

FACES OF LENR

Part 2: From Alchemy to Biological Transmutations

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Introduction to Part 2

In Part 1 the symmetry of rotation was introduced in “electrodynamics.” One practical application was discussed—the formation of heavy “condensed plasmoids” or “exotic vacuum objects” (EVOs). In this part we shall continue by explaining how rotation in charged particles appears in inorganic and organic natural phenomena.

We shall argue that the rotation of charged dust particles generates a spin field. This field catalyzes fusion of the stars that curiously does not take place inside the core, but on the surface of the interplanetary dust particles outside of the stars, in their solar corona.

The most powerful explosive energy generation of the Universe, quasars, are also driven by the above “partially controlled” dust fusion process, and *not by arbitrary black holes* as it is assumed now.

We will see that biological transmutation is also driven by a spin field, generated by the rotation of protons in the cell walls of mitochondria, in all living beings.

These rotating ATP synthesizing enzymes are the essential parts of the respiratory chain in all life forms and create a spin field. Therefore biological transmutation is *expected* in all life forms. Arguably this shows the most efficient low energy nuclear reactions (LENR), but it is outside the realm of engineering today, even at the high-tech level.

The shocking novelty of the above ubiquitous natural process (most apparent in biological LENR) lies in the fact that the fusion process takes place between two atoms *without shedding the electron cloud around their nuclei*, opening the road to the fusion of heavier nuclei, too.

Thus LENR is an essential ingredient fueling the Universe, and in life as well, as an auxiliary effect. Spin (and torsion) fields are essential to make spatial order in life (at the cellular and organ level) out of the high entropy of the environmental noise.

The Criteria of LENR Fusion

In order to have a plausible chain of arguments to describe the above processes, strong arguments are necessary for:

A) Spin (and other electric charge rotation related fields) exists in extended, non-Abelian electrodynamics. There are a number of repeated, unrelated observations to prove that spin fields exist naturally around elementary particles, shown by scattering experiments, even in current loops when the freedom to rotate is granted, and when rotating

particles are exposed to light in the visible spectra. Later in Part 4, we shall argue that spin fields are generated not only by rotating electric charges, but by rotating masses too. This connects mechanics, and gravity, to electrodynamics, contributing to further fields related to gravity. These fields are also mediated by an ether consisting of neutrinos.

B) *There is an indirect indication that externally generated spin fields are responsible for the alignment of whole atoms (not only the nuclei) to initiate low energy fusion.* This process is ruled out according to (non-rotating) Maxwellian electrodynamics, as E, B fields (electromagnetic field tensor) prohibit fusion at low temperature due to the *repulsion* of the Coulomb fields. So there is no room for catalysis with ordinary particles (atoms) at room temperature. Yet biological transmutation does it. No wonder it is shocking for nuclear physicists. Outside of this box, rotating electric charges generate spin fields by a wide variety of technical means, which catalyze these low energy reactions in weakly ionized molten liquids, plasmas or soft, condensed chiral media.

C) Spin fields, along external electric fields, shield the individual nuclei and electron shells, directing atoms towards each other, and facilitating LENR. This is what is observed in biological transmutation, where shedding the whole electron shell is lethal. This is the reason why the very existence of biological transmutation is rejected by mainstream science—ignoring the tricky engineering of life.

D) A neutrino related vacuum (or ether) is an essential ingredient of LENR fusion. It has two sources: 1) Thermal, low energy neutrino flux, generated in the outermost, coldest edge of the stars; 2) This bottleneck can be widened by the generation of thermal neutrinos (Parkhomov effect).

Symmetry: Completing the Picture

In order to have an even grudging acceptance of the above statements, two lines of arguments will be followed. One line is along symmetries, the other along experiments which somehow eluded censorship.

Symmetries are the best tools to figure out all possible movements that don't change. There are two major classes of symmetries: continuous and the more familiar finite ones, like mirror symmetry, charge replacement symmetry, time reversal symmetry. In classical physics the mirror symmetrical inorganic objects can be replaced by a mirror symmetric counterpart, so there will be no problem. In biology a mirror symmetry operation is usually lethal. A mirror-symmetric

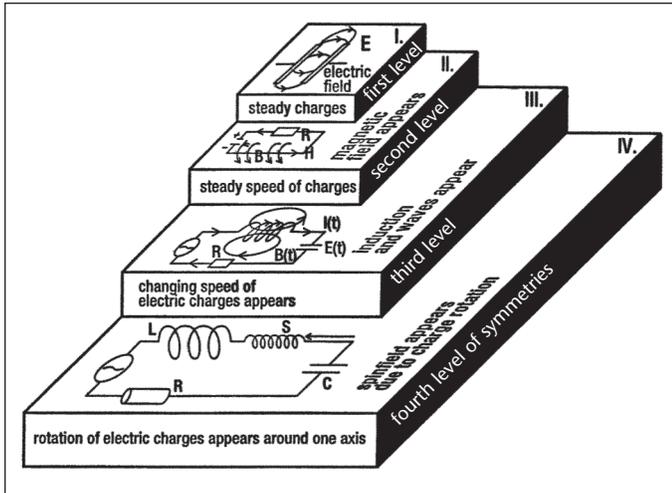


Figure 1. The level of symmetry pyramids. New phenomena are created by fewer, lower level symmetries.

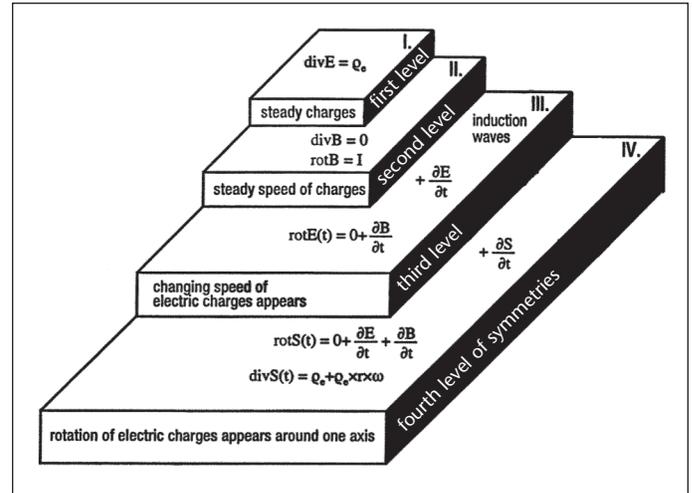


Figure 2. Mathematical terms of the successive symmetry reductions. Note that a spin field is a tensor of rank 2, but shown only as a vector.

DNA, for example, is useless.

By adding new, unexplored symmetries, new possibilities always appear on the horizon, like when climbing at higher and higher elevations. In one set of symmetries, a certain phenomena is not possible—like static electric charges do not generate magnetic fields. The higher the level of symmetry, the simpler the possible pool of effects. Conversely, reducing the symmetries by adding yet another form of movement, a new unexpected phenomena will crop up, as the movement of a precessing, nutating gyroscope is unpredictable just from looking at the $F = m \cdot a$ equation.

Therefore we shall complete the extension of electrodynamics with rotation being a seamless process. The extension doesn't harm the original set of interrelated effects. The rotation will be simply embedded into an extended set of symmetries, causing the appearance of new fields, new material properties and new Lorentz forces, which leads to hyperspace. (We may like it or not, but it is predicted to exist.) New material properties are especially important to have deeper insight into how order is created in cell biology.

In Figure 1, a hierarchical level of symmetries is shown, when electric charges are considered. A detailed description of the levels follows:

- I. On the top of the pyramid of symmetries, static electric charges create a static electric field, e.g. when amber is rubbed, static electric fields appear.
- II. When static charges are allowed to move as a constant current, static symmetry of electric fields still exist at the electrodes of a battery, but moving charges already create a B magnetic field.
- III. When the current is allowed to vary in time—that is, translation symmetry is broken—induction and waves appear. This is the “classical” Maxwell type of electrodynamics, by which spatially steady and transient currents are created, but due to its slow electron velocity, the charge rotation in a solenoid is still negligible.
- IV. When the current is allowed to rotate in a very small radius (biology-nanotechnology), a spin field appears (see Figure 2). When wires that are conductors are arranged so that they are allowed to rotate, torque appears. They are weak, but measurable, as shown in Figure 3 with Sigalov's completely forgotten results.

When charges move in a vacuum, or in a discharge tube with high mobility, rotation of charges also appears. An oscillating circuit will contain three types of fields from now on. Thus unusual resonance types will appear, and the spin field will carry torque and angular

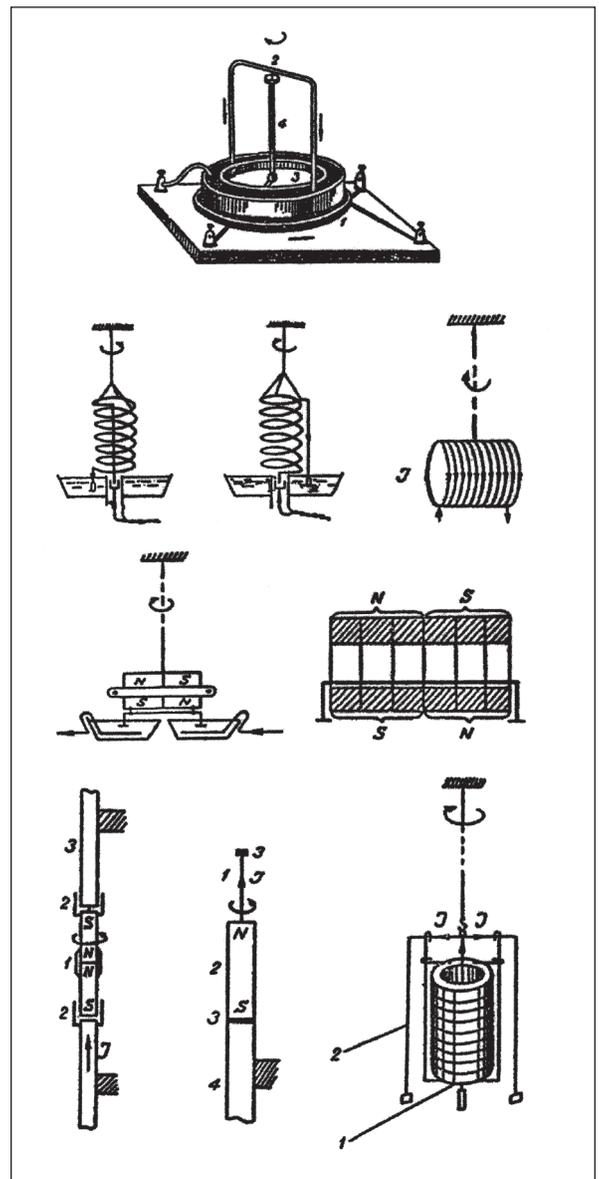


Figure 3. Some test arrangements of Sigalov. In his test, freedom was given for rotation of current carrying wires with mercury baths.

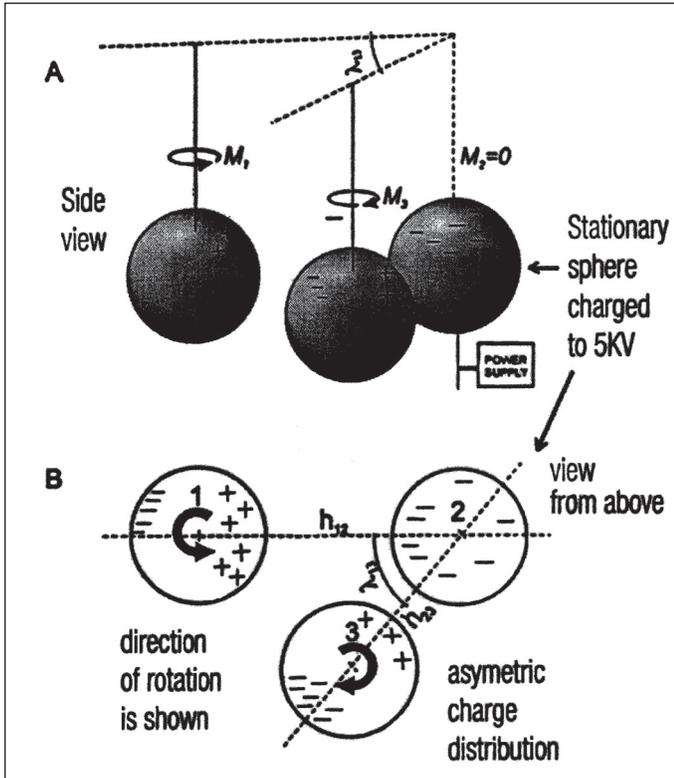


Figure 4. When three metal spheres which are charged at high voltage come close to each other, they rotate, indicating an intrinsic static macroscopic spin field.

momentum. In fact, a transversal electromagnetic radiation will always contain a spin field component as well, as induction law allows it, as $\partial S/\partial t \sim \partial E/\partial t + \partial B/\partial t$. A charged dust particle will rotate when radiated by ordered, polarized light, as shown in Figure 4 of Part 1 (*IE* #151/152).

When rotation of charges are allowed along two or three axes, further fields will appear. When rotating charges are transported as currents, a new type of field will also appear, as a tensor of rank 3 or 4, etc. Consequently, new types of waves and material properties will appear, too.

Note that condensed plasmoids also appear at this level. High virtual mass plasma waves, polaritons, already appear on level III.

In Figure 2 the symmetry hierarchy of the movement of charges is shown, where everything is familiar with Maxwell's formalism. One level deeper, with the rotation a new field (a spin field) appears.

Experimental Evidence of Spin Field

In Figure 3 some of Sigalov's forgotten test layouts are shown. He carried on Ampere's legacy, but he allowed torque to appear as rotation in his experiments.¹ He used a mercury bath for a sliding contact, and iron wires, thus a very high current was passed along the rotating frames. Rotation of current takes place only in the corners of the steel wires, so the effect is weak. On the top of the circular arrangements there are two co-axial, separate mercury pools, a lower noted by 1, and a higher noted by 3. The current goes up in column 4 and the wire frame may rotate around pivot 2. Either leg of the frame may carry the current, but only one at a

time is switched on. Though a frame is mechanically balanced, it still rotates. The current flows in the mercury bath in a mirror symmetry, to eliminate side effects.

The resultant rotation *cannot be deduced* from the Biot-Savart law. Sigalov tried to solve this puzzle within the framework of Maxwellian electrodynamics. He never noticed that due to rotation, a new torque field must be introduced. The other experiment, also shown in Figure 3, is simpler and shows a weak torque effect.

Sigalov found a weak torque even around permanent magnets, shown at the bottom of Figure 3. He never noticed that he had introduced a new symmetry with torque effects, as electrons were rotated in the experiments.

Unfortunately, Sigalov's publications were only in Russian, and nobody repeated or refined his experiments, just as with V.F. Mikhailov's magnetic monopole tests.

One expects to find a static torque around static electric charges as a real field, apart from the usual electrostatic force. Indeed, Anders Wistrom and Armik Khachatourian found this mutual torque, when three metal balls were charged electrically.² The three balls were necessary to induce the charge influence (that is, uneven charge density) and to break the mirror symmetry. This experiment is further proof that spin is not only an abstract concept of quantum mechanics, but a macroscopic effect, just as an electric field.²

In Figure 4, ostensibly there is a demonstration that static charges are the source of spin fields. The physical nature of charges is a question of fundamental importance.

A.D. Kirsch noted in a 1987 paper³ that spin polarization was important in scattering of charged particle beams. Parallel and antiparallel beam/target polarization yields completely different particle scattering paths. This indicates that there is another interaction besides Coulomb scattering. This is important to know for LENR. Coulomb shielding is not enough in itself as a means of catalysis.

It is also known that ortho and para hydrogen behaves differently, for example in diffusion tests. That is, parallel or antiparallel orientation of protons in a hydrogen molecule yields distinct, different physical properties. Even parallel laser beams attract or repel each other when they are circularly polarized.⁴ This experiment indicates again the presence of a third type of field in transversal electromagnetic radiation.

Martini and co-workers^{5a,b} found that a strong permanent magnet disc rotates above a superconductor permanently. When it is cooled to the temperature of liquid nitrogen, the rotation stops. It is probably due to a second order phase transition of unknown type, involving spin field around a permanent magnet. This is not a thermohydraulic effect assumed by some skeptics, since that cannot induce rotation at all.

Yet another attempt of the author to detect a spin field in thin (20-40 μm) diameter coils is shown in Figure 6. A thin "spin" coil and a bifilar "spin coil" is shown. The idea was to study what the response is of this coil for a *sharp transient*. The control coil was of the same length, but *wound counter clockwise* in the second half, in a bifilar manner. Indeed, there was a small, but noticeable frequency difference between the two cases. In the continuous coil, spin field energy stored energy, while in the bifilar case the two differently wound coils canceled their mutual effects, just as a bifilar coil cannot store magnetic energy. The idea behind this test was to check the difference between the spin field inductance in the two cases. (See Figure 6.)

All the above published, independent test results were not enough to convince mainstream physicists. Indeed *the engineering side of spin field generation is difficult*, except in biology. In biology, the rotation of charges is the norm, not the exception.

There is a forgotten experimental paper on the generation of rotating plasma vortices (thus spin field) by W.H. Bostick *et al.* The rotating plasma filaments were produced in external magnetic fields in accelerated plasma.⁶ They noted that strong neutron generation was observed by Mather and Kolesnikov, but this line of research was not pursued.

J.W. Mather and A.H. Williams of the Los Alamos National Laboratory also noted⁷ that *during the early transient part of the discharge plasma, vortices (filaments) were observed, but these disappeared in the steady state part.* This is in line with our argument (published in Part 1) that a rotating spin field is generated by induction during a sharp transient.

There is one more strange gas discharge test, which indicates the presence of a large real spin field unknown to mainstream physics.

An independent Hungarian researcher, Sandor Szabo, developed an AC discharge, where the long (nearly 2 m) positive column of the discharge wound itself into a tightly bound spiral. This self-coiling phenomenon is restricted to a very narrow parameter range. Even a 1% change in pressure, frequency and voltage is enough to annihilate the process. This author is unaware of similar phenomena in the vast literature of gas discharges (see Figures 7a, 7b).

The discharge was driven with pulsed, one-sided voltage pulses of about 10 kHz frequency, at about 40 Torr pressure in air, with a relaxation oscillator. The helical discharge is about 2 m long, and rotates along the axis. There is a conical, multi-branch discharge; it rotates axially too. The direction of the rotation depends on the driving frequency. This novel type of pulsed filament discharge was described by Nikola Tesla in the 1890s, and has not been replicated since.

Theoretical Considerations

The reader must be familiar with the present line of symmetry consideration by now.

A static electron is the source of the E electric field, a polar vector or tensor of rank 1.

An electron is the source of a magnetic dipole moment as well, when it is static, but generates a B magnetic induction vortex when moving along a straight line. Aligning dipole moment into parallel positions yields permanent magnets. This is not restricted to Fe, Ni and Co, because there are weak ferromagnetic plastic materials as well. The point is that there is an alignment of magnetic dipoles of electrons. The induction field is also a vector, but an axial one, and thus a tensor of rank 1. An

electron (or even a proton) has an inherent spin, or angular momentum as well. Even static, uncompensated electric charges generate torque due to their macroscopic spin field.

Our symmetry argument is the following: aligned, parallel spins must have their own spin fields, like a bar magnet. Amber and loadstone (magnetite) have natural electric and magnetic fields among solids. There is no comparable strong, frozen source of spin fields in a solid metal lattice—yet.

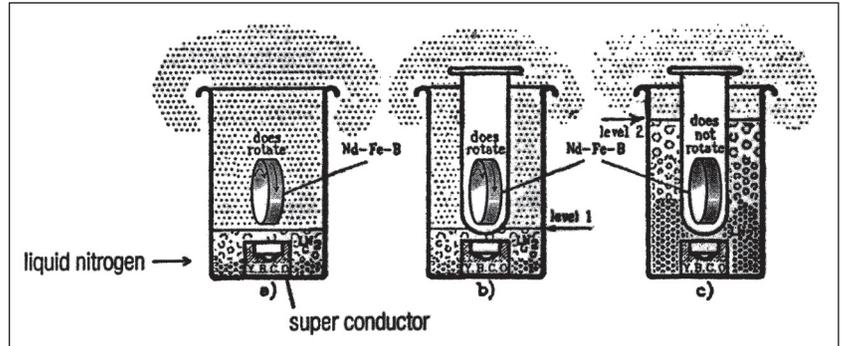


Figure 5. Permanent magnets rotate continuously above a superconducting material.

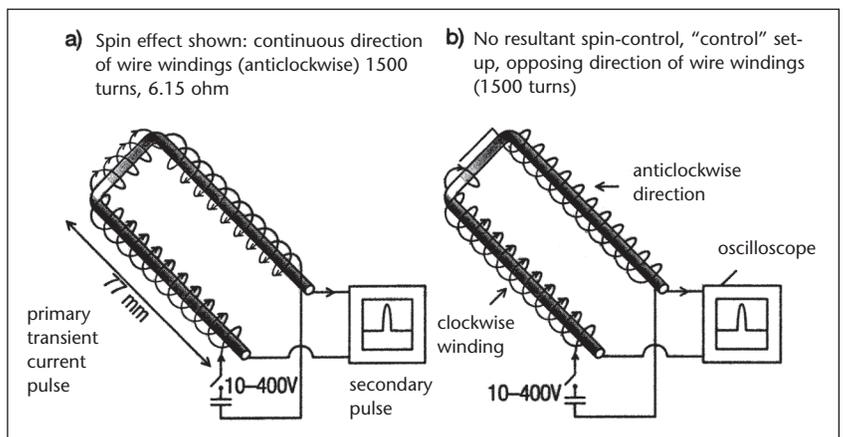
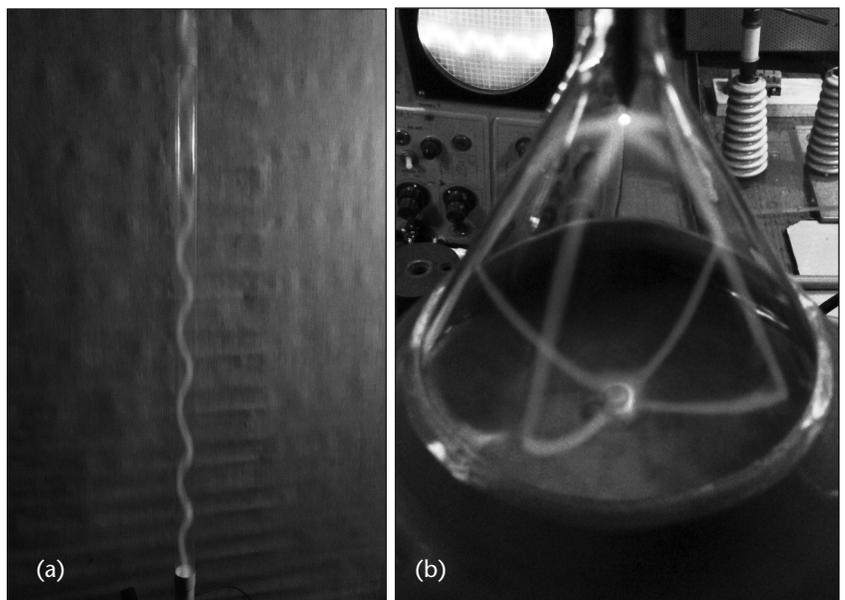


Figure 6. Two microsolenooids wound in a different manner show deviation in their inductivity.



Figures 7a-b. Experiments of Szabo indicating a dynamic spin field. Pulsed electric field generates a continuously rotating, helical positive column in a discharge. When the tube is conical, the axial self-rotation is apparent.

If an electron has spin as an intrinsic feature, like an electric charge and a magnetic dipole, then there must be an accompanying permanent spin field as well. It can be generated by aligning spins and/or by rotating high density electrons or dipoles trapped on a disk. This is a weak spin field source, but may be just enough to induce nucleon and electron shell spins into a permanent alignment as a solid slab. This experiment can influence parity violation during beta decay. There are biological experiments to influence speed of growth of seeds or to check if this field causes the declination of an electron beam, etc.

In principle it is possible to make such a solid state spin source: for example from deuterons, which have a spin 1. However, liquid deuterium can't be solidified into a slab at room temperature. A better method is to make frozen, deuterated ethanol or other deuterated solid carbohydrates, but C_6^{12} has zero nuclear spin, and a zero spin electron shell.

There are other nuclei with higher spin—like Ti^{22}_{49} , which has spin of $7/2$, but is hard to separate. But Al^{13}_{27} is stable and has a spin of $5/2$. It can be frozen into a spin polarized state, while cooling it from a molten state in an external spin field. (This latter field can be generated by rotating charges, for example on polarized BaTi.) Symmetry considerations alone indicate practical methods to generate spin polarized bulk materials. A similar but less practical consideration led the work of M. Evans and J.P. Vigier.⁸ Their two-volume book assumes the theoretical existence of a spin field. They call it the third magnetic component (B^3). Unfortunately they give no practical hint on how to make permanent spin solid objects, or how to spin polarize them. In general, physics textbooks discuss electrets and permanent magnets as macroscopic quantum effects, but not spin-field carrying solids. Indeed, there is no room for macroscopic spin-field effects in the framework of Maxwellian electrodynamics.

More (but not much) is written about the possible physical effects of magnetic monopoles and magnetic currents, which we shall discuss later.

Spin Fields and Practical Applications of LENR

Though the discussion of extended electrodynamics has not been completed yet, we shall jump to the practical applica-

tions in LENR, including how it appears in Nature.

The simplest practical application of a spin field is to use rotating, charged dust particles at the temperature range of about 1000°C to 2000°C (above Parkhomov's limit).

This author has built (with co-workers) about 20 such reactors, where fine ($1 < d < 40 \mu\text{m}$) dust particles were oscillated in weakly ionized plasma, usually at atmospheric pressure, or in the $0.1 \text{ bar} < p < 1.5 \text{ bar}$ pressure range. In these experiments microwaves were used as a convenient method to create oscillating plasma. The plasma was located in an electromagnetic metal cavity resonator, designed as a TM, TE or a mixed standing wave cavity. These cavities were at first rectangular, later cylindrical and spherical at the end, being the best choice from the viewpoint of thermal reflection. Within this metal resonant cavity there was an acoustic resonator, sometimes with holes on it—tubular or spherical—to create tuned harmonic acoustic oscillations at multiple frequencies.

The dust particles were placed into this quartz acoustic resonator, and the plasma formation was initiated by a thin graphite rod, by sparking due to microwaves. A number of test results were published over the years.⁹

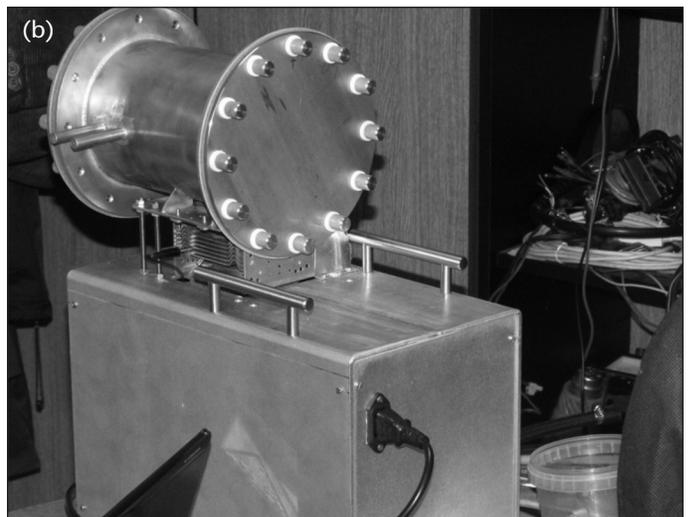
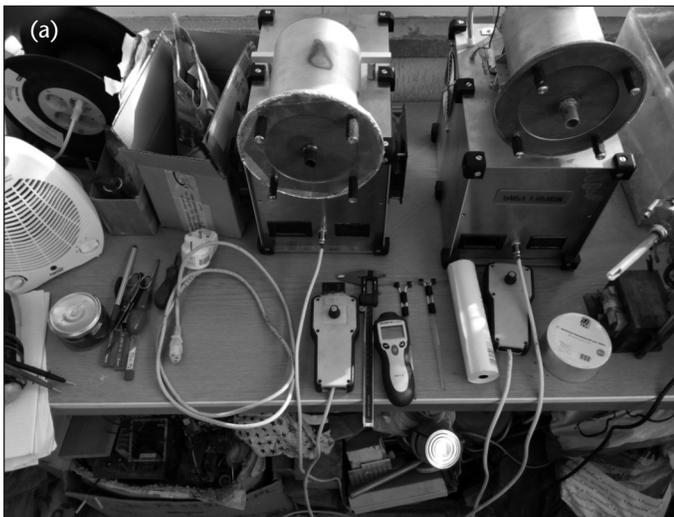
The most puzzling result of these tests was the *ubiquitous amount of transmutation of heavy nuclei*, even above the Fe-Ni bottom level of nuclear binding forces.

Two reactors are shown in Figure 8a and 8b, where only the external metal electromagnetic cavity resonator is visible.

There was only a rare trace of soft X-ray radiation at about the usual 800 W input power during the nearly decade-long R&D process. At much higher power input levels, at about 1.5 to 2 kW input, there were some exposed traces on a sealed black and white film, but at a modest intensity.

This meant that fusion took place without complete ionization. So there was no need to shed the electron clouds of fusing nuclei as in thermonuclear fusion.

It was a sort of "tunnel effect," letting heavy nuclei fuse with each other while keeping both electron shells of the fusing nuclei. Thus the inner K and L shell electrons of the atoms merged just like their corresponding nuclei. This was the rule, not the exception. Moreover, there was not much heat-energy released during these experiments. Usually oscillating graphite or charcoal dust was tested in the air plasma.



Figures 8a-b. Two different dust fusion reactors, built by the author's team.

When pure graphite dust particles were used in air, all combinations of nuclei appeared,^{9b,p20} like $C^{12} + C^{12} \rightarrow Mg^{24}$; $O^{16} + O^{16} \rightarrow ^{38}S$; $C^{12} + ^{15}N \rightarrow ^{27}Al$; and in other experiments $N^{15} + O^{16} \rightarrow P^{31}$... etc.

These results suggested the following:

- a) Transmutation takes place between the ionized gas and the surface of the dust particle, like the reaction between carbon and oxygen, carbon and nitrogen.
- b) Transmutation takes place between the nuclei of air, too (but never in the absence of carbon dust, so dust has a catalytic effect).
- c) Transmutation takes place between the atoms of the dust particle as well, like $C+C$.
- d) Maybe hydrogen (due to humidity) also takes part in the fusion process, because heavier elements like phosphorous appeared and it required an additional neutron, which could be obtained from the combination of an electron and a proton.

The lack of excessive fusion energy production was explained by Dan Szumski with the principle of least action, that is, the excess energy of a fusion process was used locally, instantly to form an energy consuming product of a neutron.

The Rotating Charged Dust Particle as a Catalyst

The above-mentioned process catalyzes LENR fusion in three ways:

- 1) Providing Coulomb shielding by an excessively charged dust particle produced the highest charge density value engineering methods can offer today.¹⁰ For steady-state plasma, the number of electrons trapped on a particle depends on the radius of the particle. During one second of exposure 250, 25,000, $2.5 \cdot 10^6$ electrons are absorbed for 1, 10 and 100 μ m-size particles. With transient dust acoustic waves, the estimated charge density is even higher by orders of magnitude.
- 2) The plasma and dust particle temperature is in excess of 1000°C, thus providing low energy thermal neutrinos, necessary for fusion reactions, in order to conserve parity, a criterion formed by Parkhomov.¹¹
- 3) The electrically charged dust particles will rotate at a very high angular velocity (with a random spatial distribution) due to turbulence and collisions. The rotation of highly charged particles will generate spin field, and the translational oscillation of the rotating charged particles will generate torsion fields as well.

In hindsight, spin fields of the nuclei and those of the ionized shell help to align, and attract, neighboring atoms (ionized or not) and guide them towards each other to fuse. In an analogy, this is similar to when iron fillings in an external magnetic field align, thus polarize and attract each other.

The rotation of highly charged dust particles is not just a side effect, but an essential part of the fusion process. The rotation, the spin field (and maybe the torsion as well) are part of a catalytic fusion process, which is the essence of an LENR process. So apart from an LENR process catalyzed by condensed plasmoids discussed in Part 1, this is another type of catalytic process—and it is the most abundant one in Nature.

The dust charging takes place in weakly ionized steady dusty plasma anyway, but oscillating resonant acoustic oscillations can enhance the dust charging by orders of magnitude, known as dust acoustic wave resonance.

The charging of dust particles on the surface is due to the vastly different speeds of electrons, and the very heavy dust particles. This charging process is well proven in self-organized “crystal dusty plasma.”

This dust-electron distribution, shown in Figure 1 of References 9a and 9b, is dynamic, and the dust particles rotate as well, just as Felix Ehrenhaft realized in the 1930s. (This was discussed in Part 1.)

The direction of the axis of rotation randomly changes due to the local thermal noise and collisions, but the spatial and temporal resolution of high speed cameras are just not good enough yet to detect them.

Dust Catalyzed LENR in Nature

Charged, rotating particles run the whole Universe. In stars shrouded in dust clouds, and in all types of life, such as the essential ATP-ase enzyme, there is a rotating nanomotor of seven to nine protons. So there is no energy from stars, and no energy for life without rotating charges. Thus spin and other related fields are the key to life and energy everywhere in Nature.

In the rest of this paper we shall discuss spin and related fields. We shall indicate that the solar corona is ostensibly the energy production site of our Sun (and all the other stars). Dust particles may run the energy production of quasars in the dusty clouds of the Universe, releasing an extreme amount of energy in the infrared spectrum. (They are the brightest objects in Nature, releasing as much energy as millions of galaxies.)

Charged, hot, dusty plasma transmutes elements in volcanic eruptions as well as in pyrocluster dust clouds and to a much lesser extent in lightning strikes.

The enigma of the solar corona: In the mainstream view of astronomy, all stars are ionized gas spheres of hydrogen, held together by gravity. Energy production is assumed to take place in the extremely hot, high pressure core, where the Lawson criteria for fusion is satisfied. This model is the holy grail of controlled thermonuclear fusion as well, repeated by all inertial and magnetic confinement devices—and they always fail. This is most probably because this process doesn't take place in Nature at all.

There are two fundamental and several minor observations that contradict the “Sun as a hot fusion energy source” model:

- a) The temperature of the solar corona is about 4 million °C, far from the surface of the Sun, while the surface is only 7000°C. (See Figure 9.)
- b) The power output of the Sun is not steady: there are 11 year long cycles demonstrated by the sunspot activity.

Our Sun is very quiet compared to other stars. There are stars that change their output significantly in a day; there is even one toroidal-shaped star, or oblong shaped due to strong rotation, etc. There are much bigger and smaller stars, hotter and colder as well. However, only our Sun can be studied in detail. The hot solar corona, high speed solar

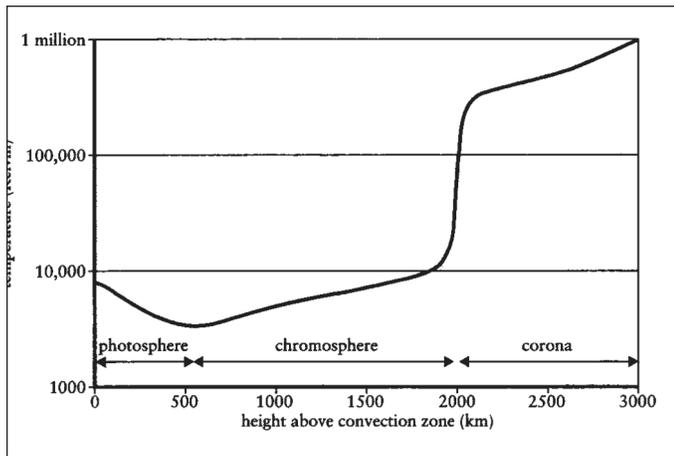


Figure 9. The temperature of the solar corona, as a function of distance from the surface. Note the logarithmic scale, and that the trend continues (not shown) up to 5 million degrees.

wind and changing output (solar activity) is apparent.

This is not a simple boring theoretical issue because: If the output of our Sun is increased by half a percent, the equatorial part of our planet would simply be scorched. If the power output is less by half a percent, a new ice age would come, and only the Mediterranean areas would be habitable since Scandinavia, the UK, Canada and New Zealand would be under thick ice again.

Though we can't "engineer" the output power, it is better to be familiar with the main principles.

There are five possible ways out of this enigma, to explain why the corona is more than a thousand times hotter than the surface of the Sun:

- 1) The observations, and the data set, are plainly wrong. (The Parker probe has recently started to collect data from the corona.)
- 2) Conservation of energy is not valid for the corona.
- 3) Laws of heat radiation and conduction are incorrect. Consequently, the temperature is much higher when moving away from the energy source (a violation of the second law of thermodynamics, point 2 in disguise).
- 4) There is an unknown source of energy in the solar corona.
- 5) Ionization of iron atoms in the solar corona (the source of temperature estimations) has quite different quantum mechanics in the corona than here on Earth.

Mainstream solar specialists choose point 3. This author has a testable model for point 4, based on the incoming interplanetary dust attracted by the mass of the Sun.

A.R. Choudhuri, author of the book *Nature's Third Cycle*,¹² argues on page 195:

The hot gas in the corona and the stream of photons flowing out from the Sun interact with each other very little. They are nowhere near reaching thermodynamic equilibrium. So we can not apply the second law of thermodynamics in the usual way to this situation.

Just a short side note: The same (false) argument is used in biology, to explain away the fact that complicated well-organized low-entropy structures grow from tiny seeds and random ambient materials (water, CO₂ and light).

The real trouble with the "laws don't apply here" explanation is with the gaseous Sun model. A lone researcher, P.M. Robitaille at Ohio State University, questions all the fundamentals, in an exhaustive, fact-based paper¹³ that states the following:

- a) As the solar surface is sharp and definite, the Sun is not a gas but a liquid.
- b) As the Sun is liquid, it is not compressible, but it conducts (supports) electric currents and generates magnetic fields, which a gas can't sustain.
- c) As the Sun is liquid, it is incompressible, and can't form a black hole, thus the formation of black holes is a myth.
- d) Due to the above, the critical pressure to satisfy Lawson's criteria for hot fusion is never met, the core of the Sun (or any star) can not generate gravity-controlled thermonuclear fusion. That is, hot fusion does not take place in Nature.

No wonder the factual scathing criticism of mainstream solar research was censured, and was not allowed to be published in their journals. Science as peer-reviewed institution overcame science as a method of observations.

I encourage readers to have a look at the Sun through a sooty glass. If we see a sharp contour, then it is not gas, but condensed matter, liquid hydrogen of 6000 to 7000°C, down to the bottom. If we can see that, then the hot solar corona heats the liquid Sun, which radiates it away, as heat and the flux of fast electrons and slower protons.

In light of the Sun as a condensed matter model of Robitaille, the gaseous Sun model is fundamentally flawed, unable to correctly predict the origin of magnetic fields, or sunspots and their 11 year cycle.

Robitaille found 40 observational facts, most of which negate the gaseous thus compressible plasma model, but verify the condensed (liquid) model. These observations are grouped into seven major groups by Robitaille, six of which are highlighted here:

Planckian line of evidence, for example the solar spectrum. The optical spectrum of our Sun is continuous, like that of a solid condensed matter, a black body. This is the reason we see all shades of all colors. Single atom gases emit only some very distinct, sharp frequencies. If the Sun were a gas, we could see only some colors emitted by hydrogen and helium.

Spectroscopic evidences, like UV, X-ray emissions, hydrogen emission, coronal emission.

Structural evidence, like the solar collapse, density, its oblateness, rotation and chromospheric shape.

Dynamic evidence, like surface activity, the solar dynamo, coronal rain, coronal loops and the solar wind. The fast solar wind is in the range of 400-800 km/sec, with a proton density of 2.5/cm³, and a particle flux 1.9 x 10⁸/cm² sec, just to quote the most important evidences.

The observational evidence substantiates the Sun (and other stars) being liquid hydrogen compressed by strong gravity but the consequences are intolerable for the mainstream view: there can't be thermonuclear fusion at the core, as it is not compressed, being liquid.

Bubble models, a thin liquid outside with gas inside, do not lead to a stable condition; any disturbance may burst the liquid shell. No compromise is possible!

The unwanted consequence of the condensed matter (liquid) Sun is: there is no known mechanism left for fusion energy generation, so scientists may look like fools. Moreover, the pretext of the most expensive experiments in physics—hot fusion—would lose its credibility instantly. So there is more than prestige at stake.

Indeed, artificial hot fusion may have only one feasible form: the one initiated by an energetic shock wave, either by a fusion bomb (H-bomb) or laser beams or X-rays, etc.—inertial confinement.

It is not by accident that Robitaille’s papers are censured by mainstream astrophysical journals, as they pinpoint the blindness of astrophysicists. This is to our peril because we lose the ability to predict an important factor in climate change.

The dust-catalyzed process in the solar corona is similar to that of the catalyzed fusion reactors discussed before. There are differences in the technical parameters though, as shown in Table 1.

Thus in the solar corona, LENR is taking place on the surface of rotating dust particles in the following manner: Very fast electrons, emitted by the surface of the Sun, are adsorbed by the incoming dust particles. This generates electrically charged, rotating particles. Thus the rotating particle will have three fields:

- Electric field, due to captured electrons just under the surface of the dust particle. Their electrostatic field will provide Coulomb shielding for the LENR process.
- The rotation of the charged dust particles will generate a weak magnetic dipole.
- A relatively strong local spin field.

Incoming but slower protons from the solar wind will be attracted to the dust particle surface, and may be neutralized and absorbed to the surface or form a neutron by $p + e^- + \nu + 0.7 \text{ MeV} \rightarrow n^1_0$. Later, the neutron forms a deuterium with a proton captured beneath the surface of the dust particle (Storms’ cycle of LENR).

Due to the generation of spin fields, other reaction paths are open as well: like $p + p \rightarrow d + e^+ + \nu$. That is a spin field catalyzed reaction, because of Coulomb shielding of the dense electron cloud on the dust particle, and the pairing ability of spin field, generated by rotation.

Fortunately, this latter reaction pattern is a testable hypothesis in dust fusion reactors, filled by hydrogen.

As the spin of the nuclei is less than that of an orbiting electron, a nascent hydrogen atom plus ionized proton reaction is more likely than a reaction between fully ionized hydrogen (protons).

All in all, in the LENR process on rotating, charged dust particles, falling into the Sun is the most likely site for energy production. This is truly a catalytic process. The dust catalytic model is testable at a lab (by dust fusion reactors) and in Nature.

The fundamental claim of this paper is that there is no fusion energy production without dust, and the energy yield is proportional to the dust density. The power output of stars changes, as there are fluctuations in the density of interstellar dust.

Sunspots

As energy production depends on the rate of inbound dust flux and outbound proton flux, it is sensitive to external perturbations. Planetary perturbations, due to the alignment of the massive gas planets—like Saturn, Uranus and Neptune—do influence the dust density distribution around the Sun. The mass ratio of planets versus the Sun is about 1:300,000. Thus the light planets can’t influence the solar mass itself, because the dissipation losses are prohibitive. This mass ratio is that of the mosquito and the dog, and the dog is also considered as soft condensed matter.

However, the mass of incoming dust, and its mobility, is already prone to the gravity-induced influence of the planets. That is, the mass of the Sun can’t be oscillated by the 11 year alignment of the major planets due to its internal friction. But the flow of the dust mass into the corona can be perturbed by the movement of the big planets.

Records indicate that between 1645 and 1715 there were no spots on the Sun (the so-called Maunder minimum). During this period, the climate was so cold in the Northern hemisphere that it was called the “little ice age.” In principle it is possible to re-calculate the positions of the planets, together with the inclination of the changes in the rotational axis of Earth (Milankovich’s cycle).

Thus the distribution of interstellar dust can be another factor influencing our climate.

Understanding the energy production in the solar corona is important for long-term weather estimations. So far the energy output of our Sun has been tacitly assumed as a constant. This is not so, and comprehending dust-catalyzed

Table 1	Solar Corona	Dust Fusion Reactor
Source of Dust	incoming interstellar cosmic dust	high density dust, as input
Pressure	very low—near vacuum	atmospheric pressure
Source of Plasma	the surface of the sun	ionization by microwaves
Temporal Mode	steady state	transient, resonant, at several frequencies
Angular Velocity	very high, due to rotation near vacuum	modest and decreasing due to dissipation in plasma
Type of Fusing Nuclei	light only	any nuclei

LENR may lead to a better long-term climate prediction. This is the stake of the solar dust fusion model.

It is hard to come to terms with the fact that a generation of astrophysicists have based their work on the gaseous “compressible plasma” model. In a plasma model, the self-generating currents are untenable, as it can be sustained only by an external power source!

Liquid metal or soft condensed matter models are closer to reality. External heating by Rayleigh-Benard type convective mass flux currents may induce electric currents, thus magnetic fields, thus sunspots. These spots are related to the surface temperature, and that in turn relates to the power production of the corona, by the heated dust particles falling into it.

Walter Maunder, a superintendent of the Greenwich Observatory, published his findings in 1894 and again in 1922, about the 11 year cycle correlation between the sunspots, climate estimate and grain prices. We know that riots usually broke out due to high food prices. Thus there is a causal connection between food riots (history) and solar corona activity, ostensibly due to dust catalyzed LENR. The nice side of it is that this model is testable in a straightforward manner, both in a lab and by the annals of meteorology and astronomy.

Quasars

It is well known by now that the most powerful objects of the Universe are the “quasi stellar radio objects.” They radiate energy mainly in the infrared range, and are the brightest, most powerful sources of energy in the whole Universe. Some of them radiate as much power as thousands of galaxies, despite their modest size (about the size of the solar system). The source of this “stellar” amount of energy is still an enigma. Previously, it was assumed that it is due to gravitational collapse alone. Nowadays, massive black holes are suspected to be the cause. This is not correct because there are two free parameters in this model: location and the mass of the black hole.

According to our dust-catalyzed fusion model, a quasar will arise when a star travels through a dense dust cloud during its path. There are several known dust clouds (like the Maghallas cloud), which are the mixtures of stars, gas and dust particles, dominated by the latter.

Due to the high energy output flux, the energy flux ionizes the neighborhood gas, thus even X-ray and γ -ray emissions are possible.

Again this is an experimentally testable hypothesis and dust density/star mass correlations can be matched in observations. The development of observations and data collection will be essential to figure out the feasibility of the dust-mediated energy production of quasars.

Biological Transmutation

Biological transmutation—a puzzling, brilliant invention of Nature—has been a forbidden fruit since its discovery about 200 years ago. It already appears at the level of “simple” bacteria, and is evident in plants, and even in warm-blooded animals. It was impossible to understand. It was easier to deny its existence. Now the path is open again to comprehend it.

In this section, we shall argue that biological transmuta-

tion takes place in the inter-membrane space of mitochondria, in the vicinity of a rotating protein nanomotor, driven by protons (ATP-ase enzyme). There is a very high electric potential gradient across the cell membrane as well, so biological transmutation takes place under the same symmetries as in a dusty plasma reactor, or in the corona of our Sun, etc. (see Figure 12c).

It is important to note that hundreds of enzymes serve as catalysts in all parts of the biochemical processes of life. They cut, fuse, reshape reagents always in an intermittent manner. However, one and only one enzyme, the ATP-ase, is a rotating “nanomotor.”

A potent electric field, and rotating charges of high angular velocity (6000 to 9000 rev/min), are the common symmetries of complex Y (ATP-ase enzyme) and the electrically highly-charged, rotating dust particles in the solar corona. Their identical symmetries lead to identical results: LENR. That causes the fusion of nuclei, even heavier than iron.

While rotating dust particles catalyze hydrogen-based fusion in the solar corona in order to create radiating energy for life, rotating ATP-ase enzymes catalyze a chemical reaction to produce adenosine-triphosphate, the nearly universal “fuel of energy” in biological cells. The identity of electric and spin field configurations in both cases can't be a mere accident—more probably an efficient technical solution for each case.

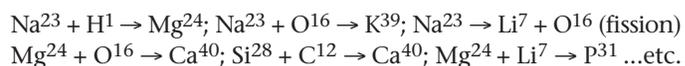
There is a difference though: biological transmutation is perhaps just a byproduct when the environment is appropriate.

The resistance to accept the mere fact of biological transmutation is reasonable, as it is completely counter-intuitive:

- Even for most members of the small LENR community, transmutation (*e.g.* in a grass root) is not possible, because there is no crystal lattice (Pd as usual), high electric current, heavy water (deadly for life), yet heavy elements are synthesized, like Ca or Fe.
- For the influential hot fusion group, this is utter nonsense, as they can't even cope with hydrogen isotopes at 50 million degrees in a strong magnetic field (up to five Tesla) confinement: in a “simple” bacteria there is nothing like that!
- For a biologist, or biophysicist, transmutation is impossible because in biology the usual reaction energies are in the order of 0.5 to 1 eV, and not in the range of MeV characteristic of nuclear reactions. Therefore it must be utter nonsense, as no nuclear tunnelling effects exist in biology!

Yet the experimental evidence is compelling. Jean-Paul Biberian wrote an important review article on this subject.¹⁴

The first reliable test results of transmutation appeared as early as the 19th century, and about 20 independent studies proved the reality of biological transmutation. The most notable researcher on the subject was C.L. Kervran, who among others established the following reactions:



Therefore fusion reactions among heavy nuclei (not only isotopes of H) take place at room temperature.

This author's own experiments together with Maria Balint with a high resolution mass spectrometer (ICPMS) confirmed the existence of biological transmutation in plant seeds, roots and leaves.

These nuclear reactions (mainly fusion) just can't take place without a massive catalytic action. As the conditions for formation of condensed plasmoids are ruled out in a cell (or bacteria), the spin field and electric field around a rotating ATP-ase enzyme seem to be responsible for it.

However, as usual in science, opinions are stronger than facts. Consequently chemical and isotope ratio changes are not examined in biological systems.

The mainstream idea is: that life = applied high school textbook physics + textbook chemistry. The opinion of this author is: life is → extended QM + physics with all symmetries in 4D + chemistry in 4D. That is, *life is simply impossible according to textbook science* because life, even at the bacterial level, is a collection of enigmas deserving attention. The most obvious of them is that growth from a seed (or sperm + egg) creates a far more complex structure than the complexity of the seed. A plant will grow from sunshine, water + CO₂ plus elements of the soil, into an organism far more complex than that of the seed. This is the blatant violation of the law of entropy, or the second law of thermodynamics.

Further, at the size range of organic molecules the thermal noise is extreme at room temperature. Therefore it must shake and destroy all order, all structures. Yet life prevails, structures grow and all organelles work in perfect dynamic equilibrium in spite of this destructive noise.

So what are the most obvious differences between life's physics and non-living high-tech (nanotech)? Life is characterized as:

- a) Chirality of the soft, condensed matter medium, consequently rotating charges.
- b) Electric current is carried both by ions and electrons, in pulses only.
- c) The medium of life: weakly ionized, soft condensed matter of water and proteins.
- d) There are strictly self-assembling, "bottom up" structures, not static structures, self-replication. This is strictly against the second law of thermodynamics, because all living organisms are ordered, low-entropy structures in a high-entropy environment. This is a "smoking gun" of something extraordinary in biology.
- e) Isotopes (especially deuterium) are important, life is sensitive to isotopes, while in chemistry they have no significance.
- f) A change in mirror symmetry is detrimental, usually fatal.

None of the above applies to our inorganic physics, and machines designed by textbook principles!

We must expect new, extended physics, new field types, new material properties in life processes. Biological transmutation is just one of the consequences of these underexplored points, and not even the weirdest (as we shall see in Part 3). Life's known sensitivity to minor differences in protein folding, or in enzyme activity, is a well known enigma, and is also a consequence of the above points.

Biophysicists and chemists are either naïve or negligent to expect that the functions of even a bacteria can be described by their high school physics.

What is the use of biological transmutation? There are three important areas where biological transmutation can be of interest:

- 1) The gut microbiome, a host of bacteria, may produce ele-

ments absent in food intake from insects upwards.

- 2) Soil bacteria and plants produce missing trace elements in depleted or poor soils, making life possible in harsh places.

- 3) Deuterium extraction from primordial water, by producing nitrogen from carbon and deuterium—rendering possible eucariotic life (cells with complex nuclei), as deuterium is poisonous.

The first two points are difficult, but not impossible to test, still in want of investigation. The last point can't be tested, but it is very probable. The deuterium content of asteroids in our solar system is about five to ten times higher out there than here on Earth. Bacteria can tolerate this higher deuterium content, but eucariotes (cells with a nucleus) can't.

Dynamic Symmetry: The Missing Concept of Biophysics

There are a number of (rather useless) books on symmetry, and group theory, especially in relation to theoretical particle physics. However, when life (biophysics) is concerned, the need for symmetry considerations vanish. In biochemistry books (organic chemistry), only the concept of mirror symmetry appears: like the role of stereo isomers, or enantiomers, that is L or left-handed, D (dextro) or right-handed. This is used to describe chirality. For us, this is too little, as mirror symmetry is static. However, life is dynamic; it has a number of real continuous rotations. In general biophysics/biochemistry, dynamics are limited to diffusion of charges. The essence of charge pulses escaped the attention of researchers. Besides, biophysics uses words like fusion and fission of nuclei, plasma, but their meaning is different.

As shown in Part 1, it is very difficult to rotate charges in wires even with our applied high-tech—the research tool of classical electrodynamics. However, omitting the symmetry of rotation and its fields is simply, literally fatal.

Due to the sophisticated diagnostic tools of biology, the pervasive presence of rotation of charges is widely known. It is also known that all organic molecules are chiral, but there are no tools to deal with chirality in material science. Dielectric and magnetic material properties are duly known and researched, but there are no known material data for chiral (organic) media, partly as a lack of chiral field source. Only Lakhtakia, Nieves and Pal call for the need to find chiral material constants.^{15a,b,c}

Life is full of enigmas: mostly due to the lack of comprehension of the consequences of charge rotation. In classical mechanics, we learn to comprehend rotation. In classical electrodynamics we are forced to unlearn (neglect) rotation. Thus when we face the consequences of rotation in biophysics, we are unable to recognize it. This is the fundamental reason why LENR is ignored in biology (along with a host of other important phenomena), and biology is unable to interpret most of its effects, from a proton pump to enzyme dynamics, and spatial shapes, etc.

Apart from the electric field, no other field is considered in textbooks as of any use (like magnetism or gravity). Again the complete lack of dynamic symmetry considerations in electrodynamics is to blame.

In a very detailed, honest, well-meaning textbook on biophysics, only the following physical effects are considered as essential to understanding life¹⁶: a Harmonic oscillator, an

ideal gas, two level systems (Ising model), entropy, the Poisson-Boltzmann model of charges in solution, the elastic model, the theory of one-dimensional rods and two-dimensional sheets, a Newtonian fluid model, diffusion and random walks, and a rate equation model of chemical kinetics. This is the "toolbox." (Other, less detailed textbooks commit the same fatal mistakes.)

No wonder LENR can't be explained under the framework of the above effects, along a host of well-known problems like protein folding. The most annoying of all is the stark difference between *in vivo* and *in vitro* processes. It is impossible to make a number of syntheses in test tubes of any complexity, at any price, while they take place in a cell at simple room temperature and normal pressure. Why? Because there are no fields of rotating charges in a test tube! Without their guiding fields, organic molecules barely react with each other. LENR fusion also appears in the vicinity of rotating charges!

In classical physics, mirror symmetry of effects are mandatory in space and time. Any process should take place in a mirror and in a time reflected way as well. For example, a mechanical clock or a chip will work equally well, if all the parts are assembled in a mirror reflected manner. Left hand or right hand side driving works for both cases.

This is not the case in biology. When butter became scarce during World War I, plentiful, cheap plant oils were hydrogenated to make margarine. It replaced just one chemical bond of hydrogen in a mirror reflected manner. This technology literally killed millions of people in the U.S. and Europe, starting in the 1920s.¹⁷ Heart attacks (myocardial infarction) were much less frequent before 1920. By the 1930s there were less than 3,000 deaths per year. By 1960, there were about 500,000 deaths/year in the U.S. alone, and cancer was also on the rise among non-smokers.

This story is mentioned for a single purpose: ignoring even a simple shift of mirror symmetry kills many more people than all the world wars—through ignorance. Procter & Gamble acquired the patent of the British food chemist Norman in 1909. He invented a Ni catalyzed method to turn cotton seed oil and lard into a solid state at room temperature by hydrogenation. The hydrogenation process transforms natural unsaturated oils into straight packable molecules, by arranging hydrogen atoms at the double bonds. In Nature both hydrogen atoms are on the same side of the carbon chain at the point of a double bond. This makes possible folding, keeping them liquid at room temperature. Hydrogenation created trans double bonds by moving one hydrogen atom across to the other side of the carbon chain at the point of the double bond.¹⁷ Oil and fat treated this way became solid at room temperature, and margarine was created.

Thus only the original one-sided symmetry was changed, yet the chemical composition of the carbohydrate chain

remained the same. See Figure 10 for the spatial shape of untreated fat.

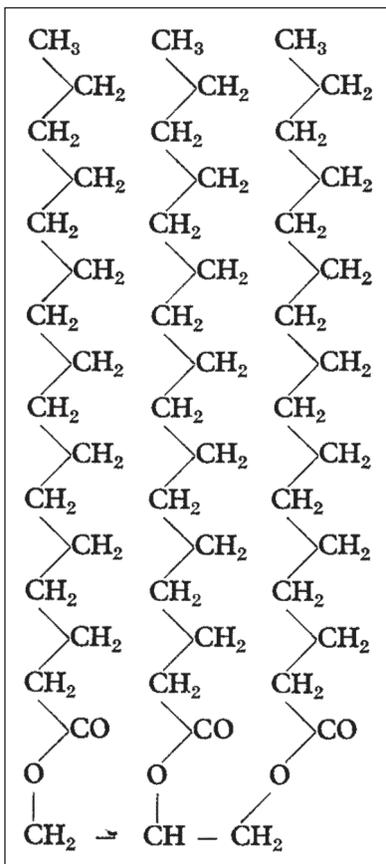


Figure 10. The simplified carbohydrate chain of fat. Note that all the hydrogen atoms are on one side in nature. Trans fats have hydrogen atoms on the other side of the chain as well.

"Trans isomers" were created by a broken mirror symmetry. Today we know them as "trans fats." Canola oil contains soy trans fats and hydrogenated soy oil is 40% trans fats.

The problem is that when a hydrogen atom is moved to the other side of the fatty acid molecule during hydrogenation, the ability of living cells to make reactions on that side is lost. They are still similar to natural fats, so the body incorporates them into the cell membrane. Once there they create havoc with thousands of vital biochemical reactions, from energy production to prostaglandin synthesis.

There is a similar fatal problem with the structure of cholesterol. Instead of the simple molecule shown on the flat sheet of textbooks, it has 254 isomers. Only one stereochemical shape is acceptable for life, the rest are either neutral or toxic to the cells by causing fatal immune reactions. (István Horváth discovered this sensitivity to spatial symmetry. He found a way to select the only proper shape of cholesterol by using enzymes. He was duly sentenced in a mock trial.)

There has been a 200-year-long ban on test results of biological transmutations. It is only the tip of the iceberg of banned or missing symmetries in biology. Yet even the notion of symmetry is missing in the subject index of detailed books on biophysics, like a large format 1,000 page treatise published in 2019.¹⁶

The Common Symmetries of Biological Transmutation and LENR

There is a qualitative difference between the *in vitro* (test tube) organic chemistry and the *in vivo* chemistry of life. No wonder that most organic molecules were never synthesized in labs, because there are no rotating charges in a test tube. Living cells are teeming with them, mostly in their mitochondria. Nineteenth century chemists, who were proud to make urea, boasted too early that they had done away with "*vis vitalis*"—that is, life's force.

They never had the slightest idea about the importance of dynamic symmetries, thus special fields in biology. The situation is the same now 200 years later. So it is high time to show how rotated electric charges help to catalyze not only chemical, but nuclear reactions as well. While it is easy to imagine a rotating charged dust particle, it requires some effort to find the same symmetry with ATP-ase nanomotors in a cell wall of a mitochondria. Figures 12a and 12c will help us to comprehend them. It will help clarify that catalytic LENR may happen near the bottom of our size (and time) scale, at the nano- or micrometer level.

However, let's first face catalytic action itself. In chemistry, an active, polarized surface catalyzes a reaction

between two reagents, usually molecules.

For example the large surface of Pd or Pt catalyzes $H_2 + O_2$ reaction, by weakening each consecutive threshold molecular bond, and overcoming their mutual repulsion. Thus it reduces the energy threshold, making possible the reactions at modest parameters.

We expect two simultaneous different catalytic actions in LENR:

- 1) Overcoming Coulomb repulsion by a very strong external electric field, when the reacting atoms are ionized on the outer shell—at least partially (like muon-catalyzed fusion in liquid deuterium).
- 2) Attraction between two reacting electron shells, induced by an external S spin field. This is similar to iron dust being organized into a chain by an external magnetic field. This step assumes an attractive force between fusing atoms. Many more details will be given in Part 3 about the extended Lorentz force, and the new “magnetic” material properties. This second catalytic step is unusual as yet. This step has not yet been completely proven but there is already indirect experimental evidence (see Figure 11 a, b).

Orbiting electrons generate magnetic fields (ferro, dia, para, ferri magnetism) but it is the structure of the electron cloud that is important. No material constants for any spin field have yet been established experimentally—apart from some sporadic biological effects, like showing torque and attraction.

Most materials (glass, aluminum, paper, copper, iron) show an attraction to the human body.

Strong mutual attraction is expected at the atomic level between the reacting electron shells due to an external spin field, as a catalytic means for cold fusion. (The same applies to the nuclei as well.) Needless to say, this happens only in the external field of a rotating charge, or in a transient plasma, where induction will generate a temporary spin field.

Before entering into the physical and technical details of rotating nanomotors carrying a charge, it is important to remind the readers that charge rotation is different from charge translation (B magnetic induction). When the translational current is steady (charge flux, Coulomb/sec), it is characterized only by a translation symmetry, which is a polar vector.

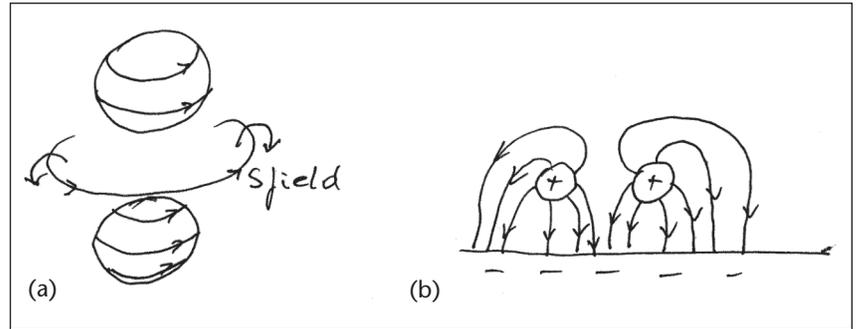


Figure 11a-b. Spin and electric fields catalyze fusion between atoms when they are partially ionized at best. a) Attraction between electron shells. b) Overcoming repulsive Coulomb forces near to a charged surface.

When a charge is rotated by a steady angular velocity (for example, in condensed plasmoids, charged, rotating dust particles or ATP-ase nanomotors), the charge is accelerated radially all the time at all spatial locations. This is characterized by an axial vector, and therefore special relativity is no longer valid.

It has a reduced symmetry compared to current flow along a straight line. The lesson of the Curie principle is: reduced symmetry is always associated with brand new effects.

The rotation of charges is pervasive, and ubiquitous in Nature. Except in viruses, rotating enzymes are everywhere, in bacteria, archaea, in plant leaves driven by sunshine, insects, fishes and the mammalian world. So where there is a charge rotation, a spin field appears, thus transmutation, and fusion-type LENR will appear—if we are willing to look for it.

Of course, if there are no questions, there are no answers. The discovery of charge-carrying rotating nanomotors was driven by curiosity. How do we breathe, and what are the events of the respiratory chain? It was an immensely bumpy road, full of nothing but unexpected, totally counter-intuitive test results. It took nearly a century to resolve it, and it is admittedly still not complete. There were five Nobel Prizes awarded for major breakthroughs, and deep, heated, hate-driven, prejudice-laced rows. (The story started just like that of LENR, but ended nearly with a Hollywood-style happy ending.) Unfortunately the real conclusions of symmetries were not drawn because the community of biochemists and molecular chemists don't speak Nature's language: symmetries.

Since this paper is about LENR, as well as missing symmetries, it is useful to show the common (identical) symmetries

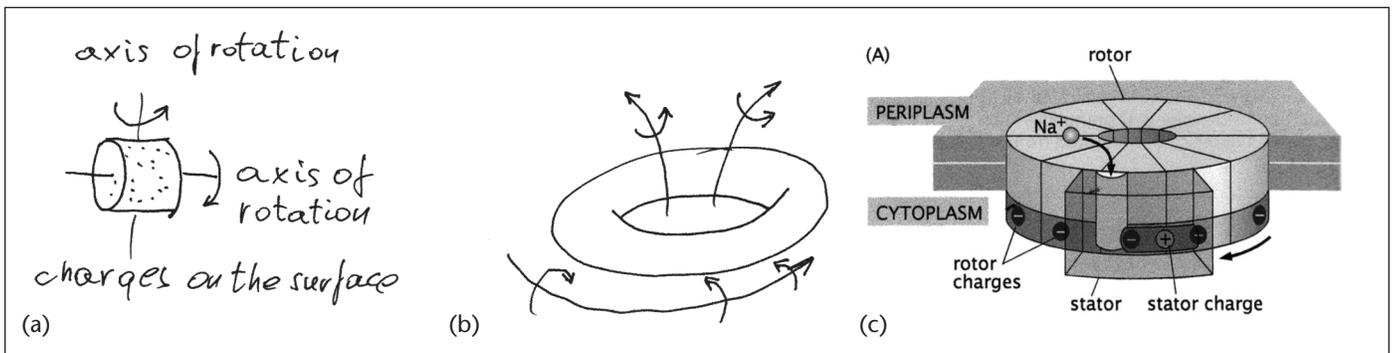


Figure 12a-c. a) A rotating dust particle, charged by high velocity electrons in an oscillating plasma. This acts as a Coulomb shielding spin field. b) Spin field generated by a toroidal-shaped condensed plasmoid. c) The approximate shape of the rotating ATP-ase enzymes. The Fo part is an electrostatic motor. Bacterial flagella have a similar rotary, protein complex.

of dust fusion, condensed plasmoids and rotating enzymes side by side. Though the first two were discussed already, they are mentioned only to demonstrate their common symmetries, despite the different technical settings.

Dust Fusion

The simplest of the three LENR catalysts is the rotating charged (solid) dust, surrounded by weakly ionized (low temperature) plasma. As shown in Figure 12a, in a plasma—usually out of equilibrium—electrons move faster than ions. The fast electrons hit the dust particles, and accumulate beneath their surfaces, and thus they become negatively charged. It will rotate freely around three axes, but in Figure 12 only one of them is shown. Thus a spin field will always arise, but if two or three axes of rotation are involved, even higher order fields (torsion, etc.) will appear. This micron-sized rotating object (of arbitrary shape) will attract positive ions from the plasma, but its own atoms are also subject to transmutation, especially when its temperature reaches the Parkhomov limit of at least 1000°C.

A floating dust particle will definitely rotate, but in a random manner, kicked regularly by turbulent forces or other particles. Its rotation will be around the axis of highest inertia, but energy partitioning may yield a rotation along other axes as well. Both electric fields and spin fields can be very intensive, by several orders of magnitude higher than in any other technical environments.

Condensed Plasmoids

The formation of these quasi-particles was discussed in Part 1, out of transient discharge plasma. They are overcharged and emit charges in their “white mode” and are in nearly chargeless state when in “dark mode” (terminology of Ken Shoulders). The weird thing is that they can be stable up to hours, even days, and they don’t recombine as standard quantum mechanics demands. (Lutz Jaitner did groundbreaking work on the stability of condensed plasmoids, described in Part 1.) It is very complicated, based on the Klein-Gordon equation. These stable quasi-particles do contain a cloud of rotating electrons around their toroidal shape, thus generating a spin field—by definition. Since they are electrically charged in “white mode,” they are able to catalyze transmutations (Figure 12b).

Rotating ATP-ase Enzyme

This is the only rotating enzyme nanomotor found in all types of life. All other enzymes (catalysts) have periodic, intermittent action between their reagents. Therefore it was quite unexpected to find an enzyme with continuous rotation, driven by a stream of charged particles. It is so unusual, beyond human imagination, that textbooks written before their discovery do not have any hint about the possibility of their existence.

Here is some data about them: in an average human (65 kg) there are a million times billion mitochondria, and each of them has 10 to 100 rotating nanomotors, so the number of nanomotors is about 10^{17} . Each of them rotates seven to nine protons continuously, and at about 100 revolutions/sec. (At about 6000 rev/min but during exercise it is

9000/min.) While the net current in a human body is negligible, this rotating current density is not. We make 60 kg of ATP molecules in a day, but consume them in seconds after their formation. Each ATP is disassembled twice in a minute (yielding energy instantly).

This generates about 130W of energy in our body; only part of it is heat. This is 10,000 times higher energy density than the specific energy production of the Sun. (By now we know that energy is generated in the dusty part of the corona, not inside the mass of the Sun.)

An *E. Coli* bacteria uses 50 billion ATP molecules for a single division (much more than at rest).

It may be clear by now that high angular velocity charge rotation and its induced fields are the very features that separate life from the non-living world.

The rotational symmetry of charges and chirality of all organic materials (proteins and carbohydrates) is a distinguishing feature not found elsewhere in inorganic nature. Now we may answer the age-old questions: What is life? Is there a sharp border between life and non-life? The border between life and death is the rotation of charges in organic materials. No rotation of charges, no life.

This is the main reason that most organic molecules can’t be produced in test tubes, not even a cell membrane, since there are no rotating charges in the test tube—no spin field. This is a simple, testable hypothesis, and this applies to LENR as well.

This is the reason why only cells produce cells. (For this very reason there is no point to debate about natural selection, and the origin of life. As long as we don’t know enough about life’s symmetries and related effects, all debates are just comparison of faiths, not facts.)

Some data: An average 65 kg person has 10^{15} mitochondria, and each mitochondria has about 100 ATP-ase rotating enzymes, totalling about 10^{17} rotating enzymes. Athletes may have ten times as many (just think of ultramarathon runners). Nine protons revolve simultaneously (we use ten instead) at one time, and they revolve at 100 times/sec; a thousand protons revolve in an ATP-ase enzyme in a second. Because the electric charge of a proton is 1.6×10^{-19} Coulomb, the current is obtained by multiplying the number of ATP-ase enzymes by the number of charges/second, by the unit charge of a proton. This yields about 1.6 Amperes of rotating current in an average 65 kg person at rest, and about 3 Amperes when hard at work. The peak power of an athlete (or a healer at peak) could be as high as 30 Amperes. This is to be multiplied by the angular velocity of an ATP-ase enzyme of 100 rev/sec, that is 100x yields about 1.9×10^4 A rad/sec or in terms of charge, Coulomb X radian/sec². This is the measurement of the spin field, as a sum of steady, rotary, accelerating charges in a human body. In the opinion of the author, this field around living beings has been termed the “aura.”

In classical mechanics for rotary motion, the angular momentum (N) is used to describe the static state of a rotating mass ($\Theta \cdot \omega = N$, where Θ is the moment of inertia, ω is the angular velocity). Thus a body accelerates, but its center is static. The concept of mass and velocity is extended and generalized for rotation.

After this numerical detour, we look at some weird working principles and strange structures of the ATP-ase rotary enzymes in the mitochondria. Each and every aspect was fought bitterly during its discovery, and rejected outright by

the mainstream, since they are outrageously different from our expectation. The only problem was that eating and breathing are undeniable processes, otherwise known as the process of “oxidative phosphorylation.” Without this understanding, they would be still unknown by outsiders, just as LENR stands today.

There are three weird features about these common biological processes (and dozens of lesser ones, like Huizenga’s three miracles):

- 1) The chemical energy of the food digestion chain at the last step (before the ATP molecule was formed) was stored *not* as a powerful chemical compound, but as a static electric potential difference in proton concentrations at the two sides of the mitochondria’s inner cell membrane. (Biochemists have been looking for this miracle molecule for 30 years in vain. It turned out to be just an illusion.)
- 2) The shape of the ATP forming enzyme turned out to be a fully fledged, utterly complicated rotary nanomotor. The driving electrostatic motor (F_0 complex) is shown in Figure 12c, but not the segmented, nine-fold symmetry enzyme.
- 3) How are naked protons (hydrogen ions or sometimes naked sodium ions) created without recombination, and then pumped through the cell membrane of the mitochondria? Each step was intensely researched, and bitterly contested during the 100 odd years since mitochondria was first pinpointed as the power plant of all life forms here on planet Earth.

At this point we are interested only in LENR-related transmutation aspects. There is a very steep gradient of proton concentration yielding a very strong E electric field, across the cell membrane of mitochondria, namely 30 million V/m (where nearly all dielectrics break down).^{19,p73}

Note: the thickness in that cell membrane is a bare 6 nanometers so this 30 million V/m field intensity is used for Coulomb shielding in biological transmutation.

The process of proton concentration difference was discovered by a British biochemist, Peter D. Mitchell, in 1961. His publications were soon banned, and he was forced to leave his research group at Edinburgh University. Then with his own hands he built a private research lab at Glynn Valley in 1964. His test results were published as samizdat in gray covered leaflets. Fortunately for him, his data was convincing and acknowledged by former colleagues, unlike Pons and Fleischmann’s data. Mitchell introduced a novel concept into organic chemistry, a sort of vector, explaining that reactions have a direction not previously known in chemistry. Though he won the Nobel Prize in 1978 for his electric field gradient theory and experiments, he himself bitterly opposed the possibility of a rotating enzyme, as David Boyer complained in his Nobel Prize acceptance speech.²⁰

The full rotary structure of the ATP-ase nanomotor assembly was mapped by John Walker,²¹ but there were many other people who contributed to this difficult task. The structure and function of the rotary ATP-ase nanomotor is

described in detail by Nicholls and Ferguson.²²

It is quite clear that the rotation of protons in the F_0 portion of the ATP-ase enzyme is considered only as a mechanical solution by biology. The electrodynamic consequences are simply ignored. Therefore, no fundamental, qualitative consequences are considered anywhere in the numerous and growing experimental papers. The rotational symmetry itself is mentioned only concerning the geometric structure of the proton-driven “motor” of this complex, as the nine-fold mirror symmetry of the “mushroom-like” enzyme (catalyst) head.

The Location and Time of Biological Transmutation

(What follows is a hypothesis, not an experimental proof, but there is circumstantial evidence. Anyway, it will be far from the mainstream view, but testable.)

The most common type of transmutation may take place inside the F_0 ring between the deuterium nuclei and a neighboring carbon atom, like $C^{6}_{12} + H^1_2$

$\rightarrow N^7_{14}$. This reaction was nailed down by Jean Moncade.²³

This nuclear reaction may destroy a given rotary enzyme since it can be frequent. (By now, out of 6500 hydrogen atoms, only one is deuterium.) However, this reaction might have led to the reduction of deuterium density of the early ocean down to a level allowing multicellular organisms to grow. It is known that bacteria appeared some two billion year ago, then for a further billion years no multicellular organisms appeared. Nick Lane characterized it as a “boring billion years.”¹⁹ Well, bacteria diligently crunched deuterium,

so our emerging nitrogen atmosphere is due to this slow process. Also, it is a sign of life on a celestial body that at least bacteria are present on a moon or planet.²³

Even much heavier nuclei may also be fused around the F_0 - F_1 complex, as a strong electric field (Coulomb shielding), magnetic and spin fields exist there in the matrix of mitochondria. (A soup inside the mitochondria is rich in minerals and organic matter.) No other place in a cell has these three fields at such an intensity! The timing is also important. Parkhomov noted that biological activity increases at full moons, because the ambient thermal neutrino flux is enhanced at this time. This in turn has a measurable effect on biology, since biological transmutation also requires neutrinos.¹¹

This remarkable periodicity is widely known because some diligent biologists meticulously collected data on growth, germination, birth and death, migration for nearly all species. The lunar cycle is the most apparent, but the eleven and seven year periods are also apparent. Endres and Schad poured through over 1000 references to prove the reality of moon cycles.²⁴ Diurnal changes were researched and established by Foster and Kreitzman.²⁵

Most test results on the outcome of biological transmutation were published by Kervran, and Vysotskii and

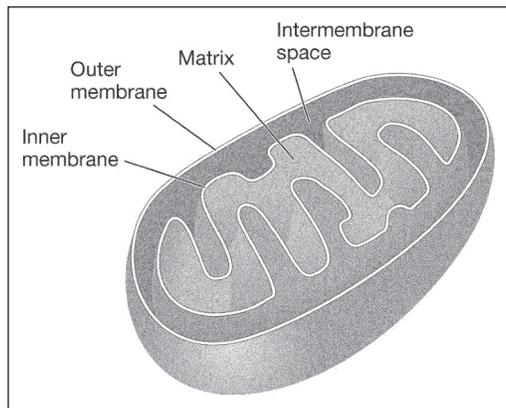


Figure 13. The schematic layout of the mitochondria and its double wall; the He proton(ion) concentration gradient creates the strong electric field.

Kornilova, described in the review by Biberian.¹⁴

During the last 200 years since chemical analysis made it possible, mounting experimental evidence has been collected. However, the rotary nanomotor of the ATP-ase enzyme is not only a catalyst in the respiratory chemical chain, but at a physical, nuclear level, too!

In order to achieve reliable, high-yield test data on biological transmutation, the age old experience must be taken into account!

The best period to observe biological transmutation is in spring, around the full moon (due to high neutrino flux) when root tips and leaves grow rapidly. Otherwise it is within the range of test error. The best method to collect test data is by high resolution ICPM, where shifts of isotope ratios are also apparent, according to the experience of this author. (The test data was not published at the ICCF22 cold fusion conference in 2019, as perhaps the organizers were afraid of tarnishing the reputation of LENR research.) Is biological transmutation just a side effect, or an essential part of life? The latter is more probable.

Summary of Part 2

The rotational symmetry of electrodynamics is the most important missing link to comprehend LENR in Nature. Charged rotating dust particles, and transient discharges (via condensed plasmoids), are the main catalysts, both via the spin field. Thus a number of poorly understood laboratory and natural phenomena are interpreted, including:

- a) dust fusion reactions by Tesla, Oshawa, Esko's Quantum Rabbit, Klimov's rotating flow reactor and the author's resonant reactor
- b) the solar corona and quasars, transmutation in volcanic eruptions
- c) biological transmutation of deuterium, and heavy nuclei in all life forms having rotary nanomotors

In general, anomalies present a golden opportunity for experimentalists and theoreticians alike to widen our view of Nature. This is seldom done, but with a firm grip on symmetries, Nature's book is readable.

In Part 3, we shall continue our investigation with the help of symmetries, to find the missing longitudinal and torsion waves, to extend the Lorentz force, to find new material properties in organic and inorganic materials, and to find extended symmetries in gravity as well, along the Maxwell-Heaviside equations, and find neutrinos as an indispensable medium of LENR.

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