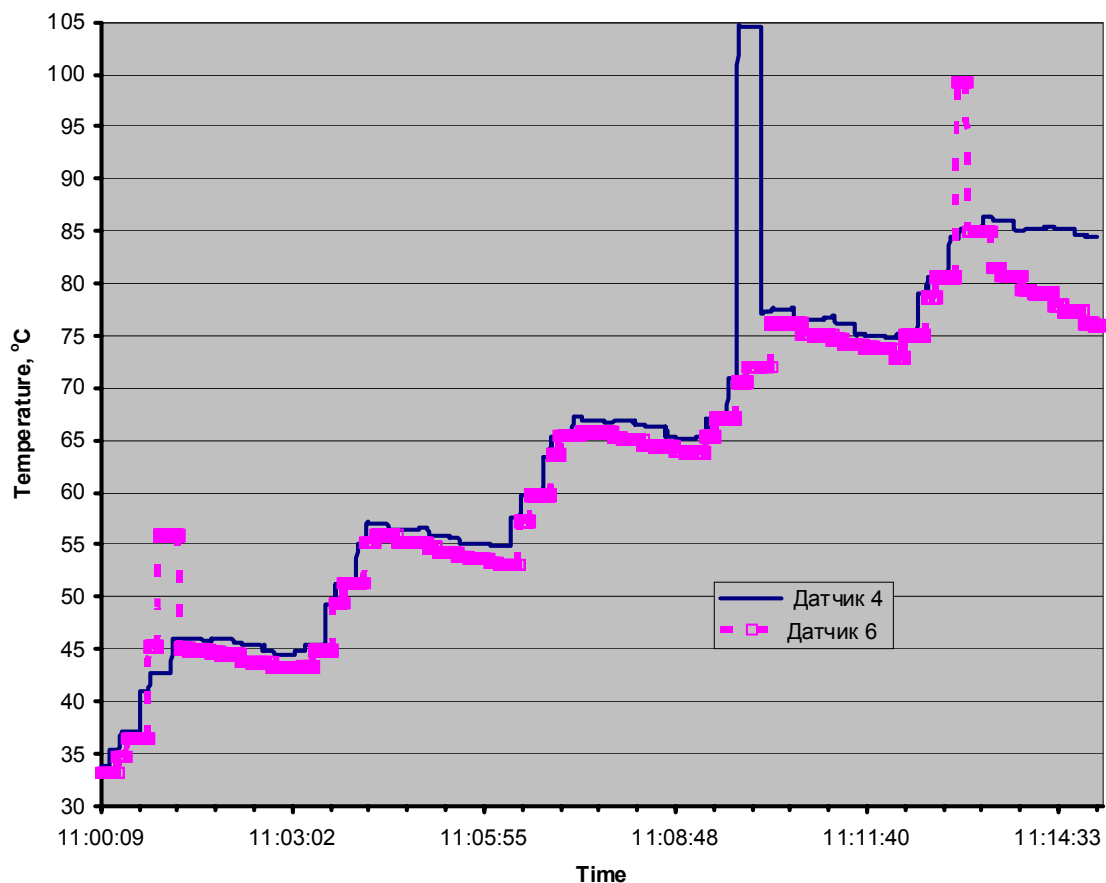

Fig. 28. Anomalous rise of temperature (by 15-30^{0}C above average) in some parts of the stand: on a bypass pipe of the reverse movement (sensor 6); after the whirlpool stream generator (sensor 4).

3-2. Aside from the rise of temperature a local decrease of temperature by 10-50^{0}C below average was observed (sensor 2 fig. 29). It is usually observed at the water input into the centrifuge pump with air content in the water. Pump created under pressure up to 0,5 atmospheres, and while the water is not a gas, there was a similar effect - swift decrease of water temperature according to

the Clausius - Clyperone equation **PV = RT**. Sometimes, the water cooled down to minus 25^{0}C for a short time.
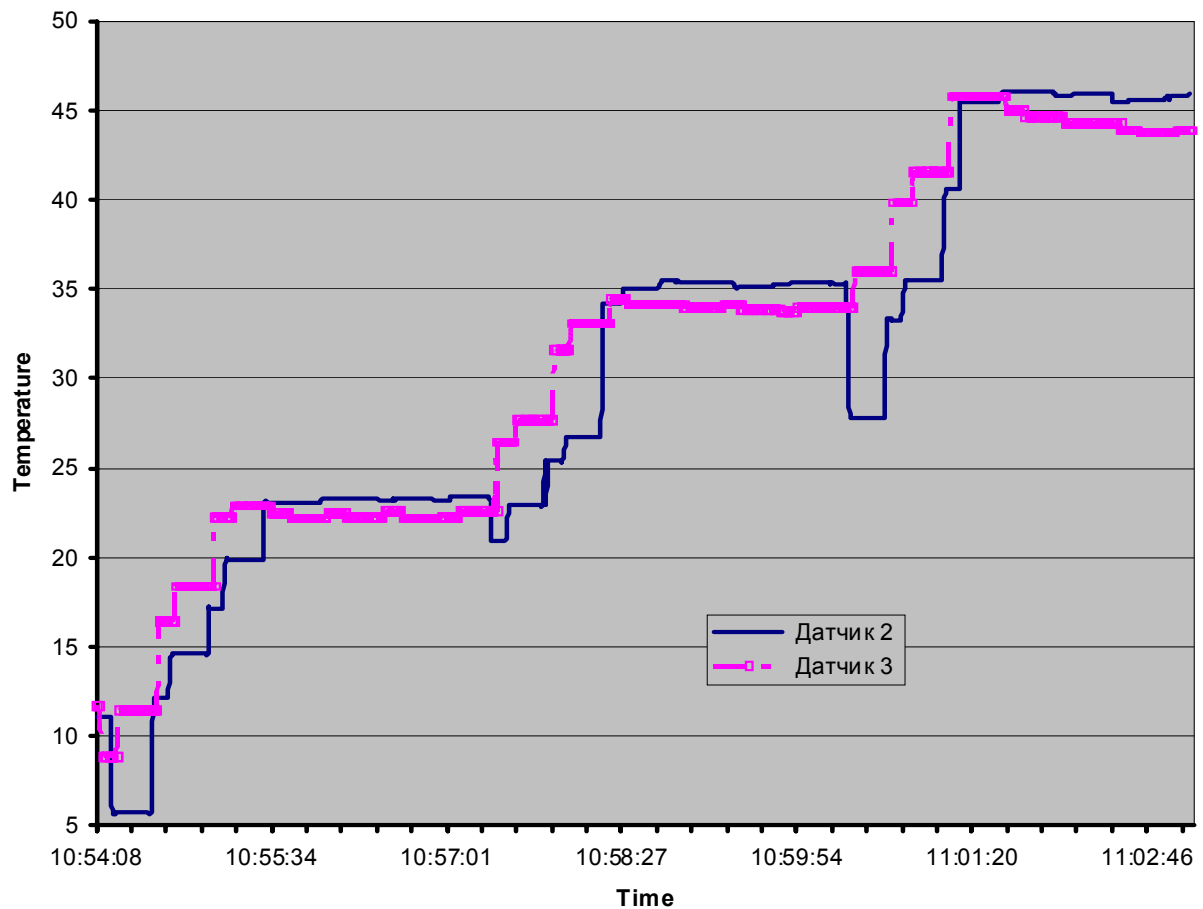

Fig. 29. Anomalous decrease of water temperature by changing the work mode.

3-3. An effect of spontaneous heating up after switching off the pump was discovered. Depending on modes and water content, it fluctuated from 10 to 30% of the heating value (fig. 30). Probably, it can be connected with the water change to a balanced state and the decrease in clusterisation.

An interesting regularity should be noted - similar to the quantum effects of changes in water energy state. Nikolai Kozyrev observed some "quantum" effects in his experiments.
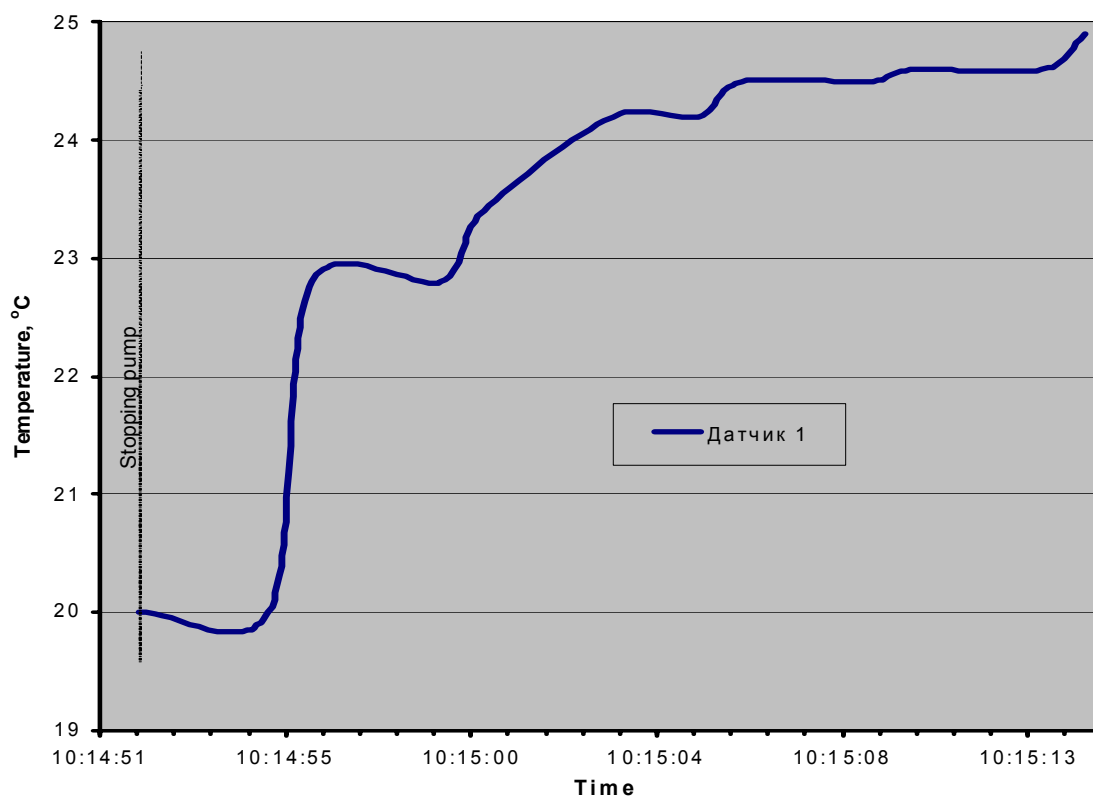
Fig.30. Spontaneous heating up after switching off the pump (post-action effect)

3-4 Study to discover the α, β and γ radiation at different modes has shown their complete absence, which questions the hypothesis about thermonuclear cold synthesis during VGTG work. No high frequency electromagnetic and magnetic emission was discovered.

3-5 The first preliminary analysis of physical-chemical water properties was conducted, it is discovered that the water PH and valence of some elements change in the first minutes of work It is noted that the gas dissolution in the water increases by 400 times. This water property remained for the next 5 minutes after turning the stand down - this points to powerful structural and physical-chemical changes in the water.

More other effects were discovered that require additional research. Bu the main conclusion lies in the fact that water properties are insufficiently studies and aside of the various physical-chemical properties and informational structures it has enormous structural energy power.

Should be noted that the new effects were discovered only by the usage of an experimental stand, original research methods and tests and throughout research control. In the common conditions, we have received only the average result, represented by the rise of water temperature at the circuit output.

13. Practical use of artificial entropy and anti-entropy streams

Entropy and anti-entropy stream was a secondary goal for our experiments, because the stand was created for other purposes - study of the whirlpool processes and finding out anomalous heat emission in order to develop environment-friendly sources of energy generation. Therefore, to

generate these streams another stand is required, allowing to concentrate energy on a unit of particular volume and not the whole circuit as in our case. It could be impulse-based with the usage of reflectors (Kozyrev's mirrors or other energy concentrators) for a direct effect on a researched object. Therefore, it could be way less powerful. Different gas electric arrestor's dischargers in resonance mode, cavitation or plasma charges in the water could be used as a generator.

It is easy to find practical use of artificial entropy and anti-entropy streams. First of all, it is the aforementioned possibility to melt metals at a room temperature by artificial entropy stream (fig. 31a). With that, the melt metal would remain cold and not interact with the atmosphere or crucible. It is especially important for melting chemically active and radioactive metals - uranium, plutonium, as well as refractory metals, etc.

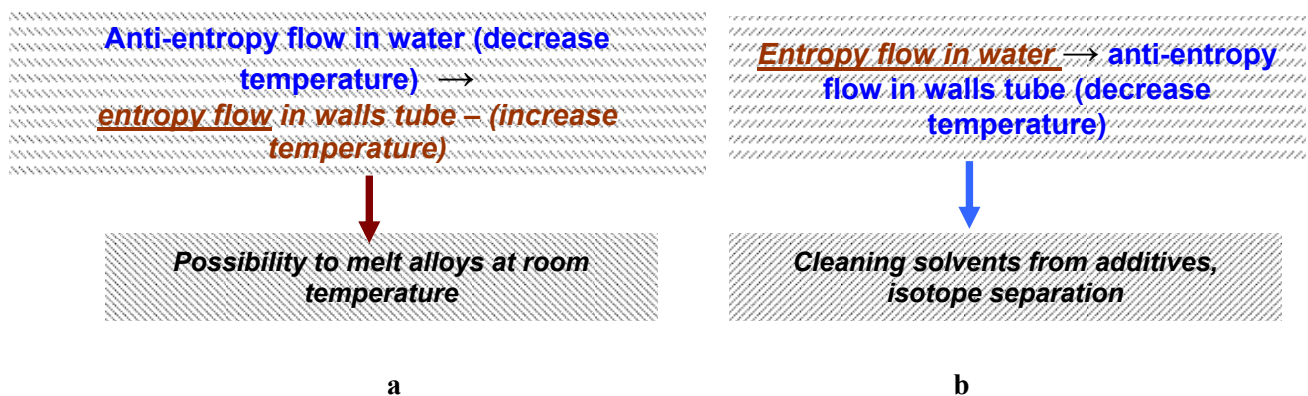| Anti-entropy flow in water (decrease temperature) → *entropy flow in walls tube – (increase temperature)*	*Entropy flow in water* → anti-entropy flow in walls tube (decrease temperature)
↓	↓
Possibility to melt alloys at room temperature	*Cleaning solvents from additives, isotope separation*
a	**b**

Fig. 31. Scheme of artificial creation of energy streams and their usage, a - entropy stream (melting materials at the room temperature), b - anti-entropy stream (cleaning the solvent from additives).

By artificially creating an entropy stream (fig. 31 b) and forming, according to Lenz's law, the anti-entropy stream in the material, it is possible to change the direction of various physical-chemical reactions. Particularly, for cleaning solvents from additives and desalinization of sea water. Especially important may be the usage to separate isotopes, for example N^{15} and N^{14}, Pu^{239} and Pu^{240}, U^{238} and U^{235}. For this, aside from creating thermodynamic conditions, allowing for separation, the usage of special technological methods and special equipment (centrifuge or membrane) is needed. It is clear that they would play a secondary role.

Entropy stream can be represented as an area of increased energy density of PV, as it was in the past, before it has achieved the real level with decreased energy density due to Universe expansion. Therefore, it is easier to be concentrated by Kozyrev's mirrors (fig.32-a). Regarding the anti-entropy stream, it is created by decreasing the PV density, as it will be in the future. Therefore, it is hard to concentrate (due to the density gradient this are will suffer from an influx of energy outside in order to level down its concentration) Therefore, the studied object is better put in the center, surrounded by anti-entropy stream generators.
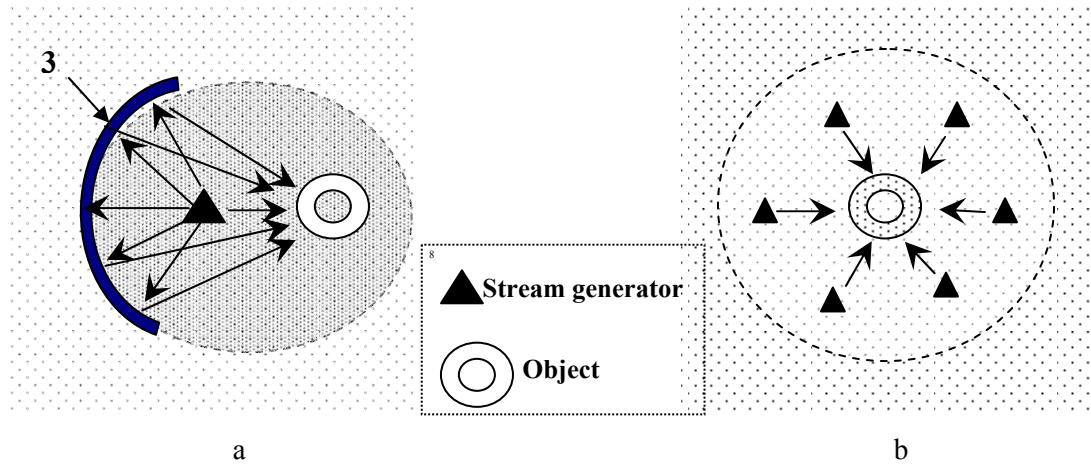
Fig. 32. Optimal sample disposition, a - in entropy stream generation, b - in anti-entropy stream generation
1 - entropy or anti-entropy stream generators, 2 - studied object, 3 - Kozyrev's mirror.

The creation of such processes is possible thanks to the energy origin of entropy, that was little studied in the past, and **to Lenz's law, being an analogy to energy conservation law, and Newton's third law,** and should be considered when analyzing any energy processes.

14. Energy effects appearing during the highly volatile change of Physical Vacuum density

Processes of change in Physical Vacuum (PV) energy density, caused, probably, by emission and absorption effects of relict neutrino, can also cause energy emission in the material bodies. Most likely, such effects occur in the Sun and stars, creating additional energy aside from thermonuclear reactions. By registering solar neutrinos, it was determined, that the thermonuclear sources compose only one third of Sun radiation. Earlier, Nikolai Kozyrev, comparing radius and luminosity of stars, proved that the main contribution into researching the stars should be made by yet unknown energy sources [19, 23, 31]. He proposed, that they are connected to "time streams", which, in our physical interpretation, correlated to the density change processes in PV, that can happen as during the rotational movement and gravitational interaction, as during the expansion of the Universe.

Let's take a closer look at this process. Electron remains in a balanced state in PV with existing energy density. Pressuring and densification of PV occurs in whirlpools (stars, the Sun, water whirlpools and whirlwinds), rotational movement with acceleration and in any energy effects related to sudden change in PV density. Electron, being an elementary particle [32-35], a probable elementary vortex [17, 27, 36], is stable only in the PV of energy density where it had been created (particle charge stability is constant). According to the classical physics of elementary particles, **electron mass change** is possible only by absorption or return of the mass-carrying particle. In case of the electron, it is the electron antineutrino.

Electrons, arriving into PV of lower density, transfer into unbalanced state (the curve of the electron vortex is too high for a lower density PV). Electron mass, i.e. the curve in lower density PV should be lower, supporting the stability of electron as a true elementary particle. Therefore, it gives away the excessive mass to PV, releasing the electron anti-neutrino (fig. 32 a). With this**, electron**

receives an impulse from anti-neutrino, i.e. kinetic energy, spent on heating up its environment - gas, plasma or water. Then, returning to a normal state - a PV of normal density, lower mass electron in some time absorbs additional mass of electron anti-neutrino. With that, by absorbing anti-neutrino, electron gets an impulse again i.e. kinetic energy, spent on heating up its environment (fig. 32 b). Because a part of anti-neutrino energy during absorption and release was spent to send an impulse to an electron, then, due to energy conservation law, the total number of anti-neutrino goes down.

If we take as a basis the famous process of β-breakdown, where electron, flying out from the core, releases the excess of energy (mass) as antineutrino and kinetic energy, about 30% of that energy is spent on the impulse. Therefore, about 30% of energy is absorbed by the environment, i.e. there is a constant irreversible process of the decrease in universal anti-neutrino numbers, their total energy valued at 10^{69} joules.

Release of anti-neutrino
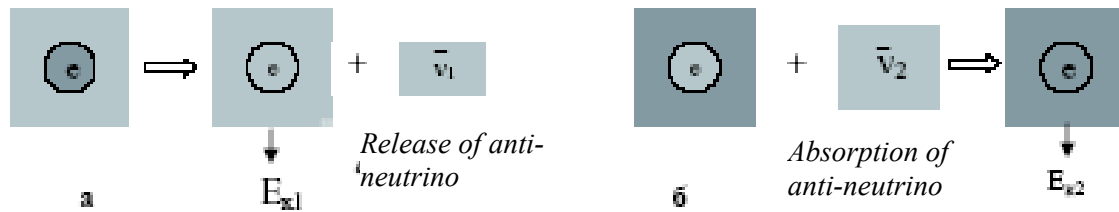
Absorption of anti-neutrino

Fig. 32. Absorption and release of anti-neutrino by an electron during the change in PV density; a - at decrease; b - at increase [27, 29]

It is quite possible, that this process occurs in plasma charges in the water or in the other environment with excessive emission of heat, which, probably by mistake, is attributed to the thermonuclear synthesis effect [37, 38].

Should be noted, that a similar energy process, but with an electromagnetic emission, can happen with the nucleus in the core, but it is way more complicated.

Acknowledgements

15. Conclusion

It is shown, that the entropy of mixing is of the energy nature (not only statistical one, as the probability of state). Energetic entropy processes (in ideal mixing) are not observable, because of their hidden nature (simultaneously occurs the emission and absorption of heat). But they are reflected in the changes of energy condition of Physical Vacuum (PV).

A hypothesis is proposed, in which changes in the entropy of mixing are analyzed as linked with the interaction between matter and Physical Vacuum. Experimental results were carried out of interaction between Physical Vacuum and material bodies in different energetic exposures, including distanced, which resulted in body mass reduction due to increase in energetic density of Physical Vacuum around them. The same effect is observed during the increase of mixing entropy - it points out on its energetic nature, not only the measure of disorder. So, the second law of thermodynamics, when applied to open systems, i.e. matter plus Physical Vacuum, gets additional physical meaning as the law of energy conservation. A hypothesis is conceived to explain the anti-gravity effects from the conducted experiments.

There was an attempt to find correlation by the use of Lenz's Rule between the rise in entropy and Universe expansion, and also some particularities of Universal expansion with possibility to exceed the speed of light.

A physical explanation of Nikolai Kozyrev's experiments is proposed.

Methods of entropy and anti-entropy stream (flow) generation, arising in the forced mode use of vortex heat generators, were tested, as were practical uses of received effects for purification of solutions from additives and for metals melting at lower temperatures. Probable energetic effects that appear at fast changes in Physical Vacuum density are analyzed.

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