

Fuel-less Energetics (Problems, solutions, forecasts)

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In memory of P.K. Oshchepkov

Abstracts

Since thermodynamics is a scientific basis of heat generation (and energy production from the heat), the crisis is stipulated by its paradigm: the heat can only be produced from a fuel (coal, uranium, oil) while energy can be produced by heat carrier flows, which is organized between two temperature levels. This results in the recommendations to build monsters such as heat power plants and atomic power plants burning millions tons of fuel covering the earth with entropy darkness.

Such thermodynamics resolutely denies fuel-less energetics based on the new paradigm: heat is valuable as it is at any temperature; **it is convertible into energy of ensembles of particles under external fields control. Fuel-less power engineering takes heat from the environment. It is ecologically clean, autonomous and costless.**

“There is no any other science, where its creation and application would bring to so many false assumptions and conclusions as thermodynamics”.
Bazarov I.P., 1991

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Three laws of thermodynamics of fire and steam

It is thermodynamics, “science of sciences”, that doomed the Earth to suffocation and overheating, to flora and fauna extinction. Is

it science at all? It just looks like a part of macrophysics only...

The following definition is accepted: thermodynamics is a phenomenological theory of macroscopic processes accompanied by energy transformation, i.e. thermodynamics is a science about energy. However, it is then specified that, as the processes represent changes of inner energy stipulated by the movement of the composing particles called thermal movement, then it is a science about thermal movement. It was developed from the analysis of heat-work transformations in steam engines. Being phenomenological it proceeds from experimental data. That is why it is based on the three experimental beginnings or “principles”. It is not allowed to call them “Laws”. Unlike other sciences, thermodynamics **does not have any axiomatic grounds**. Neither does it have legitimate reasons to be called thermodynamics, as it does not include “time” in the calculations. Thermodynamics is obviously unacceptable for energy processes, e.g. in electrical engineering. While pretending on the universal nature of its methods, thermodynamics does not offer definition to the clearly different notions of “heat” and “energy”. Encyclopedia defines “energy” as a general quantitative measure of movement and interaction of matter. So if we stay within thermodynamics phenomenology then energy is heat in movement. In other words, heat is just potential (not more) energy. Other definitions do not exist. Thermodynamics is not interested in the nature of heat, its genesis; the process “boiler - steam - piston (blade) - refrigerator” is described in the same way both for a nuclear reactor and a locomobile engine with straw burnt in it.

First Principle of Thermodynamics:

Sum of all kinds of energy in an isolated system is a constant. It namely is a “law” of conservation of energy. It seems almost trivial but it is hard to apply it to a piece of radioactive substance.

Second Principle of Thermodynamics

stipulates entropy existence for any balanced system. Clausius (1850) formulated it as follows: Heat cannot spontaneously pass from

a cold body to a warm one. Hence, if S is entropy, then in the reversible cycle

$$S_2 - S_1 = \Delta S = \Delta Q/T$$

(Q is heat, J , T is temperature, K).

So, physical sense of entropy is reduced heat, i.e. how many Joules falls at $1K$. Actually, it is an elementary, almost primitive, index. (In a general case, according to Carno $dS = dQ/T!$).

Darwin was the first to attack the second principle, he was followed by Maxwell who proposed an imaginary device, which able to separate heat contrary to the second principle. K. E. Ziolkovsky proved the limited nature of the second principle in details and he claimed possibilities for environmental heat usage. Until now neither an equipment for measurements of entropy nor method for its calculation exist; they only satisfy with the difference $\Delta S = S_2 - S_1$.

To imitate accurate science the **Third Principle of thermodynamics** was derived from Nernst-Planck theorems: At the absolute zero temperature the entropy of all substances is equal to zero being in balance, i.e. $T=0$, $S=S_{T=0}=0$.

Principles of thermodynamics, Second Principle, notion of entropy have been provoking endless discussions for a century and a half. Having so limited facilities (three Principles and entropy) thermodynamics has been belligerent trying to cover all the diversity of natural processes. One of the first conclusions that entropy tends to infinity, i.e. equilibrium comes in any system and motion disappears was declared as a proof, fatal prophecy of the Universe heat death coming. V.V. Gubin contributed a lot in understanding entropy, having been described as "queen of shades". **Entropy is a consequence of the idealised Carno cycle, establishing maximum efficiency level (η) of heat engine (not exceeding 1)**. It is η - subjective criteria of "utility", interfering into natural relations.

Therefore, ΔS is clearly evaluative, calculated index, demonstrating an obtained level of heat control, management of heat in a machine. This way the phantom of entropy was deprived of the other-world-master-of-natural-processes veil. It is purposeful to stress that second principle has as many as 7 wordings, entropy does more than 5, and "heat" is ambiguous as well.

The concept of "exergy" has been accepted rather recently; it is defined as

$$\tau = Q (1 - T_m/T_h),$$

where T_m is the temperature of the medium, T_h is the heat source temperature, Q is heat. For $T_m = T_h$ heat is definitely unworkable, as $\tau=0$. This formed the basis for the widespread thesis that environmental heat is impossible to use. However, when **fuel elements** which are deliber-

ately mono-temperature units with $\eta=0$, are being squeezed into the bonds of thermodynamics, no efficiency limits are supposed and $\eta > 1$. At that there is an explanation that fuel element converts environmental heat into electrical power, but τ is negative for this case of the concept of "exergy"! (Editor's note: Just here negative time notion can be applied). Gibbs's paradox was the frontal part of thermodynamics, again with entropy: entropy of gases mixture was not always to be formed as sum, for example, in a mixture of a similar gases. The fundamental entropy characteristics of additivity had been violated for more than a century. Even nowadays it is half-explained.

One of the postulates of thermodynamics is the thesis about unlimited increase of the inner energy of the body with temperature increase: it was almost an axiom. However, like the Euclidian fifth postulate it has turned out to be disproved. All these patrimonial flaws serve as a basis for aversion of its prohibitions and forecasts rigidity (finality). The importance of recently discovered some (spin) systems are hard to over-estimate. In these systems inner energy asymptotically tends to a limit, for every system element has restrictions in its maximum energy. Within the frames of the second Principle (i.e. for ΔS increasing) the perpetual motion machine is forbidden. Nevertheless under pressure of new facts and permanent criticism new versions of the Second Principle are coming as well as new thermodynamics models, "improving" it (for example, Ulybin's "Phenomenological Thermomechanics"). These models still try to keep entropy even as a passive "witness". Referring to spin systems thermodynamics already finds it theoretically possible to realize the perpetual motion (PM) machine (for example, Thomson - Plank's PM of second type). Positive work in it is produced periodically only due to the cooling of one body (Bazarov I.P. wrote about it). Thus the prohibition of the evident event is removed.

Magnetics and dielectrics can be considered as such sort spin systems: affected by an intensive factor H , E (field intensity), which is an analogue of T , their energy does not increase infinitely but also it has asymptotic limit.

With all the diversity of heat-energy transformation processes, thermodynamics considers an organized flow of high temperature towards a working elements, directed to a lower temperature level (refrigerator), to be the only possible.

No other power engineering this "technical thermodynamics of fire and steam" is able to offer; its theoretical resource based on the three shaky Principles has been exhausted.

Yet its grave heritage - modern disastrous power engineering - is not its objective, but it is just the unexpected result of the historic engineering development. It can be blamed, though, for the savage more-than-a-century ne-

gation of other ways, suppression of any antithesis enjoying the status of academic Science. Monopoly in science as well as in politics always leads to gangrene.

Academicians and Forecasts (Invective)

In 1943 P.K. Oshchepkov (inventor of radar) formulated the task of getting electricity directly from heat. Later he broadened it as a goal to find the way of concentration of this dissipated energy. He had a laboratory in an academic institute in the 50s. He became a follower of Darwin's ideas and Ziolkovsky's in particular. Then P.K. Oshchepkov established the Public Institute of Energy Inversion (PIEI).

The leading idea of this work was the thesis **that energy is impossible to eliminate, but it can be dissipated; energy is impossible to create, but it can be collected.**

Before that there appeared a Central Committee of Communist Party of Soviet Union (CC CPSU) resolution (#715296, 23 June 1960) formulating the following scientific tasks:

1. To develop new energy sources.
2. To work out new principles of motion without reactive mass flow.
3. To develop new principles of protection from nuclear radiation.

As CC CPSU was more important than Government, the State formulated these tasks exclusively sagaciously. The prognosis was a most adequate one, and the reaction was timely.

However, nothing has been done until now. This resolution became a good key to Ministry of Finance safes for many academic institutes, while the Energy Inversion Institute turned out to be a voluntary executor of the first task. Its permanent leader was P.K. Oshchepkov (1908 - 1992). At first period the Institute of Energy Inversion had more than 1000 engineers and scientists on staff.

The institute's structure exists until now but its activity has dropped since P.K. Oshchepkov's death (there is contact name Mr. Ravil Shakirov, phone 7-095-325-78-13).

The Institute held eight all-Union sessions for 20 years. Tendency to make pronouncements for the effect, dogmatism, Marxist classics' and both alive and the late academics' citing featured the reports. The reporters were obviously playing safe refraining from accusations in scientific heresy and ideological sedition. There is no one constructive solution on dissipated energy concentration left for present time. Unaware of that, the Energy Inversion Institute was clear to have been working on the first Resolution task, although it failed to avoid the USSR Academy of Science's criticism.

On 20 November 1959 the USSR Academy of Science Presidium considered articles from a number of newspapers, dealing with dissipation and concentration of energy. It was pointed out "the matter has caused... a morbid sensation ... which has misled a wide range of readers" ("The Pravda", Nov.20, 1959). And now, as if "helping out" the readers, on Nov. 20, 1959 "The Pravda" on behalf of academics L. Artsimovish, P. Kapitsa, I. Tamm held up to shame N. Kozyrev for the claim that there is no power sources in stars and time can create energy. Further they blamed some members of The Metallurgy Institute for their belief that concentration of energy is possible. The academicians also remind "The Pravda" readers that efficiency factor cannot be higher than 100%. Twenty-eight years have passed, the list of academicians has been renewed but the Academy's interdiction spirit is timeless. On June 22, 1987 "The Pravda" informs its readers that academicians of new wave are also preoccupied with the Ziolkovsky's thesis, which is developed in The Energy Inversion Institute. Acad. E. Velikhov, A. Prokhorov, R. Sagdeev outright blame Oshchepkov's followers for popularization of unscientific ideas since they stated that "nowadays [1987] science does not possess a single fact contradicting the second principle". But at this time Veinik's invention "The source of electro energy" had been known for 9 years...

They suggest closing the Energy Inversion Institute for both the unscientific ideas and taking the institute employee's resources and time, perhaps away of the "bright future" building process. The less prominent scientists such as Doctor of Science V.V. Sytchev, Doctor of Science E.E. Shpilrain ("Energy" N2, 1987), E.E. Shpilrain, Candidate of Science A.M. Semenov ("Energy" N4, 1984), the USSR Academy of Science Corresponding Member L.M. Beberman ("Energy" N1, 1984) also played in public as obscurants. In that way Russian scientific "elite" met and swept away fuel-less energetics.

Such has been academics' (i.e. the State's) attitude to the new approaches: to forbid and to destroy. Genetics was trampled down, in "Voprosy Filosofii" ("Questions of Philosophy" magazine) cybernetics was sneered at, and today any ideas of torsion fields and energy concentration are attacked. They follow to CPSU behavior and no lessons have been taught yet.

The forecasts about energetics collapse coming were true and timely. However nuclear and thermonuclear energies were staked on, alternatives in energetics having been neglected. It was not by chance that E. Velikhov and A. Prokhorov led those programs and gave away fantastic promises to the world... But "the sea has not caught fire" until now... The launch of the first thermonuclear reactor has delayed from 1990 (according to Acad. Velikhov's claim of 1978) to 2050. Now USA refused this chimerical project. On the other hand the outlaws research teams now have already several laboratory prototypes (devices taking energy from the environment).

Due to their social status academicians are never supposed to accept novelty; they have no competitors, they are monopolists. **Fuel-less energetics will arise in design offices and R&D institutes rather than in the academy.**

How will the suggestions of their ancestors' be repudiated in Russian Academy of Science in 2015-2020? Particularly, the latter had been keeping back bringing to life the first task of the extremely wise CC Resolution of 1960.

The Russian Academy of Science will see the strategic turn of the energetics vector from present one to the fuel-less one, from Klausius to Ziolkovsky... Who will you join, new Russian academicians?

Anti-entropy processes in experiments

The well-known Maxwell's demon was the first to show that the processes not involving entropy rise are possible. In the imaginary experiment this demon was standing by the partition gate and sorted molecules according to their velocities, letting in "quick" ones and closing the gate before "slow" (cold) ones. From this the left side of this vessel becomes hot and its right side becomes cold. Since then (approx. 1871) searching for the "partition" has become the task to solve for entropy antagonists. Thermodynamics has been condemning this search in every way.

Presently, there have been found several "partitions" of the kind. Electric, magnetic, molecular fields work there providing generation of negative entropy and anti-entropy, i.e. processes beyond the Second Principles:

1. Due to surface tension (in nearly mono-molecular liquid layer) aqueous tension P above a drop of a liquid depends on curvature of surface. The more the curvature is, the less the drop is and more P is; in other case the surface is concave (like in a jar) and P becomes less than that above a flat liquid. Thus, **blanket can serve the partition** wanted. If the water is sprayed within the vessel under $T=\text{const}$, eventually the small drops having large P will evaporate and cool, while the big ones will warm up due to the small drops' molecules condensing hence heating up the former. This illustrates passing heat from a cooler body to a warmer one, for T in the vessel being constant. Design of this process of taking energy away of the environment can be made in many ways.

1.1. In 1979 the academician of Byelorussia Academy of Science A.I. Veinik patented "The source of electro energy" (patent #822713). It is described in his book. Small drops are created on the surface of a microporous partition. Points of junction of thermocouples are placed near the flat-water surface and near the drops. Electric

load is connected to the thermocouples. The drops seem to receive heat directly from the environment. The "Lazarev ring" is also described there.

1.2. The "Lazarev's ring" is a ring-shaped closed volume with a porous partition filled with a volatile liquid, which is capable to make long-lasting circulating under isothermal conditions without heat inflow. In case work has been done, the external heat comes to the area of evaporation, to the partition.

1.3. In a bigger scale this partition was studied, realized and fully described by E.G. Smenkovsky in his "energy separator". Temperature difference in each stage of partition system was increased up to 0.5°C .

1.4. In 1981-1987 engineer Avakov A.V. together with his son realized their "Open system" method to take heat from the environment applying gas hydrates. The method is based on the ability of water to combine with methane, ethane etc, forming a snow looking pulp at $3-6^{\circ}\text{C}$. At $16-18^{\circ}\text{C}$ it decomposes into water and a gas, pressure rising up to 600 atm. This gas is able to rotate a turbine. Inventors overcame the USSR Council of Ministers, "Energy" research and manufacturing company, All-Union R&D Gas Institute, Ministry of Gas... A demonstration device was built, with efficiency of 118%. A project of 100 MW power stations was designed. With the author's death (1912-1996) the work on the "open system" stopped.

2. TMI (thermomagnetic inductance) method was tested and described by the authors of this article, Zaev N.E. It is based on the interaction of charge carriers moving at **thermal speeds** V_x, V_y, V_z (with magnetic field H_y) in a semiconductor plate. It is necessary to note, H_y being perpendicular to the plate. (The plate has the plate-thick wide diagonal slots in its 4 corners and the slots approximately equal to the thickness of the plate). Lorenz force directs the charges upwards-downwards, leftwards - rightwards according to the vectors V_x, V_z . This causes Electro Motive Forces V and V on the plate edges (if intensity H is not constant along plate height Z). The values $V_x, V_y, \Delta H/\Delta Z, X''', Z''', \pm q, \text{time of motion } \tau, \text{ length of motion } l$ are necessary for calculations. Thus, for Bi (bismuth) and $\tau=2*10^{-9}$ sec, $H_0=15\text{kE}$, $T\sim 300^{\circ}\text{K}$, $Z_0=25$ mm, $V=5.5*10^{-6}$ V.

Really in the experiment for a much less H the voltage $V\sim 3.5*10^{-4}$ V was measured. This shows the reality of energy absorption (**with zero exergy**) converting heat into energy without considerable some ΔT and workability of the heat for any temperature $T\gg 0$.

3. Electrothermal separation of gas molecules into "hot" and "cold" (ETER) is theoretically developed by the author (Zaev N.E.), who considered the third time derivative of path (X)", **describing gas molecules radius travel in a coaxial condenser** (in an electric capacitor). In TMI two velocities (V_x, V_z) are effective, in ETER - only one. Point-to-point field intensity change on the way from one electrode to another is taken into account.

A glass coaxial capacitor is used in the experiment. It is filled with either air or air-ammonium mixture (ammonium is polar gas). The experiment is described in the collection of articles mentioned here. Cooling of the external electrode was expected. In the experiment with ammonium it constituted $\sim 0.1^\circ\text{C}$, with air it was $\sim 0.02^\circ\text{C}$. If the core electrode is made pipe-shaped, then the liquid, flowing in ETER, will warm up getting heat from the outer electrode, which will take heat from the environment (please, note there is no power spent on maintaining electric field between the electrodes).

4. On February 12, 1980 at physical section of The Moscow State University the author (Zaev N.E.) made a report on ability of a changing field to cool down some dielectric, with energy generation in this process. In 1892 B.B. Golitsyn proved mutual conversion of dielectric heat energy into electric one, and vice versa; the discovery went by unnoticed. Also Sytchev V.V. described ferroelectrics able to generate energy in the "heating-cooling" cycle with efficiency about 3%-5%. But variconds (ferroelectric capacitors) can work in the same cycle "charge-discharge", taking heat from the environment, with efficiency 126%. Really, for capacitance of 33 mF and frequency ~ 100 Hz, efficiency is measured about 138% (calculated is about 123%); power density of generation ~ 2.1 kW/m³. **In perspective, variconds based on polyvinylidene fluoride dielectric can provide power density up to 45 kWt/m³.** Capacitor power concentrator (generator) - C-cassor - actually represents the perpetual motion machine of second type. This non-linear dielectric with $de/dE > 0$ presents a close analogue of a spin system because its energy increases with E (electric field) rise up to saturation state only. It periodically generates energy, cooling itself. C-cassor is described in "Electrotechnica" magazine, N12, 1998, pp.53-55.

5. On March, 18, 1980 the author (Zaev N.E.) reported at the same Moscow State University on cooling of ferro-magnetics with a changing magnetic field, causing energy generation (ferrocassor). Details can be found in "Russkaya Musl" magazine (N2, 1992, pp. 7-28). The latest news of power generation in "M-D" ("Magnetization - Demagnetization) cycles is in the magazine "Electrotechnica", N3, 2000, pp.53-55. (Editor's note: Also see New Energy Technologies, #1 (4) of 2002, p. 40). Efficiency A_m/A_d ("Magnetization" energy / "Demagnetization" energy) **has reached 150% - 250% for magnetic power density $W_{den}H$ 10 kW/ m³**, for "MD" cycles frequency about 50 kHz. According to physical phenomena, the ferrocassor is the spin system (as it is generally defined notion) and it is the Thompson-Plank perpetual motion machine (notion of XIX century), which can generate positive energy periodically cooling itself. (Similar research has started in the UK by Remi).

6. In 1888 engineer D.A. Lachinov while carrying out water electrolysis in a sealed electrolyzer, discovered that power consumption to be usual but H₂ and O₂ gases are produced as very compressed gases (up to 200 atm).

Calculations showed that power spent on electrolysis is about 11% of the work, which is necessary to compress the gases! Long-year discussions have led the scientists to the conclusion that the power is taken from the environment (Pfleiderer G.). In 1993 the author (Zaev N.E.) patented the energy complex "Ecozan" (23.02.1993, patent #93,006,256). It consist of a high-pressure electrolyzer, turbines with a generator, heat exchanger to provide heating of the exhaust gases H₂ and O₂, fuel elements (water and energy from them is used in the electrolyzer). All the complex components work taking heat of the environment, **so on the whole its efficiency is more than 100%.**

7. In 1853 Stokes discovered that luminescent light has wavelength longer than the light falling on the luminophor. Soon it was discovered also that this law is not often true: some luminescent light has wavelength shorter than falling light. It became an epoch discovery, which was impossible to explain until M.A. Veinshtein's work of 1960. He calculated light power efficiency ratio: **it was about 160%, i.e. for 1 Joule of the falling light luminophor returns 1.6 Joule. The experiment showed that efficiency could be more than 160%. In Russia Yulia N Chukova successfully developed this phenomenon (topic name is "anti-stokes luminescence").**

8. Volod'ko Yu.I. established that **laminar air flowing out of an optimum nozzle has excessive energy due to the flow cooling down.** Based on this phenomenon a new flying machine (not consuming fuel) and a powerful concentrator of environmental energy are proposed. Russian Federation Patent #2,025,572 of 23.12.1991. Specific power of this system is about 3.5 kW/kg (without generator weight).

Presently, this concludes the list of known anti-entropy processes realized in experiments. Which of them are to become working technologies will be shown in the nearest future. Most probably it will be apparatus rather than mechanical devices (i.e. the systems without moving and rubbing parts subjected to wear). Such apparatus almost do not need external resources. Their lifetime is more than 50 years (like electromagnetic transformers). Major research with steady financing lies ahead. Non-government forms of the research projects are preferable in this case. New magnetic materials and new polymeric dielectrics are necessary. Also the physical research of the beyond-the-Second-Principle phenomena will be needed.

Additional information about untested anti-entropy devices

a) "A device for transforming environmental heat into mechanical energy", Dunaevsky S.M., Russian Federation Patent #2,101,521. Working heat is low-boiling substance (freon, nitrogen etc).

- b) "A device for generating mechanical energy and a way to generate mechanical energy", Roshchin V.V., Godin S.M., RF Patent 2,155,435 of 27.10.1999. Based on moving magnetic fields and environment interaction.
- c) **Obtaining of electrical power and thermal energy ("cold" on the cold junction, heat on the "hot" one) in a thermoelectric circuit.** It is based on special mode of the Peltie's effect, after the point of inversion of the sign of heat (+ or -) on the junction of the thermocouple. Details are in Zaev N.E., col. New edges of physics., M. 1996, p. 148-151.
- d) According to Maxwell's calculations Earth atmosphere temperature falls with height (a well-studied fact) due to the gravitation field effect on thermal processes. He, however, had to refuse from this conclusion, called later Maxwell's paradox, for it contradicts with the Second Principle. But yet if he is right, then heat flow and electric power can be obtained using a simple device. For example, two well thermo-insulated 100-500 m height tubes are put next to each other, the one is filled with hydrogen (0.089988 kg/m³) and another with xenon (5.8971 kg/m³); at the base the gases contact with the ground. According to V.F. Yakovlev's theory, who proved Maxwell's hypothesis (and independently K.E. Ziolkovsky's theory) gases would have different temperature at the same height. More temperature being in the tube with xenon having a greater specific gravity. If the top ends of the tubes are connected with a heat-conducting bridge, then heat will flow from xenon to hydrogen. **If thermoelectric circuit junctions (thermocouples) are mounted at the top-ends, the electric current I (A) will flow through the load R (Ohm) and heat $Q=I^2 \cdot R$ (W) will be generated in the load. Surprisingly, Maxwell's paradox has been discussed for more than a century but nobody has fulfilled such a simple experiment.**
- e) Referring to M. Faraday's approach to terrestrial magnetism, Zaev N.E., Becker G.P. considered the possibility for heating and cooling substance **due to change of its thermal capacity C**. It can be caused by many factors, including external magnetic field variation. **Changing C by 1% will result in $\Delta T \sim 3K$ without any special changes of energy of the substance. Any $\pm \Delta C$ cyclic processes make it possible to take energy away of the environment.** C-variation can cause descent of "cold" in the North, ground frost due to magnetic field variations. ΔC processes are very slow for they are consequence of polymerizing, i.e. forming structures (swarms) of oxygen molecules in a quiet atmosphere.
- f) Heat pumps also can be considered as examples of fuel-less energetics if they consume environmental energy.

The list of ten tried and half a dozen potentially correct ways of the environment energy concentrating proves that the academicians either to have been insincere when in 1987 they claimed to be unaware of the ways against the second "law", or they indeed knew nothing of them. This means they hid fuel-less energy possibilities and should be sued for that, or they acknowledged their own incompetence and thus have to take off their academics' mantles. Anyway, Russian Academy of Science Presidium should openly discuss the situation in the science about physical and technical basis for Russian power engineering.

Philosophic aspects of the new paradigm

The entropy phantom has deeply rooted in philosophic trends tackling the matters of the universe and science on nature and society. There is entropy in thermodynamics, entropy in information theory, biology, statistical physics, entropy of the Universe and the "Time arrow". So much has been written, so many discussed... That is why proof of its insignificance, using juridical terminology, experimental proof, should have various consequences in scientific and engineering fields.

Entropy phantom seems to stay forever, notwithstanding its consideration as just a calculating parameter. Revealing its actual meaning, removing its mysterious veil, Gubin V.B. still stresses its value as a tool.

The established anti-entropy paradigm "heat is self-valuable at any temperature" is not alternative to the classic thermodynamic paradigm "heat value appears only in its temperature difference or in "double-face nature". The first lies within the latter. It becomes obvious if "value" is substituted for "workability" because the term "heat" implies the same understanding of its nature in both statements. The difference, most considerable though, between the two paradigms is in utilitarian approach to heat. The first paradigm allows simplifying and reducing the way from heat to energy: instead of conventional "boiler-steam-blade (piston)-refrigerator" we have "boiler-block-work". Here "boil" represents a source, a volume with workable particles, usually it means the environment. Presence of heat at the beginning of the process (cycle) justifies close relations of final products in both paradigms. Absence of "steam", "blades", "refrigerator" is a technical difference only and the main advantage because heat ("exhaust") of zero exergy is usually consumed by a refrigerator, but according to the new paradigm it is workable in future, as the initial one, having turned into work.

In functioning ferro- and C-concentrators of environmental heat there seems neglected the general philosophical statement that actions is equal to counteraction (this is an inaccurate rephrasing Newton's III law

that the forces are equal and opposite). Important statement "action = energy x time" is not included into the system SI. In concentrators it is "Charge" C or "magnetization" (M) that make **initial action**, while **response** is due to "Discharge" (D) or "demagnetization" (D). Although energy inequality of the "initial action" and "response" is a rare case, the philosopher P.V. Florensky generally predicted it 76 years ago. **He introduced a medium with negative viscosity**, which resists every action with its own inner action oppositely directed to external action. It does not consume work but produces it and spends the saved energy. In that way his shrewd mind outdid experimenters for many decades.

The term heat has almost conventional meaning, being collective in physics; it combines all kinds of energy, which is radiant one in its sense for all range of waves. Not in vain Reni Junior in the beautiful story "Fight for Fire" praised flame and bonfire ashes twinkling. Back then the ancestor knew Fire to be the gift and punishment sent by Heavens. Heat needs living beings, it warms, lights, purifies. For economic context the unimportant from theory's point of view differences under discussions, play great part, since the necessity to possess, obtain and burn fuel disappears. The consequences of this fact are both bright and threatening.

Intrinsic doom of speculative concepts, based on transient Principles of thermodynamics, seems to be proved by the experiment. The Principles, being supported by the officials, had endured for more than a century and a half. They could be neglected, if they had not imposed their aggressive solutions to the whole world: heat can only be obtained by fuel burning; energy can only be transported through heat flows according to Carno cycle (and so on). Kuznetsov's appeals to scientists to devote their work to entropy growth control and combating Second Principle are very timely now. The best way to diminish entropy and to get rid of Second Principle myth is to develop the fuel-less energetics. Today's thermodynamics represents a rough copy of the visible essence in steam engines. As long as they grew more ingenious and variable, it simply followed them, but it never having been leading, never having been developing new ideas.

Brownian motion (water molecule, mercury atom) kinetic energy of a particle is connected with temperature unambiguously. But output energy of particle in TMI, ETER methods as well as energy of domains in C-concentrators and ferro-concentrators is a multi-parametric model: output net energy can be affected (besides thermal velocity) by the length of free path, carrier density, $\Delta E/\Delta X$, $\Delta H/\Delta Z$, magnetic and electric permeability. Parameters never before have existed in thermodynamics have included into processes of creation of energy. They are bringing Brownian motion energy instead of smoky bonfire heat.

Social aspect of fuel-less energetics growing

Importance of available power in this or that social structure yet has not been appreciated by social theories. It still is obvious: in developed countries the power consumption level is ~12 kW (~17 horse-powers) per each resident. Many centuries life went unchanged, only monarchs and leaders changed while energy was always produced by "**warm machines**" (oxen, horses etc) out of hay and oats. Since the end of 18 century "**hot machines**" (steam-engines, turbo-generators, pistons) have appeared, using fire, steam, coil, oil and petrol. They have dramatically changed our life for the last two centuries. Here comes the age of fuel-less energetics, the age of energy taken from "**cold machines**", making use of the environment. At a glance it looks like a sheer blessing:

1. It promises abundance of cheap kWt hours; they will be 15-20 times cheaper than now.
2. Electrical energy production is absolutely harmless and ecological.
3. Fuel-less power is highly autonomous, usually generated near the place of consumption (apartment, farm, ship, military outpost...).
4. Once started, energy concentrators will generate for unlimited long period (more than 50 years) with minimum maintenance effort.
5. This energetics will provide everyone with 15 (and more) kWt, which may raise labor performance and, respectively, improve living standards and comfort.
6. This power engineering will return Nature its rivers, woods, fields, because dams, high-voltage power lines, waste banks near mines and mines themselves, power plant pipes and ashes waste piles will disappear.

However, we should bear in mind the drawbacks of the transition period:

1. Steady shutdown of the fuel and energy industry will begin, i.e. redundancies of minors, railway workers, oilrig and oil refining workers.
2. Fall in demand on chemical current sources will result in dropping orders for lead, zinc, mercury, silver, cadmium which will cause unemployment in non-ferrous metallurgy.
3. Autonomy of new energy systems will lead to fall in demand on wires and cables. Long-distance power lines, high-power cable networks in cities will become useless. Heavy engineering industry (turbines, hydro generators, transformers) will be stopped due to recession in demand.
4. Eventually a recession in motor industry will start: diesel and carburetor engines of vehicles will be replaced by electric motors.

However, fuel-less energetics coming will be followed by intensive structural metamorphosis:

1. Electrical engineering has got long-term orders for a production of a wide range of electric motors replacing combustion engines.
2. Electronic industry will start mass production of micro-concentrators of environmental energy to substitute battery elements in home and portable audio and video equipment.
3. Contractors will get a huge pile of orders for estates and cottages because of the inevitable drift from the cities to the countryside. Low prices and availability of power allow urban facilities for comfort at any place.
4. Industry is to start mass production of compatible energy systems ranging from 0.5 kW to 50 kW applicable in apartments, farms, blocks of flats, "motorcycles", motor cars (particularly, electric cars).
5. Eventually ferrofrosters, double-purpose cassors, will come capable to produce both power and cold in the same unit.

Electric energy abundance, its availability will diminish one of the main problems of any civilization: concern about resources ownership and control, fuel mining, i.e. the concern about Heat. Thus the social structure with its functions, purposes and methods will start slowly but steadily evaluate. Struggling unemployment, working day will be reduced up to 6 hours, working week - up to 3 days.

Retirement age will lower down to 40-45 years; the army will tackle civil defense tasks only.

Motivation of labor will weaken; education will lose its attractiveness; then the "atomization" of society will appears, i.e. its fragmentation and personal isolation at farmers, cottages and villas will go up; also individualism, indifference to public matters will come up. New civilization will be set up on the land of new energy Eldorado as if returning to initial harmony with Nature and to the sense of human existence at a different level of the historic spiral.

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