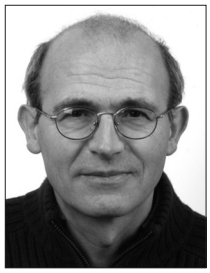
BREAKING THROUGH EDITORIAL



ICCF22 — Assisi, Italy, 2019

George Egely

Unfortunately, David Nagel will not have time to provide his usual thorough, detailed description of the ICCF meeting, so readers will have to put up with my subjective reflections on the 22nd International Conference on Condensed Matter Nuclear Science (Cold Fusion). [The *IE* website, http://infinite-energy.com/resources/iccf22.html, has links to video, photos and reporting from the conference. Marianne Macy will provide more in-depth reporting for *IE* online and possibly in Issue 149.)

Since I first came across cold fusion, I have had a nightmare: that we see only the tip of the iceberg, that there are several phenomena connected only by transmutation. Transmutation—which is not necessarily a net energy producing phenomenon—may have many forms, and a wide scale of intensity. This nightmare became for me a reality listening to lectures and talking to researchers at ICCF22.

As an experimentalist, I have tried many forms of transmutation. I worked in classical alchemy with Peter Grandics (*IE* #142), where fine dust of SiO and perhaps some additives were turned into gold after heating above 1000°C, but nothing else.

I experimented with resonant dusty plasma, with massive transmutation yields, leading to tungsten, lead and even uranium.

And of course I worked with direct electric energy production via the Correa-Chernetzky effects, with transient electric discharges in low pressure tubes, of large cathode areas.

Last but not least, I worked with a fluidized bed of large area cathodes of the Patterson cells, which is an electrochemical LENR solution.

I am skeptical about a general "one size fits all" type of theory that is an all-encompassing general model for all the above phenomena.

Even a single experimental area of the above phenomena lacks reliable models capable of prediction.

I do not blame theoreticians though, because they have to see through a fog of scanty, sometimes unreliable data sets.

But I don't think that the "classical" Pons-Fleischmann electrochemical effect has the same physical background as cavitation or transient spark-induced transmutation.

Of course, the darkest problems of all are lurking around all the above phenomena: is textbook physics enough to tackle the above phenomena? My answer (likely shared by most researchers of LENR): NO! NO! NO!

So where are the hidden traps of tacit but fatal assumptions? Are current quantum mechanics and nuclear/atomics physics correct in their mainstream "cut into solid rock" form? Certainly present textbook physics, and the mainstream physics community, are unable/unwilling to tackle the above phenomena.

The only exception at ICCF22 was the theoretical work of Peter Kálmán and Tamás Keszthelyi, from the Technical University of Budapest. Their work was summarized by David Nagel. Their main conclusion is that in a solid environment, even textbook quantum mechanics allow LENR when there is a violation of energy and momentum conservation in a short, intermediate period. Their theoretical predictions are valid for a metal lattice—proton/deuteron interaction. The reaction is a sort of catalytic reaction, involving heavy nuclei like palladium. Higher order terms, neglected so far, must be taken into account in these cases.

What I miss from this otherwise pioneering work is that there is no firm guideline for the experimentalist about what is to be done for a better yield, or a better rate of fusion.

David Nagel and Steve Katinsky of LENRIA are on the verge of a quite different breakthrough: to make a mass-produced, repeatable electrochemical experiment. Their aim is important to help the social acceptance of LENR, by a series of successful tests.

Fusion by Catalysis

Contemporary science is characterized by a number of false, thus harmful, myths: *e.g.*, arteries become sclerotic due to high cholesterol; cancer can be cured by poisons; consciousness is just electrochemistry within the brain, etc.

In physics there are also a number of unproven myths, like: there is no ether, energy is always conserved, etc.

In fusion, it is widely accepted that hot fusion will be realized in an economic way as a two-body interaction by high temperature alone. No way. Like in all life processes, economy requires catalysis. There are many forms of catalysis (all of them are three-body interactions); the question is, which one is the best or, if there are several of them, which is the best for heat production, or for electricity production?

In my opinion, ICCF22 reached a turning point, by openly addressing these vital issues.

It seems quite certain now that unusual quasi-particles are the catalyst in some LENR processes.

For example, phonons or acoustic waves were always claimed to have a charge shielding role in metal lattices of Ni or Pd-. Peter Hagelstein is the theoretician behind this line of thought, and it is backed by experimental results.

Jozsef Garai calculated that the vacancies of a Pd lattice are the catalytic sites, which makes possible fusion for deuterium nuclei at 21.65 THz, and similar values for HD and proton-proton systems.

However, the real "jack of all trades" catalytic pseudo-particle was described by Lutz Jaitner.

Condensed Plasmoids

These pseudo-particles have had different names during their two decades of history. Ken Shoulders called them *electrum validum*, electron clusters containing several millions of electrons, somehow sticking together during a sharp, sudden spark discharge. His theory never got a widespread reputation, as there was no acceptable description of what the "glue" is among the electrons.

Lutz Jaitner solved this puzzle by assuming a fully ionized nuclei surrounded by a cloud of electrons, millions of them. The shape of this self-sustaining plasmoid is like a helical spring.

I personally wouldn't believe this phenomenon, had I not seen the traces of this strange object. This summer Bob Greenyer from the Martin Fleischmann Memorial Project (MFMP) organized a trip to visit Mr. Ohmasa, a Japanese inventor.

Ohmasa made a special gas with the help of cavitating bubbles, in the mixture of H_2O/D_2O. On the plates of the vibration system there were a number of caterpillar-like long traces of these strange quasi-particles. Most people call it strange radiation, as these plasmoids are indeed very strange.

We are interested because they are stable, sometimes for days, and their high mass and strong electric field makes them capable of Coulomb shielding, which can catalyze fusion between nuclei.

Jaitner's quantum mechanical model seems to describe all the weird features of this massive quasi-particle. (See Figure 1 from Jaitner's presentation.)

Looking at the details of the catalytic process, there was a similar line of thought by András Kovács, who wrote a number of papers (with co-authors) about the re-thinking of electrodynamics, thus opening new methods for charge screening. (See, in particular, the ICCF paper "Maxwell Dirac Theory and Occam's Razor: Unified Field, Elementary Particles and Nuclear Interactions" by Kovacs, Vassallo, Di Tommaso, Celani and Wang.) In this model, apart from Ni-hydrogen systems, other metals like Mn are also prone to LENR processes. As this model requires the intimate knowledge of Clifford algebra, its details are not easy to grasp.

Keith Fredericks caused me another surprise, by showing experimental evidence that the "strange radiation" appears in nature as well, probably of cosmic origin on sensitive films.

The Russian Results

While in the West Shoulders was the main protagonist of charge clusters as exotic vacuum objects, Russian researchers embraced this idea earlier. They have regular yearly conferences on LENR and ball lightning, and usually discuss the physical features of these objects openly. Anatoly Klimov briefed us about these meetings, and invited participants to take part in them in the future.

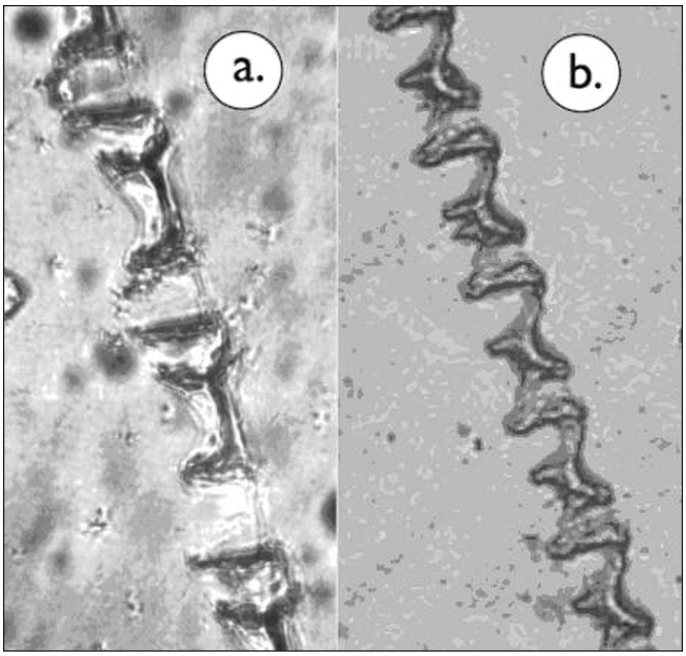


Figure 1. Caterpillar-like traces of strange radiation.

Russian LENR seems to be more open and more innovative, though they always work on shoestring budgets.

Bob Greenyer of MFMP had a paper in the absence of Parkhamov, about a long-running, small, high-temperature reactor. Parkhamov's model involves neutrinos, generated above 1000°C, and electrons. In this model, fusion takes place between two nuclei, a charge screening electron and a neutrino. The latter is necessary for lepton charge conservation. The model is of significant value, as it yields an insight as to why elevated temperatures are required for LENR fusion.

Cold Fission?!

For me another big surprise came from the presentation of Alberto Carpinteri and coworkers from the Technical University of Torino, Department of Structural Engineering. They have realized that neutrons were released during compression experiments on brittle rock samples. The very fact that hydrogen loaded crystals release neutrons was known before, but noticed only on the sidelines.

Carpinteri and fellow researchers Lacidogna, Manuello, Sandrona *et al*. propose that fission is the main LENR phenomenon when brittle crystals are smashed. They have carried out a series of systematic tests on different natural crystal samples, including marble, basalts and iron ores.

The samples were of different sizes, and the mechanical loads were different. But neutrons were always released, especially with iron-containing ores, where they measured up to 1000 times as much background neutron flux. This is surprising, because iron and nickel are the most stable nuclei due to their high binding energy.

In their model, a mechanical vibration in the order of teraHertz triggers fracture of the nuclei in the crystal struc-

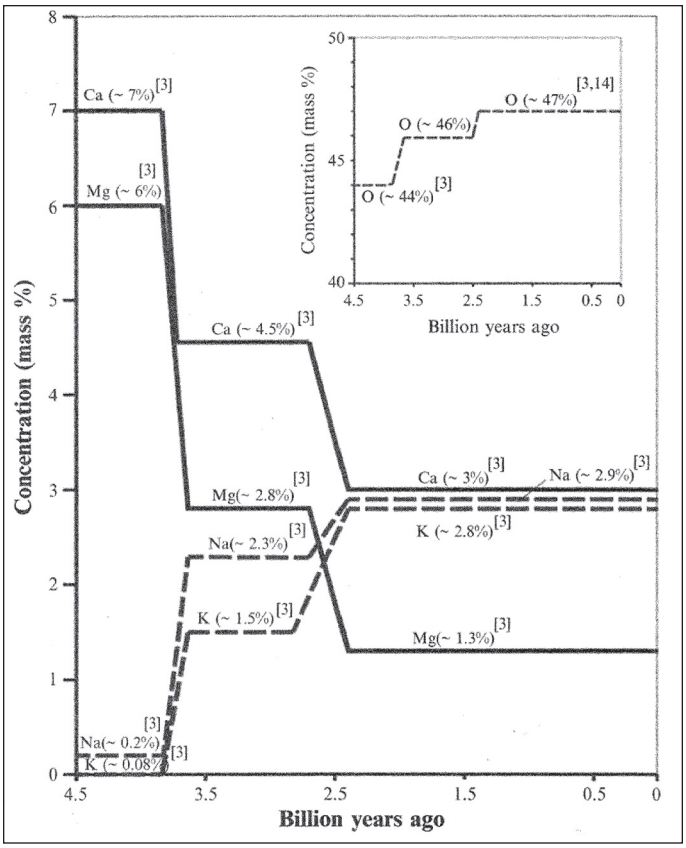


Figure 2. Concentration of mass percentage for Mg, Ca, Na, K and O as a function of geological time.

ture, due to the resonant vibration of the crystal lattice during high stress, and cracking.

They have repeated the electrochemical experiments along the line of Pons and Fleischmann, and found a copious amount of micro-cracks due to hydrogen embrittlement.

Though no explanation is given for the difference between the result of hydrogen and deuterium, nevertheless their arguments are persuasive.

Thus LENR as a field is much wider, proving that fission can be as significant as fusion!

They give several observations as a consequence of the crack-(tensile) induced fission, like the change of chemical composition of Earth's crust.

The transmutation of massive amounts of heavy minerals into lighter nuclei due to fission is an acceptable hypothesis, given the observed fact of sudden depletion of iron at the same time when aluminum increases suddenly (in geophysical time scale). (See Figure 2, from a 2015 book edited by Carpinteri *et al.*, *Acoustic, Electromagnetic, Neutron Emissions from Fracture and Earthquakes*.)

Biological Transmutation

Vladimir Vysotskii presented an interesting observation that titanium tooth implants fell out of their sockets—apparently due to transmutation of a titanium isotope into a calcium isotope. Titanium is widely used for hip and tooth implants, and preferred to ceramic ones due to its toughness and low price. No dentist realized that it may undergo transmutation due to some bacteria dwelling in some mouths. But Vysotskii examined the titanium and found some of the metal is missing, and it can't be explained away by ordinary inflammation.

I also intended to present a paper on biological transmutation—notably a series of test results on the shift in isotope ratios of Cu and Zn in the roots and leaves of celery, maize, etc. Unfortunately, conference organizers turned down the paper, perhaps because they don't believe in biological transmutation or find it of importance. In my opinion, as a community we should be open to the present coherent set of test data. Maybe it is not explicable by our present understanding, but it is always worth learning from Nature.

We have access now to high sensitivity ICPM, with laser ablation, so that rules out errors of sample contamination. Indeed, we found a definite shift of the isotope ratio of Cu, but not for sodium, sulfur or phosphorous. For Zn it was also noteworthy, but just above significance.

Epilogue

The ICCF22 organizing committee did a superb organizing job and conducted a seamlessly run meeting. We had a Renaissance dinner on Thursday evening.

Just about the same time as ICCF22, there was a huge week-long meeting of hot fusion researchers, the 14th International Symposium on Fusion Technology (ISFNT14), in Budapest, my home town.

Only hot fusion was discussed because officially there is no other type of fusion technology. Bernard Bigo, chief executive of ITER, promised hydrogen plasma by 2025. A D-T mixture will be injected into the chamber ten years later, when calorimetry can be performed.

Antonius Donne of EUROFUSION promised a useful fusion device by 2060, when only a few of the conference participants will be alive anyway.

Only Mohamed Abdou, director of the UCLA Fusion Lab, had some criticism about the lack of progress during the last 20 years.

But none of them realized the fundamental, fatal problem: there is no fusion without some catalyst—a third body. All of them assumed that the complete lack of feasibility would be continued for decades to come. All of them trusted that the censorship on LENR would be continuous...

We all agree though that more funding is necessary—for us millions, for them billions...

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