Fusion by Pseudo-Particles, Part 3

The Future and Lessons of (Quasi-Particle) History

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Each pseudo or quasi-particle had its long fight for acceptance. Though semiconductors were known to exist by the 1880s, and the discovery of their rectification features commenced soon afterward, it was ignored by mainstream physics, meaning classical mechanics and Maxwellian electrodynamics. Semiconductor research was not even off mainstream, but off-off mainstream. Radioactivity was researched by the enthusiastic Curie couple, in filthy sheds. Even a generation later, in the 1920s, Wolfgang Pauli scorned semiconductors as "physics of dirt." Electron holes as quasi-particles did not storm physics departments. The idea reached industry and society a generation later in the early 1950s.

Similarly, dust particles and dusty plasma today are still a synonym of dirt, an unwanted byproduct from semiconductor manufacturing. Their practical utility is not yet apparent. It is an "alien" not only for the mainstream, but also for the off-off mainstream school of thought.

Today "real," analytically predictable, high-energy particle physics is the "mainstream." Emergent properties and multi-body interactions are not yet mainstream, although they are occasionally treatable by perturbation methods. Multi-body interactions yield "closed," analytical results only for a handful of symmetrical multi-body cases. They are not elegant, consequently not publishable in theoretical papers.

Influential makers of science policy don't think along the lines of "emergent," multi-body interactions, and endless series of committees and panel discussions have no room for weird quasi-particles, never did and never will. (They are highly educated experts, not just populist politicians.)

In fact, the longest, most expensive "civil war" of physics and science in general is already being fought along these trenches. On one side of the trenches are the well-equipped but poorly led armies of "thermonuclear fusionists," without using charge shielding and resonance. This is an unbelievably poor level of engineering, even by the standards of the worst engineering schools.

On the other side of the widest trench are the small, ill-equipped rebel army of "cold fusionists," mainly the followers of Pons and Fleischmann. Charge shielding, in the form of a deuterated palladium lattice, is on their flag. But it is still not good enough for victory.

An insignificant group of individual "guerrillas," mostly in the forgotten past, used different technical forms to make "high effective mass pseudo-particles." Consequently they had partial but little known victories from time to time but their greed, arrogance and extreme individualism made sure that they failed.

Even the thermonuclear fusion camp has its internal strife. There is some "friendly fire" between the inertial and magnetic confinement camps, but they become united to scorn the resonant Farnsworth Hirsh followers, the Russian "spheromaks," the Bussard polywell, or the focus fusion by Eric Lerner (U.S. Patent 7,482,607) using Joffe's bars, or the Stellator type of magnetic confinement, or G. Laberge's printer reactor (U.S. Patent 0198483/2006). This method is based on sudden adiabatic compression of the plasma by induced pressure waves with fast acting pistons. The fundamental engineering concept has come from laser printer injectors. The mainstream has exclusive access to friendly media, and a fresh supply of "cannon fodder"—troops from university indoctrination.

But thermonuclear fusion can't win against nature as it is because turbulent instabilities, eternal neutron losses, unavoidable heating inefficiencies are their worst and merciless enemies. (The recent fiasco of N.I.F. proves this point.) This "ghost army" of nature's forces will not let them win, no matter what they do.

So victory is likely on the rebels' side if they are willing to learn the skilled use of pseudo-particles. They may win partly because pseudo-particle research is by orders of magnitude less expensive than high energy thermonuclear fusion physics.

A lesson of science history is that electron holes as pseudo-particles in semiconductors have changed the methods of communication in epic proportions.

Phonons, polaritons, charged, oscillating dust particles, as pseudo-particles, have the same life changing potential for sustainable energy production in small, mobile, noiseless, inexpensive units. Phonons and plasmon polaritons are not new to science. (*Applied Physics Letters* and *IEEE Transactions on Plasma Physics* carries one or two new papers on these subjects in every issue.) But the practical application completely escapes researchers. Though nanotechnology is a rapidly expanding, and is now an accepted field of research, its workers are also unaware of the possible "gold rush" in their field.

The present state of affairs is a sad example of delusive indoctrination. Enormous effort has been spent on the elusive Higgs boson, which will yield no benefit for society, while pseudo-particle research, the research of emergence for multi-body interactions, lacks proper funding and fresh ideas.

Another area of pseudo-particle research has the potential of those two areas, namely of magnetic monopoles and magnetic currents. Rotating, charged ferromagnetic dust particles have the properties of South or North magnetic monopoles, as proven experimentally by the Austrian Felix Ehrenfest and the Russians Mikhailov and Mikhailova.

There are enormous fortunes to be made, followed by tectonic social changes from these other pseudo-particles. But change is not inevitable with the old mindset, where effort is wasted on useless "real" particles, and not enough opportunity is given to pseudo-particles.

In order to grasp the utility of the coupled plasmon-electron wave model, it will be useful to start from familiar ground.

The Benefit of Pseudo-Particles

The original Pons-Fleischmann idea was based on the hope that deuterium nuclei diffused into octahedral-tetrahedral sites will approach each other efficiently in the charge-shielded palladium metal lattice. Then the loading factor, endorsed by Michael McKubre, is indeed important.

However, in a static DC supply mode, the success rate and the reliability of these bulk-metal tests are low, as borne out by the experience of the last two decades. Mechanical vibrations of the metal lattice or current transients do improve the reliability and success but "surface contamination" ("poisoning") usually terminates good results. Though electrochemical deuterium loading is generally accepted and widespread within the LENR community, the underlying physical process is still debated.

Plasma based (*i.e.*, surface based) phenomena offer more pragmatic applications. J.P. Biberian offers a comprehensive opinion in his detailed review paper[1] of this field: "The use of gas phase instead of the original electrochemical system is certainly the future of the field. There is no longer the low temperature operational limitation as exists with electrolysis in water. On the other hand, the gas phase is a much cleaner environment that permits better control of materials. I believe that the most interesting system is the nickel hydrogen pair."

Gas (plasma) based inventions are as prevalent through the history of inventions (see Part 1 of this paper, *IE* #107) as electrolysis-based inventions. Even the nickel alloy (stainless steel) based invention of Stanley Meyer or S. Horváth might fall partly into this category, as some plasma might be generated in the hydrogen bubbles on the cathode during high current impulses.

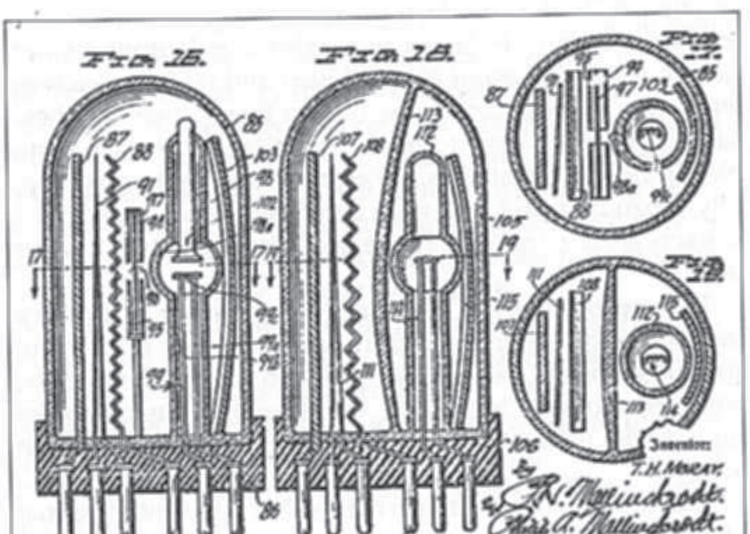


Figure 1. Cross sections of some Moray tubes.

LENR and Nanotechnology

Surface-based LENR inventions for electrolysis and plasma have the same reliability problem as bulk cathode methods, but it is easier to identify the important size and shape features of the surface. Moreover, rapidly evolving nanotechnology offers technical features previously unknown, like a dense matrix of sharp needles from metal or carbon cones grown for flat planet plasma TVs, or nanohole resonator arrays, etc.

Scanning electron microscopes yield better and better resolution and magnification of a surface, helping quality control. Mysterious "surface poisoning" might turn out to be nothing else but a damaged, razed, flat re-structured cathode surface. Only Paulo Correa carefully watched his cathode surface; Meyer, Puharich, Horváth and Chernetsky did not.

The recent paper by Moray King[2] is an excellent source of recent experimental evidence about the importance of surface quality. The patent application of Francesco Celani (U.S. 0124915/2012) is a really useful contribution in the LENR field. It is all about surface preparation. Contrary to the Rossi or Piantelli patent applications, the information in the Celani application can be understood, and surface quality control is described in terms of measurable parameters. It will be an historical patent.

Unfortunately the Moray patent (U.S. 2,460,707/1949) is not up to this quality. The cathode composition is listed as 5% copper, 55% lead, 30% sulphur, 10% aluminium. The molten copper aluminium alloy is the base metal, and then sulphur is added, then cooled, etc. The problem is that the surface texture is widely variable to heat treatment/refolding—as mechanical treatment. The folding/stretching treatment of this complex alloy has a double function. It acts partly as a catalyzer for decomposition of water, hydrogen, and molecular hydrogen, and a site for high effective mass plasmons—electron waves.[3]

The catalytic effects are significantly enhanced by bimetallic structures such as Ni-C or Cu-Al nanostructures.

The rapidly growing knowledge of nanotechnology helps us to appreciate the forgotten knowledge of past inventions, to clear the names of the inventors from the fog of ignorance.

The Moray tubes (see Figure 1) complicate further this foggy picture. There are sharp edges, large surface cathodes and anodes, and high voltages in this complex transient plasma tubes. To complicate this mess further, Moray claims in his other writings that the first stage of his device consisted of oscillating circuits only—with no plasma.

The explanation of the spectacular energy gain is of no use: "In my theory. . .electrons, protons, ions. . .they are portions of ether, that by some unknown means have become dissociated here and became electrically charged." The quasi-particle induced LENR model hopefully clears some of the thick fog.

Moray obviously chose high voltage, high frequency, low current plasma discharges in order to maintain surface quality. Correa, Chernetsky, Meyer and Horváth could not maintain it because surface erosion destroyed the grid of small needles, dendrites and cavities on the surface, and along with it the excess energy effect as well. Surface quality control in the nanometer range was a painful, hopeless wandering in the darkness for them. Dust is a more friendly medium, but not without its problems.

The importance of surface phenomena (thus its quality) is demonstrated further by the test results of Tadahiko Mizuno.[4] Mizuno clearly demonstrates in his paper that a transmutation process takes place at the surface within one micron depth at most, or even nearer the surface. John Bockris also noted the importance of surface needles—dendrites—for excess heat effects and the associated tritium production. Whenever these surface dendrites were removed by vigorous shaking of the electrolyte, the excess energy effect—tritium production—ceased. This is a good indication that needles and grooves on the surface enhance LENR phenomena, at least one technical form of it.

Mahadeva Srinivasan[5] arrives at a similar conclusion in his review paper "Wide-Ranging Studies on the Emission of Neutrons or Tritium by LENR Configurations: A Historical Review of the Early BARC Results." Srinivasan concludes that nuclear reactions seem to occur in highly localized "hot spots" and neutrons (if detected) are released in bursts. LENR reactions are more likely to take place at certain places on the surface and at certain times, periodically.

Srinivasan's fellow workers at BARC observed tritium production in Ni-H systems, "heat after death" phenomena and the lack of need for high hydrogen loading for excess heat for surface-dominated reactions.

These features are consistent with the polarization wave-coupled plasma wave model, which renders possible charge shielding by high effective mass quasi-particles, *i.e.* plasmon polariton coupled waves.

This tentative model offers a step-by step explanation of LENR devices discussed in Part 1.

The carbon dust device of Tesla and Egely, the copper-lead–sulphur "spongy cathode" of Moray, the needle and small cavity cathode devices of Shoulders, Correa, Chernetsky, etc., the micro or nanoparticle based devices of Piantelli, Rossi, Arata and Zhang all come under the same umbrella.

"Heat after death" is a runaway positive feedback effect in this model. Heat is created after the initial external excitation generating infrared waves. They in turn generate surface polarization waves on the surface, or resonances in a cavity. Thus these excited, high effective mass resonant electron waves generate neutrons by merging with protons, then deuterium, then tritium, then helium-4, releasing heat during these sub-steps.

The Role of Collective Oscillations

The "bottleneck" of these processes is neutron formation. The energy of the combined surface electron waves—proton cloud assembly, shown in Figures 1-7 in Part 2 of the paper—must reach a 0.75 MeV threshold level for the whole cloud. This is the salient point. It is not necessary for each individual proton-electron pair to have this high level. The sum of binding-oscillating energy of all proton-electron waves should reach this threshold, as this is a collective oscillation. It would indeed be difficult and energetically inefficient for single electron-proton pairs to form such a high energy. But tens of thousands of electron-proton pairs adding together their individual energy in a cooperative, coherent structure may easily reach this threshold level in a resonant process.

Continuous neutron generation is one major initial step of LENR phenomena. The ultracold neutrons react with other nuclei quite close to the surface; they seldom leave their generating environment, to say nothing of the reactor itself. This "branching anomaly" has been known from the beginning of the discovery of the LENR process and it is rather a blessing, not a curse. As LENR reactions are far less radioactive than mainstream thermonuclear reactions, they are more "user-friendly." Critics of the field, like Huizenga, used this fortunate effect to discredit the phenomena—still expecting the features of D-T thermonuclear reactions. But none of the several LENR reactions have intensive X-ray or gamma ray radiation. They are usually barely above the background level at all since slow neutrons have a high reaction cross section.

This is no wonder, since these fundamental phenomena and biological transmutations may take place even at room temperature. Most probably chiral media, the rotation of electrons above the surface of conducting nanoparticles, long molecules of carbohydrates and complicated, folded, conductive proteins are essential to transmutation and perhaps to energy production. Since life processes are more efficient and more sophisticated than anything we do with technology, no slow neutrons are expected to appear, *e.g.* around growing yeast cultures, capable of transmutations.

The neutron generation process is highly selective but only on a surface. Due to its resonant nature, a given cavity size can react either with deuterium or with ordinary hydrogen, but not with both. If the resonant cavity size distribution is not uniform, it may react with both hydrogen isotopes, but poorly, only at some isolated "hot spots," until it is destroyed by local heat. However, a mixture of D and H is suitable for such surfaces, as suggested by Edward Teller.

Cold worked, hard chips of titanium, full of sharp edges and cracks, or proper sized nickel alloy dust are ideal starting points for such plasma based experiments.

The combination of plasmon polaritons with a suitable surface quality offers a unified treatment for both past, forgotten inventions and for recent physics in nanotechnology. It helps to incorporate the useful technical features of these forgotten inventions, because this helps to establish a stronger probability of repeatability, and a better input/output power ratio. Moreover, the output in these revolutionary old devices can be electric energy as it was for Tesla and Moray.

The formation of neutrons, ostensibly through electroweak interactions (Widom-Larsen model) is only one among possible branches of LENR processes. The other, smaller branch is based on charge shielding and strong interactions. Here protons are involved in the reacting nuclei, in D - D → He^4, or p + D → He^3 type reactions for energy production. There are other reactions between heavier nuclei, causing transmutation phenomena; some are fusions, others fissions. Usually a combination of all the above phenomena takes place, as heavy ionized atoms may oscillate among the protons also.

Can we do away altogether with single protons and have only argon or neon "fuel" for the plasma? The Correas had such an environment but it had always been contaminated by some water, thus hydrogen, diffusing through the glass walls of their discharge tubes. Even He or Ne may be used as a fuel as for Papp, but it is inefficient and therefore technically useless.

It is important to note that each of the technical solutions is able to generate neutrons. Only the dusty plasma and surface plasmon polariton processes are really collective oscillations. Papp's collision chain/negative ion charge shielding is a somewhat unique process, broadly fitting into the LENR process since it has no plasmon polaritons.

Direct Experimental Proof

A major disadvantage of these processes is that it is difficult to test them directly. Though the study of surface plasmons on flat gold or silver plates, or in glass embedded colloids, is common and widespread in mainstream science, it is rare in diluted hydrogen or deuterium plasma. The only exception is the test of Peter Hagelstein, Dennis Letts and Dennis Cravens,[6] who induced surface plasmon polaritons on a palladium surface by the beat frequency of two lasers directed toward the same small spot. The lasers were tuneable in the optical range of petaHz, therefore their difference or beat frequency is in the infrared (terahertz) range. By carefully adjusting the beat frequency, they noted some distinguishable resonant frequencies, where local excess heat was produced.

It was noteworthy that a very small amount of input energy for the surface wave excitation was enough to induce local excess LENR heat energy, but by orders of magnitude higher. This was a smart, well-designed experiment. Unfortunately it got less attention then it deserves.

Sharp energy producing resonant peaks were observed at 8.4 THz, 14.5 THz, 14.75 THz, 15.3 THz, and a broad resonant peak between 20.0 THz and 21.4 THz, showing the characteristic features of Fano resonances discussed in Part 2. They have also noted the influence of the surface quality of the cathode, since different sites produced wildly varying amounts of excess heat.

In fact, this idea can be used to create a diagnostic tool for electrolysis only. By radiating a very small spot in a given infrared spectra (or a controlled part of the spectra), it is possible to identify the excess energy generation capability of a surface. A collimated infrared beam transmitted by a flexible optical fiber would do the same job. The amount of locally produced excess heat can be measured by infrared thermometers.

Lasers are not economic tools for the excitation of large surfaces, but infrared radiation does the job, as was noted by Focardi, Scaramuzzi, Celani, Rossi, Piantelli, Arata and Zhang, just to name some researchers. Transient electric field excitation is another practical method, but not good for diagnostics.

The Letts-Cravens-Hagelstein experiment provides a deep insight into the resonant nature of the LENR excitation process. If there is no resonant excitation of surface plasmons (or volumetric phonons), there is no appreciable result in the form of excess heat or transmutation.

Unfortunately the method cannot be applied to transient plasma-based processes, because the generated heat is measured in a time integrated way, over a large area or volume.

The Winner is. . .

There is no definite result at the time of writing, because the race for mass production is just about to start. Therefore bookkeepers, the real judges of any race in the economy, are not working yet. The opinion is therefore my own, based on "hands on" experience.

Frankly, there is not much future for any devices based on electrolysis. It is due to problems of quality control, *e.g.* surface roughness, width depth and length control of cracks, and the site of surface plasmons. Bulk palladium devices are out of the question, partly because of their high price, partly because of their weak, unreliable performance. Thin film, Ni layer devices might be of academic, but not practical, interest.

Tera-peta hertz frequency, 200 - 600°C plasmon polaritons are more economic to make than less frequent volumetric phonons. A more favorable economic output is expected starting from mid-temperature range (~200°C) $Ni-H_1$[1] systems for heat production. These are micron or nano sized grain particles heated just under the "heat after death" temperature (400°C) in order to be able to control the process. Any higher temperature is not a really good solution. I favor carbon nanodust territory (dust acoustic resonance), a field of carbon nanoparticles and charge shielding by two simultaneous processes, shown in Table 1-4 and 1-5 in Part 2.

Papp's process is the most suitable for mechanical work. Although it is meant to replace internal combustion engines, its future is not guaranteed because direct electrical energy generation is a more straightforward solution on board the newly developed electric cars.

In this field the carbon-based Tesla process and the "Swiss cheese" cathode Moray process compete with each other. The latter one is less efficient and requires a very high input voltage, not accessible by present conventional technology. Its only advantage is its reliability and durability, as cathode erosion is not significant. (It is a resonant process, using low-current; see Figure 1.)

The Gray, Jekkel-oxy-gas, Correa or Chernetzky processes are quite cumbersome. Thus an insight to the features of charge shielding and quasi-particles, and multi-body interactions, gives some clue to the economy of these processes.

There are two dark horses in this race (one is based on another quasi-particle, the magnon, which is generated by transient magnetic phenomena). The forgotten inventions of Hubbard, Hans Coler and some other researchers give definite hope for direct energy production by resonant magnetic circuits. (These are not permanent magnet motors—which are a dead end street, except perhaps the Yildiz motor. My guess, based on some firsthand experience, is that the Tesla legacy can be competitive here.)

The Competitors

The first competitor is the so-called "monothermal cell," usually simple solid-state devices producing a low voltage low current. The effect was discovered about 20 times during the last century, but always went into oblivion. This device consists of two electrodes of different materials, with a semiconducting material between them. The electric field creates a preferential direction of charges in the semiconductor due to the difference of contact potential. The charge may be an electron, or a quasi-particle—an electron hole. The thermal noise and/or vacuum fluctuations are the source of the electric energy. The random oscillations of the real and pseudo charges are rectified by the internal electric field established between the electrodes of different materials.

The current density is in the order of micro amperes/cm^2, though it can be substantially increased with proper technological development. The output is intermittent, though after a few minutes the semiconductor filled cell becomes "tired" due to excess charges building up in the vicinity of the electrodes. The power production of the cell recovers after the load is switched off for awhile.

The author and his colleague, J. Szamosközi, have about ten years of experience with the system. Our electrodes were made of either copper-aluminium or copper-carbon. The semiconductor material was selected out of thousands of household materials: poorly conducting plastic materials (antistatic plastic), glues and paints, mixed with different fine grain powders.

The technical challenge is to spread this semiconducting material evenly in a thin layer between the electrodes. This thickness is usually in the order of 50 - 100 micrometers. If it is thinner, a slight technical error may cause a short circuit in the cell. But if the semiconductor is thicker than about 100 micrometers, the electric field between them is too weak, and the cell resistance is too high. Thus the overall output is reduced.

It is not easy to find a suitable material, as most paints deteriorate or dry after a few weeks and plastic materials tend to lose their conductivity as they age.

Silicon-based semiconductors must be doped to have a proper conductivity, and are expensive and fragile to make. Organic semiconductors are promising for these applications although they are not available for amateur researchers.

We have even used brake (hydraulic) fluid in thin layers, as it is easy to spread, and with a thin insulating mesh, large surface areas can be established.

A typical cell is shown in Figure 2, taken from a German patent application by Eckhart Kaufmann in 2009 (DE 10/2009017961), using copper-zinc electrodes.

Figures 3a and 3b are photographs of one of our experimental cells with copper-carbon electrodes. The semiconductor is a "fine-tuned" industrial glue mixture. This is the sixth generation of such a cell. Each new cell doubled the electric output of the earlier one. The 10 cm^2 electrode area is able to flash a small LED every 10 seconds. The previous cell was able to flash after a 50 second delay period. The typical cell voltage is about 0.5 V, thus it is not the electrochemical contact potential difference.

The effect clearly violates the second principle of thermodynamics as it is stated in the textbooks, which claims that due to irreversibility one cannot gain energy with the help of "Maxwell's demon." That is, we cannot separate and accumulate fast and slow particles in a gas, and thus create a temperature difference. However, this principle holds only for electrically neutral particles, not for the charged ones we use, even if they are quasi-particles. The monothermal cell is in fact a Maxwell's demon.

The "monothermal" cell theory was established for electrolytes by the late Romanian inventor and theorist Nicolae V. Karpen. Figures 4a and 4b are two photographs of Karpen's devices in the 1940s. They have constantly produced electricity ever since in the National Technical Museum of Bucharest, continuously driving a small torsion pendulum. There has been no sign of deterioration of the gold-platinum electrodes since then because the effect is not based on stored electrochemical energy. Figure 4b is a close-up of a Karpen cell. (Note the similarity to a Pons-Fleischmann cell.) The Karpen theory was later extended to semiconductors by M. Marinescu, but both scientists had an "icy" rejection of their work (like LENR). Thus their work is barely known except to Romanian electrochemists.

Magnon-Based Devices

For most "established" opinions all these LENR and monothermal devices are heresy. But they pale compared to what comes next.

From time to time amateur researchers stumble into an unusual, mostly resonant effect, when electricity is produced

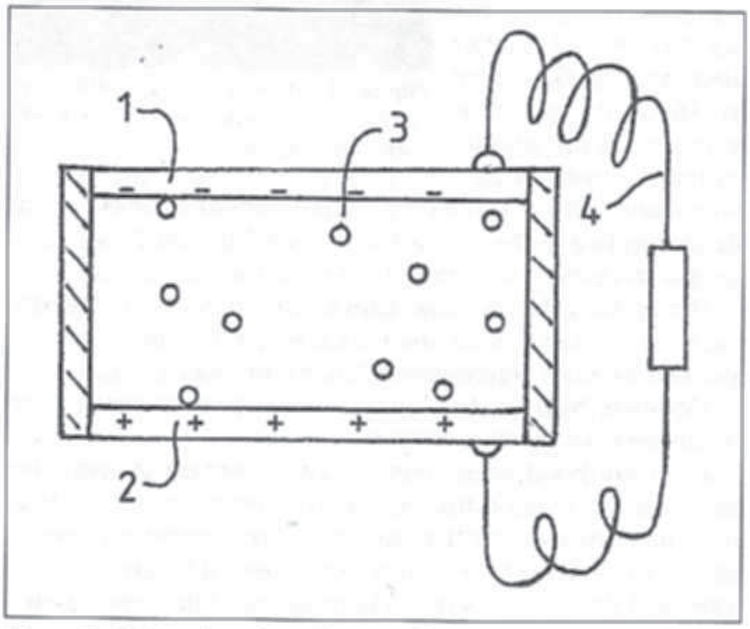
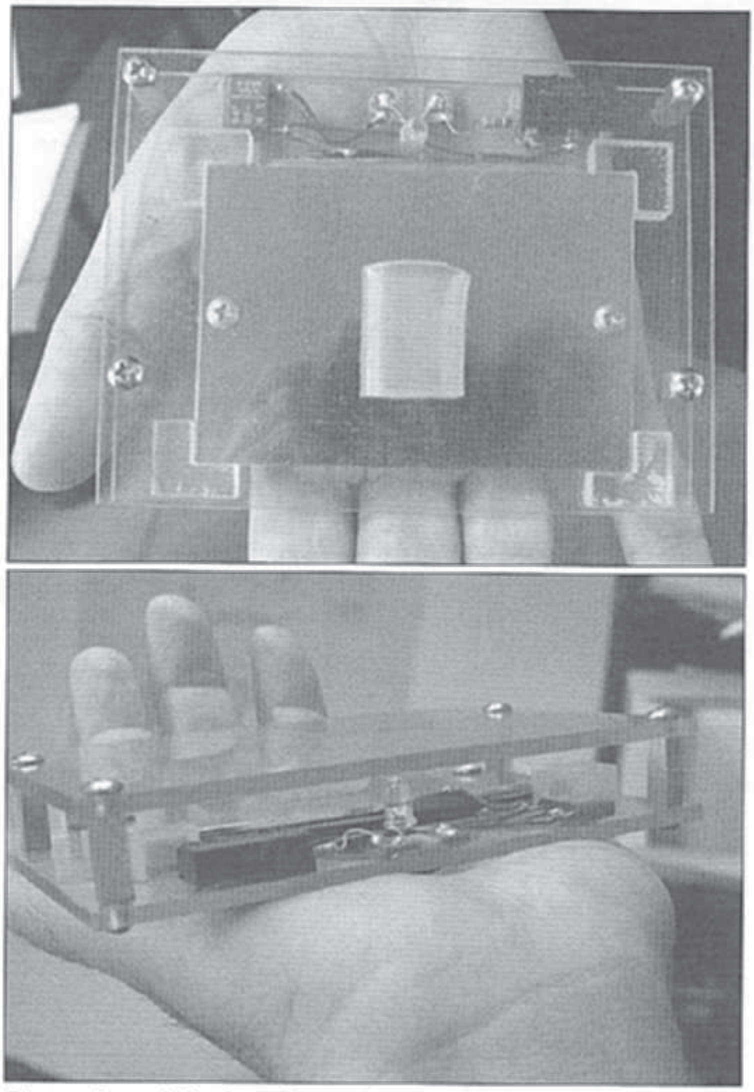


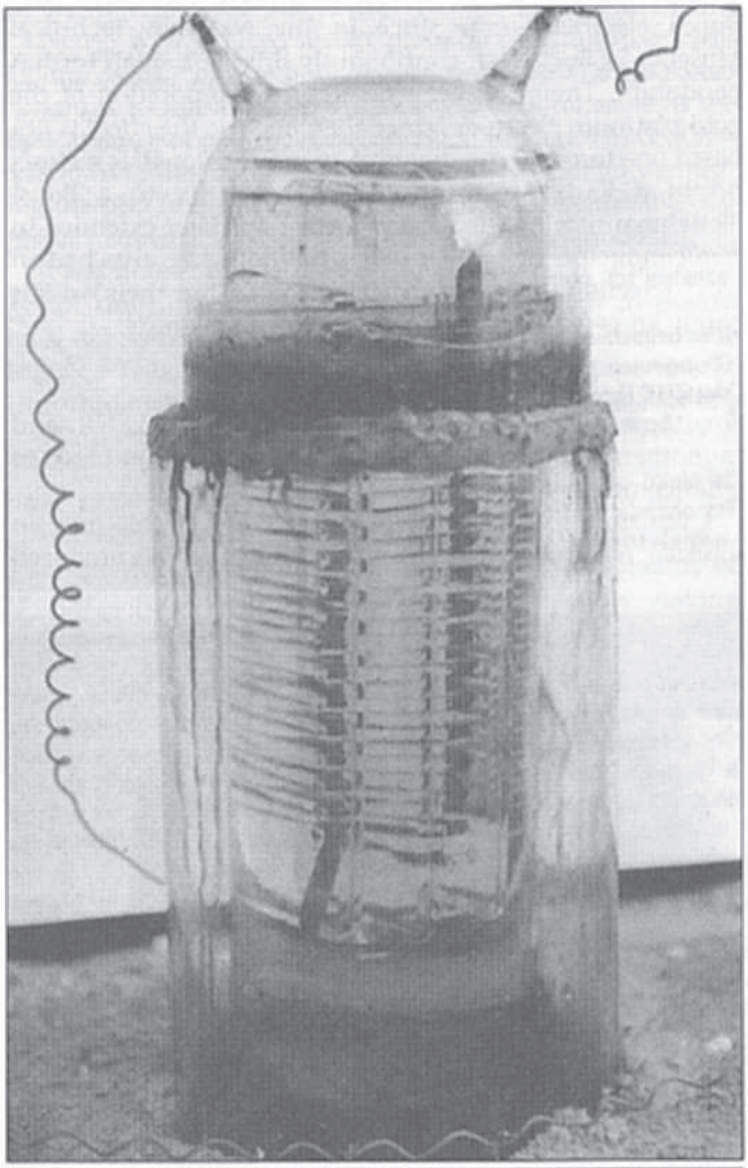
Figure 2. Schematics of a unitherm cell.

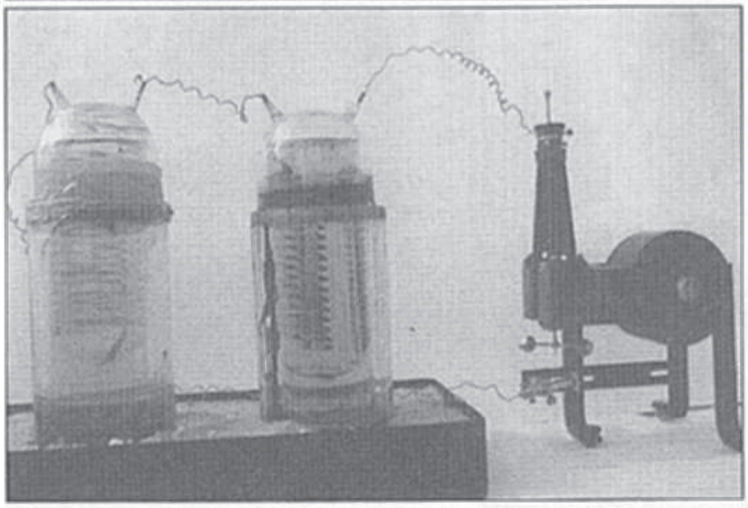


Figures 3a and 3b. One of our cells in the author's hand.

apparently out of nothing. Usually only fragmented information is available and these devices seldom get patented. The very cautiously worded U.S. patent for Gunderson is the exception, not the rule (8,093,869/2012, Apparatus for Generating Electricity Utilising Non-destructive Interference of Energy).

From a distance, the author is involved in the re-development of such a device, called the "Hubbard resonant transformer" (see Figure 5). So far only a small amount of excess energy has been measured. The parameter range where the resonant excess energy appears is narrow. It took years of work to find it. Obviously most readers will dismiss this since it violates the energy conservation principle.





Figures 4a and 4b. Electrolytic cells by Karpen yielding a small amount of electric energy.

Let me remind the readers how science works as an institution. The energy conservation principle was established by a German physician, Meyer, who made this statement for closed thermodynamic systems. He was considered then as a fool and an outsider. His papers were not published by the established journals in the 1820s.

Then, due to Helmholtz, the idea has been excessively generalized even to systems which were not carefully tested due to the extreme technical challenge of measuring all the necessary parameters at the same time. For example, 50 Hz resonant, noisy, iron core transformers were found to yield too much heat, but heat output is usually not measured automatically. Dissipation losses are believed to be equal to the generated heat. However, some transformers "poorly designed" and in a non-linear ferro-resonant mode of operation do yield excess heat or vanish heat. The subject deserves a separate paper. Only magnons as quasi-particles are of interest here.

Another well-known, eye-catching phenomenon, where the conservation of energy is apparently violated but never mentioned, is the tornado. The tornado, and the dust devil in arid areas, are typically rare, self-organizing phenomena, where physical models and computer software are unreliable. Mathematical models notoriously break down and fail to predict or even to simulate these effects, despite the best efforts.

Data fed from real life events provide reliable initial and boundary conditions. However, in simulations tornadoes stop in a couple of seconds, whereas in real life this kind of vortex might exist for hours without losing its energy content while destroying houses or sucking up small lakes and rivers.

Figure 5. A resonant experimental Hubbard transformer with Ohmic load, under development.

Our tornadoes are short-lived compared to those in other planets. The most famous is the big red eye of Jupiter discovered by G. Cassini in 1665. It has been rotating along smaller vortexes ever since. Saturn and Uranus also have such permanent vortexes. Even Venus has two of them. It is worth knowing that these giant gas planets emit much more heat than they absorb.

The spiral galaxies have anomalous movements (hence the need for dark matter and dark energy), yet spherical and globular galaxies behave according to textbooks.

Modified Newtonian dynamics has been suggested to avoid the need for dark matter.

Trout are good swimmers in fast mountain streams. In fact, they are so good that they do not move at all, yet they are not swept away by the fast rivers. Their secret is a tornado-like flow around their body as discovered by an Austrian forester, Viktor Schauberger. There are some modern followers, too.

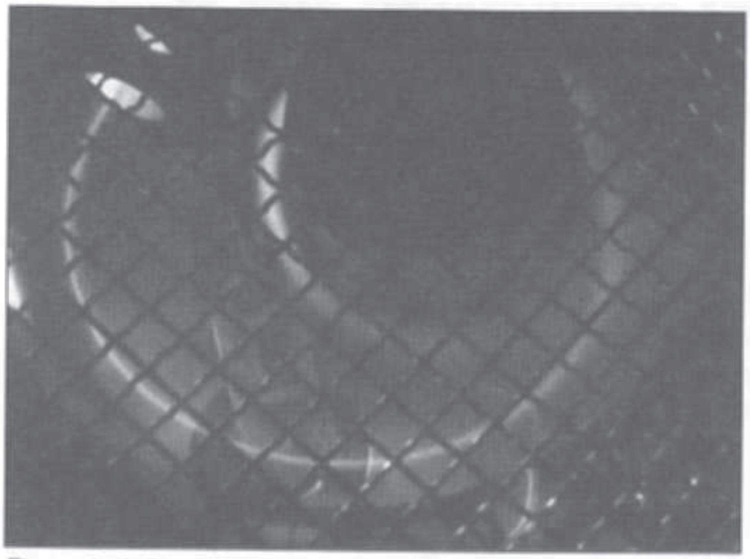


Figure 6. A "good" electron beam penetrating a repulsive electric field.

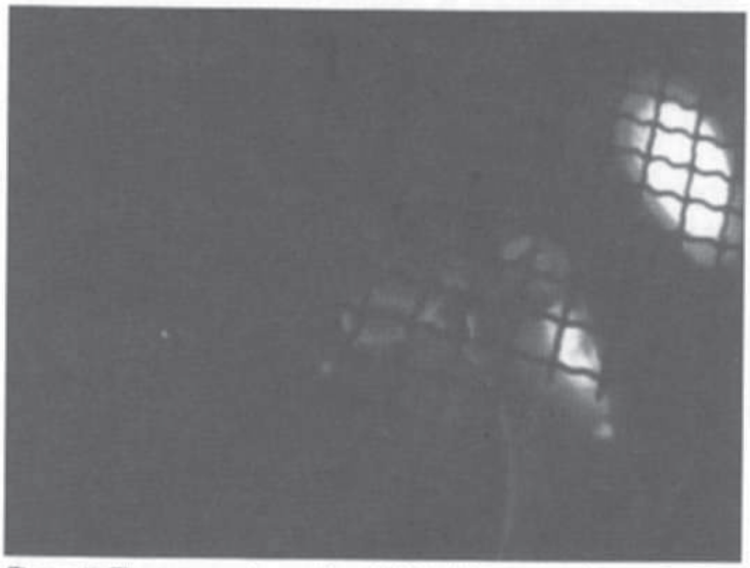


Figure 7. The same set-up with a slightly different incident angle. The beam is repulsed at zero potential.

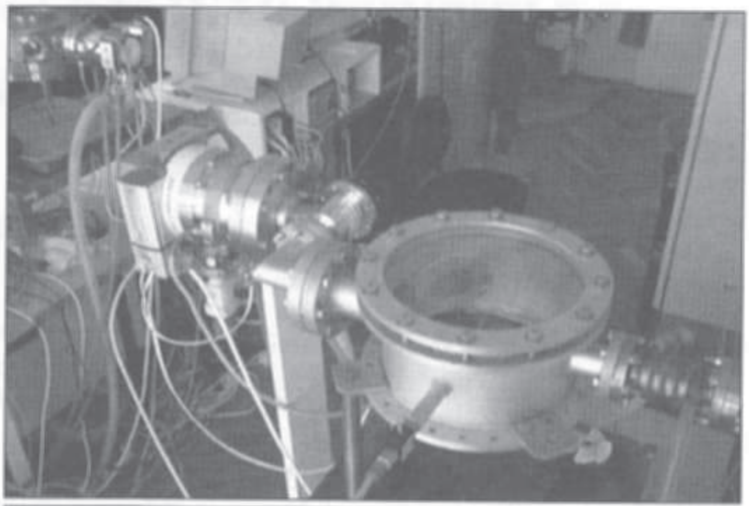
The excellent mass produced sack-less vacuum cleaner by Dyson is a good example for an industrial application. But he had to build 5,127 experimental models to find the "right" parameters when the "cyclone" works "miraculously." Otherwise it is of little use.

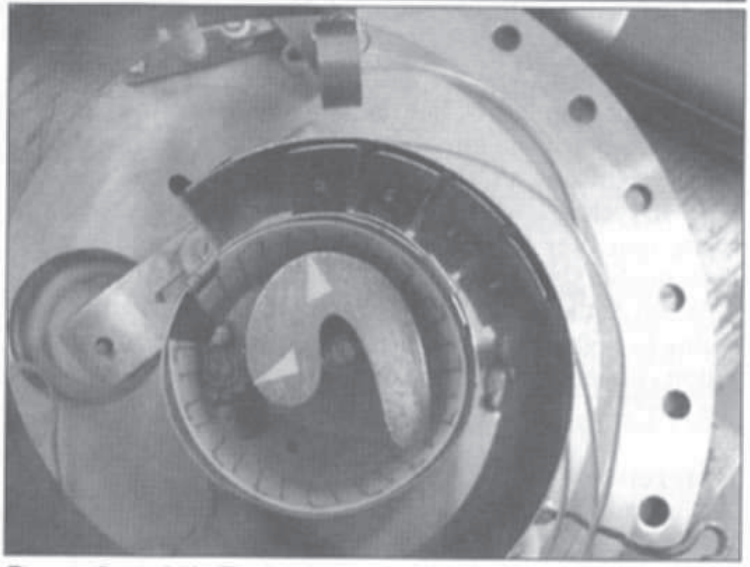
Another remarkable invention was worked out by Harry Schoell in Florida (Cyclon Power Technologies Inc.) It is a flame/steam cyclone with up to 46% mechanical efficiency. Considering the necessary losses, it is about 20% better then what is allowed by textbook physics.

Indian inventor Somender Singh patented a vortex-based internal combustion engine (U.S. Patent 6,237,579), which has also an unusually high efficiency.

This author and his team have developed an electron beam tornado based on the same principle. There is no room here for the details, but a properly formed electron beam may penetrate a repulsive electric field up to 180-200 V potential difference, provided the beam travels in spiral electric and magnetic fields. In Figure 6 a "correct" parameter set is shown, when the beam penetrates the repulsive field.

In Figure 7 the beam bounces back from the same field because the angle of approach is not correct. The vacuum vessel is shown in Figure 8. More photos can be seen on the website www.greentechinfo.eu .





Figures 8a and 8b. The electron tornado vacuum chamber from outside and from inside.

There are a wide range of renewable energy production technologies where there is no fuel and thus no pollution.

LENR is the best candidate though. However, none of the present established old or "renewable" technologies are good enough for our needs.

Hot fusion, solar or wind, uranium based reactors are not mentioned here because they are uncompetitive with quasi-particle based light element fusion (or neutron capture if you prefer).

Not so long ago, light water experiments were used by "cold fusion" researchers as control experiments, because they were convinced that nothing happens there. Their tacit assumption was that a D + D reaction, and charge shielding by the bulk palladium lattice, drive a fusion reaction. It turned out that shielding is nearly as weak as that in the Tokamak plasma. But quasi-particles will come to the rescue—for those who are able to use them.

Epilogue

The first theoretical paper on the possibility of neutron capture and nuclear transmutation was written by G. Gamow in 1935.[7] Julian Schwinger, the most original U.S. physicist, suggested this mechanism again to no avail in the early 1990s. There is a need to translate these ideas into inventions. There is no hint of how to do it here on Earth in a machine. The quasi-particle-based LENR devices of Tesla and

Moray were witnessed by dozens of people, but became forgotten by the time Schwinger formulated his theory.

The existence of magnetic monopoles (as a fine example of a quasi-particle) was discovered by Felix Ehrenhaft in the 1920s witnessed by dozens and published in several papers. V.F. Mikhailov re-discovered them to no avail. This subject is ignored by mainstream science.

Monothermal cells violating the second principle of thermodynamics have been discovered and forgotten dozens of times.

A forgotten Korean researcher, Hyung Chick Pyun, discovered by accident a semiconducting organic polymer, containing polyacetylen, in 1967. This could be an excellent application for an electron hole-based monothermal cell. Later the American Alan MacDiarmid got the Nobel Prize for the discovery, but the monothermal energy producing effect is still unknown.

Powerful tornadoes are well-known here on Earth and on other giant gas planets, but their energy-producing capability have escaped the attention of researchers. Although this effect is utilized in the Dyson vacuum cleaner and the Schoell cyclon lawn mower, even their inventors are not aware that they violate the First Law of Thermodynamics. Each method is capable of producing "infinite energy."

When Arctic ice is melting, the economy is tethering partly due to high energy prices as resources are dwindling, pollution chokes half of China. Isn't it time to think "outside of the box"?

References

1. Biberian, J.P. 2009. "Low Energy Nuclear Reactions in Gas Phase," *Low Energy Nuclear Reactions and New Energy Technologies Sourcebook*, Vol. 2, eds. J. Marwan and S.B. Krivit, American Chemical Society Symposium Series 1029, Oxford University Press, 9-34.
2. King, M.B. 2012. "Cavitating Electrolyzers and the Zero Point Energy," *Infinite Energy*, 18, 106, 8-15.
3. For more about the catalytic effects see: Zhou, B. *et al.*, eds. 2002. "Novel Catalytic Properties of Bimetallic Surface Nanostructures," *Nanotechnology in Catalysis*, Vol. 1, Chapter 2, Kluwer.
4. Mizuno, T. 2009. ""Transmutation Reactions in Condensed Matter Laboratory of Nuclear and Environmental Materials," *Low Energy Nuclear Reactions and New Energy Technologies Sourcebook*, Vol. 1, eds. J. Marwan and S.B. Krivit, American Chemical Society Symposium Series 998, Oxford University Press.
5. Srinivasan, M. 2009. "Wide-Ranging Studies on the Emission of Neutrons and Tritium by LENR Configurations: An Historical Review of the Early BARC Results," *Low Energy Nuclear Reactions and New Energy Technologies Sourcebook*, Vol. 2, eds. J. Marwan and S.B. Krivit, American Chemical Society Symposium Series 1029, Oxford University Press, 35-57.
6. Letts, D., Cravens, D. and Hagelstein, P. DATE "Dual Laser Stimulation and Optical Phonons in Palladium Deuteride," *Low Energy Nuclear Reactions and New Energy Technologies Sourcebook*, Vol. 2, eds. J. Marwan and S.B. Krivit, American Chemical Society Symposium Series 1029, Oxford University Press, 81-93.
7. Gamow, G. 1935. "Origin of the Chemical Elements," *Ohio Journal of Science*, 5, September, 406-413.

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