Ninth International Conference on Cold Fusion (ICCF9) Meets in Beijing, China

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The first International Conference on Cold Fusion of the twenty-first century (ICCF9) was held at Tsinghua University in Beijing, China from May 19 through May 25, 2002. Conferees gathered at the International Convention Center in the new, luxurious Uniscenter Hotel. New experiments with irrefutable evidence for nuclear-scale excess heat and nuclear products of low-energy nuclear reactions (LENR) made this a good step forward. Nevertheless, the lack of clear-cut evidence of progress toward near-term commercialization of the real but elusive excess heat phenomenon was disappointing. Still, it must be said that significant efforts to commercialize this new energy source are occurring worldwide, a fact not evident in the public discussions.

This ICCF9 report, prepared soon after returning from China, is only a brief overview of the conference. More reports may be published in future *IE* issues. Full technical papers will be in the conference Proceedings, which will be available for purchase from the ICCF9 website (http://iccf9.global.tsinghua.edu.cn).

ICCF9 was the first ICCF meeting to be held in China. The last one, ICCF8, was held May 2000 in Lerici, Italy (see report in *IE* #32). Two other ICCFs have been held in Asia: ICCF3 (1992) and ICCF6 (1996), both in Japan. Following the traditional Europe-Asia-North America rotation for ICCFs, ICCF10 will be held in the U.S., quite possibly in the Cambridge/Boston area, but certainly on the eastern seaboard. The chairman for ICCF10 is cold fusion theorist Prof. Peter Hagelstein of MIT's Department of Electrical Engineering and Computer Science—hence the pull toward the Boston area. ICCF10 will occur either in September or October 2003, because it was agreed among members of the international organizing committee that a two-year separation between ICCFs is too long.

ICCF9 was sponsored by: China's Fundamental Research Division of the Ministry of Science and Technology; the Physics Division II of the Natural Science Foundation of China; the Chinese Nuclear Physics Society; and the Department of Physics at Tsinghua University. It is gratifying to observe the open-mindedness of these Chinese science organizations. Would that ICCF10 could be sponsored by the U.S. DOE, NSF, the American Nuclear Society, and the MIT Physics Department. But please don't hold your breath for that!

According to the ICCF9 Organizing Chairman, Professor of Physics Xing Zhong Li of Tsinghua University, the conference had 124 attendees, with 17 "accompanying persons." The ICCF9 conference book contains 104 abstracts. The bulk of these papers were presented in poster sessions on three different days, with two to three minute oral summaries being given to the full assembly of

participants. Presentations that were deemed to merit longer lectures to the whole group received 30 to 50 minute time allotments. Some 77 of the attendees were from abroad, but the rest were all from China, which appears to have an active interest in cold fusion, dispersed among a variety of physics departments and organizations. Known attendees and paper submissions (or abstracts) came from Australia, Belarus, China, France, Georgia, Germany, Greece, India, Indonesia, Israel, Italy, Japan, Romania, Russia, Spain, U.K., Ukraine, and the U.S.

Jed Rothwell provided this initial impression of ICCF9, which seems appropriate: "These conferences are more difficult to describe than they were a few years ago because experiments are much more sophisticated. Results are no longer binary: heat or no heat. Bare bones, basic repeatability is good in most experiments. Results are usually multifaceted: heat plus charged particles plus transmutations. When results are less than satisfactory, it is because they vary over a wide range and do not correlate well with one another. Expectations and standards are rising. A few years ago researchers were pleased to see something happening in most runs. Now they want to see the same thing happen to within an order of magnitude."

ICCF9 was similar to the other ICCFs since about ICCF6 in Toya, Japan—a mixed bag of very, very good material and experiments (*e.g.* the Mitsubishi Heavy Industries report on repeatable transmutations—see below), and lots of modest improvements, hints of progress here and there, as well as some very marginal experiments. My overall feeling about the cold fusion field is one of general sadness and pessimism, tempered with glimmers of hope. Certainly, the reality of these phenomena keep being re-emphasized with a widening circle of experiments, but the field is generally unheralded and/or disrespected worldwide. This was the first ICCF at which the infamous anti-cold fusioneer, Dr. Douglas Morrison of CERN, was not present to assault cold fusion researchers with ludicrous questions. Because of his passing last year, there will be no absurd critiques circulated to the outside world. This year, Robert Park of the APS was simply silent about ICCF9—his cold fusion "informer" was no more.

Almost no one in the cold fusion field seems to have a clue about what has to be done to energize the field—pardon the pun. And there is even peculiar, inexplicable concealment of certain advancements by some researchers. One example: Shortly before ICCF9, reports of a new cold fusion method developed by a respected U.S. researcher were circulating. It involves shining a low-power laser onto a coated cathode in an electrochemical cold fusion cell in calorimetric balance (no excess power). Remarkable, rapid increase in output power of the cell occurs when the red laser light hits an appropriate "active" spot on the cathode, or so it is said. Moreover, the effect is very repeatable. Yet for reasons that are not clear nor seemingly justified, no report of this work was provided at ICCF9. With that episode as background, the end-of-conference talk about

“cooperation” and more rapid sharing of information seemed like so much hogwash.

The only speaker who talked openly and directly about an intent to commercialize was Dr. Les Case. His work, four years beyond ICCF7 in Vancouver at which he announced his gas-phase “catalytic fusion,” has not yet emerged from the shadows. He spoke at ICCF9 in expansive terms, and indeed he has launched a real new and important area in cold fusion (possibly the *most* important direction), but it is still unclear how far from his goal he remains.

We worked very, very hard here at New Energy Research Lab (NERL) in Bow, New Hampshire to help Dr. Case use his big (100-liter internal volume) dewar cell to verify excess heat and try to achieve self-sustainment with his new proprietary formula—a patent-applied-for catalyst very unlike earlier ones that were successfully tested by him and others. Sorry to say, just after ICCF9 we came to this conclusion about our initial Case work after performing a second week-long series of runs with his catalyst: Almost no excess heat, possibly at most a few watts out of approximately 100 watts input. This is obviously far below self-sustaining, and it is possible that some unconfirmed defect was present in these tests. For his part, Dr. Case remains confident that various “know how” items have not yet been properly integrated into these experiments, because his own laboratory work with a smaller device evidences great performance, he says. Nothing would make us happier than to see our New Hampshire catalytic fusion colleague succeed brilliantly by creating the self-sustaining reactor he believes to be just around the corner. Other work on catalytic fusion, of a still confidential nature, is proceeding elsewhere in the U.S., using Seebeck envelope calorimetry of much smaller samples.

Conference organizer Prof. X.Z. Li’s group at Tsinghua University reported excess heat (at 2 watts/cc level) in a gas-loaded system involving palladium wire in a deuterium atmosphere. Gas-phase excess heat work of any kind bears a clear relation to what Case is doing in catalytic fusion, so this paper was of special interest. It speaks of a “pumping effect” of deuterium into palladium, a phenomenon which will certainly merit scrutiny by others.

Some very good news that may help commercialization efforts in the thin-film area: A group at Japan’s Yokahama National University led by Drs. Ota and Fujii tried ordinary water electrolytic cells with thin-film-coated metal beads and tiny cylinders, similar to Dr. James Patterson’s thin-metal film-coated plastic beads, which were so successful in the mid-1990s. (There are hints that cold fusion work at CETI may be coming to life again. Stay tuned!) The Yokahama group succeed in getting excess heat from about 25% of its cells. The excess heat was not very high—about 50% excess at maximum. Dr. Michael McKubre of SRI International had not been convinced about the calorimetry of Patterson cells before ICCF9, but in his summary toward the end of the conference he said that he was impressed with the Yokahama work.

There were numerous papers confirming various kinds of nuclear products—in Russia, China, and Japan. Prof. John Dash and Dr. John Warner at Portland State University reported excess heat results in the 10-25% excess range using titanium cathodes in heavy water cells. They also found that trace amounts of gold had formed during some runs, as detected by neutron activation analysis—a presumptive transmutation.

Dr. Iwamura *et al.* at Mitsubishi Heavy Industries Advanced Technologies Center had the most spectacular work, which will be reported in the *Japanese Journal of Applied Physics* later this summer. They used a very expensive vacuum chamber with in-situ XPS (X-ray photoelectron spectrometry) detection to observe the transmutation of an atomic species; cesium and strontium were used separately. The species is plated onto a palladium and CaO-layered sandwich of material through which deuterium gas passes as it is drawn through layers by vacuum on the other side. The upper surface (facing the D2 gas) is 400 Ångstrom-thick pure Pd, followed by a 1,000 Å multilayer sandwich of CaO and Pd. Then the bottom layer, facing the vacuum, is 0.1 mm thick Pd. The upper D2 gas-facing Pd layer has deposited on it the cesium (or strontium). Iwamura *et al.* obtained a *time-history* of the transmutation phenomenon: Cesium (Cs) transmutes to praseodymium (Pr), *i.e.* Cs-133 goes to Pr-141. As the Cs declined, the Pr increased correspondingly.

The group hypothesizes that there is a gain by the initial species of two alpha particles (two He-4) or a Be-8 nucleus! The time-history of the growth of the new species matched the decline of the old species. Contamination has been completely ruled out by exhaustive testing. In the case of strontium, the reaction is: Sr-88 goes to Mo-96. As detected by SIMS analysis, the molybdenum isotope produced is Mo-96, highly anomalous with no possibility of being naturally-occurring Mo. Overall, the Mitsubishi work is as close to being a confirmation of what might be called “modern alchemy” as can be imagined.

Italy, well-represented at ICCF9, has an official cold fusion program which operates at several centers. Also, it is known that the Pirelli Corporation at Milano has a working group in cold fusion. The group of Dr. Antonella DeNinno *et al.* at ENEA has apparently demonstrated massive excess heat in current-fed exploding wires laid down on a substrate in a D_2 gas atmosphere (this work was initially presented at ICCF8). Cold fusion pioneer Dr. Martin Fleischmann has concluded (told in private discussions) that this group has demonstrated *megawatts per cubic centimeter* of power, although the researchers claimed “only” 3-4 *kilowatts per cubic centimeter*. In private remarks, Fleischmann continues to be convinced that military authorities are now in on all of this and looking toward the use of cold fusion processes in weapons.

Of great interest concerning the Italian program is that **physics Nobel laureate Carlo Rubbia has recently been quoted in the Italian press to this effect: he**

believes that cold fusion is real and important. Rubbia apparently was so eager to hear a firsthand report from ICCF9 that he called several Italian scientists home from the conference on the day before it ended. A delicious emerging irony in this: a nemesis of cold fusion from its early days, science journalist Gary Taubes, had written a book, *Nobel Dreams*—a scathing personal attack on Rubbia's high-energy physics work—this, long before cold fusion was announced. Rubbia may yet get his revenge on Taubes! **(A further aside: U.K. physics Nobel laureate Brian Josephson continues to follow reports from the cold fusion field with great interest, and is dismayed that mainstream scientific publications are not paying attention to this work.)**

We also learned at ICCF9 that a small cold fusion group from Virginia has managed to secure a contract from the U.S. Army for a cold fusion experiment. It is also known that DARPA (Defense Advanced Research Projects Agency) in the U.S. has provided limited funding to a few high-profile cold fusion projects in academia (at MIT, of all places!) and industry, but whether such funding continues anywhere is not known. Dr. Edward Teller's associate, Dr. Lowell Wood of the Lawrence Livermore National Laboratory (a nuclear weapons research facility), attended both ICCF7 and ICCF8. At the latter conference, Dr. Wood seemed impressed with the quality of papers and appeared convinced of the reality of the phenomenon.

A four person group from Israel attended ICCF9. It was good to see interest from a country that perhaps more than any other might benefit from the advent of the peaceful use of cold fusion energy.

Roger Stringham of sonofusion fame (First Gate Energies, Inc.) has moved his laboratory to Hawaii from California. He gave a talk at ICCF9, basically a review of his ultrasonic implantation of deuterium into metals. He reiterated his findings of helium-4, helium-3, and tritium in some of his earlier experiments.

Professor Yoshiaki Arata and Dr. Y.C. Zhang presented research in the same general area in which Stringham works, which is reported in two recent papers. Here are the abstracts:

"Intense Sono-implantation of Atoms from Gases into Metals," *Applied Physics Letters*, 1 April 2002, Vol. 80, No. 13, Yoshiaki Arata and Yue-Chang Zhang, Cooperation Research Center for Science and Technology, Osaka University, 11-1 Mihogaoka, Ibaraki, Osaka 567-0047, Japan.

Abstract: It was found that various gaseous atoms can be easily implanted into metal powders under ultrasonic cavitation inside a vessel with water (H_2O, D_2O, or a mixture thereof). Inert gases (^3He, ^4He, Ne, and Ar) and others (N_2, air, H_2, and D_2) were strongly sono-implanted into metals such as Ti, Fe, Ni, Cu, Zr, Pd, Ag, Ta, Pt, and Au, which were originally set in the vessel as foils, and were broken into ultrafine metal powders during intense ultrasonic processing. A large

amount of implanted atoms was verified to exist in these powders from mass spectroscopic analyzes.

"Nuclear Fusion Reacted Inside Metals by Intense Sono-implantation Effect," *Proceedings of the Japan Academy*, Vol. 78, Ser. B, No. 3 (2002), Y. Arata, Y-C. Zhang.

Partial Abstract: "Using intense ultrasonic cavitation effect, metals kept in heavy water were changed to nanometer-sized fine powder and simultaneously condensed a large amount of deuterium for 1 ~ 2 days. Mass analyzes of gases released from the revenant metal powders revealed existence of ^{3}He and ^{4}He. . .excess energy was recognized in only D_2O working liquid. . ."

The work employs foils of Ti, Pd, Ag, Ta, Pt, and Au from which nanometer-sized powders are created that are deuterium-loaded. It was disappointing that Drs. Arata and Zhang did not acknowledge Stringham's work, which certainly is related to theirs and preceded it. This is but one small indicator of the mind-boggling fragmentation that goes on in a field that is itself under attack from the outside. I have told my cold fusion colleagues for years: "We're in a life-raft together already. Nobody should be poking holes in the life-raft!"

One of the key concepts that has emerged prominently at both ICCF8 and ICCF9 is that of *flux* of hydrogen (deuterium or protium) into and through metals as a beneficial attribute for producing LENR reactions. The term *flux* is to be considered in contrast to the parameter of *loading ratio* (the ratio of hydrogen nuclei to the number of metal lattice nuclei), which was much discussed in past conferences as a necessary condition for excess heat production. This important theoretical concept had been put forth long ago by Dr. Mitchell R. Swartz, of Jet Energy Technology, Inc. of Massachusetts.[1,2] At ICCF9, Dr. Swartz's work on optimal operating point excess heat determination was highlighted when Prof. Hagelstein narrated a video tape that Swartz had prepared for the APS meeting this past spring.

The Wednesday in the middle of the conference was devoted to a sight-seeing and technology-related outing for the conferees. We were transported via two large buses through some horrible traffic jams in Beijing, and outward on free-flowing superhighways toward the Great Wall of China (at Badaling). For a few hours we all walked and climbed the awesome, ancient structure, which stretches some 7,000 kilometers over mountaintops and into valleys across China. It was a relaxing interlude.

The outing also featured a stop at the Beijing Ti-Gold Great Wall Corporation, whose primary business is using ion-implantation to coat decorative and architectural objects (metallic and non-metallic) with a luscious film of gold overlaying titanium. The company also sells ten models of ion-implanting machines and vacuum chambers. The company

was one of ICCF9's sponsors. President and owner of the company, Prof. Wang Dian Ru, has taken the bold step of financing a collaboration between his company and Tsinghua University on a major cold fusion experiment. (To my knowledge, no such collaboration on a cold fusion experiment exists in the United States.) Students, graduate students, and one of Dr. X.Z. Li's post-doctoral associates work on the project, which bears some relation to the earlier-described Mitsubishi Heavy Industries experiment. A state-of-the-art IR camera that peers through glass ports provides a measure of metal temperature distribution caused by the deuterium that is made to penetrate palladium and other metal substrates in the vacuum chamber.

The concluding day of the conference was largely devoted to reviewing what ICCF9 had accomplished and "where to go from here." The perennial discussion arose concerning the two-humped distribution of numbers of cold fusion researchers plotted on a graph against their ages. The bulk of researchers are, indeed, getting on in years and by retirement, illness, or death will be disappearing—perhaps before the hoped-for victory party at the humorously posited ICCF15. So, how will the much smaller "hump" of younger researchers be able to carry out all the work that must be done? How to get more people involved in the field? Remarkably, not a peep was heard during this multi-hour review about developing commercially available *demonstration units*—or about cold fusion commercialization period! I held back my frustration and did not speak to that point (as I had at ICCF8), for fear of being impolite to the tired group of colleagues.

One way to gain greater acceptance may be to form a peer-reviewed journal for the field, because with Prof. George Miley leaving as editor, *Fusion Science* (formerly *Fusion Technology*) appears no longer to be allowing LENR papers among its hot fusion pages. (Such papers are said by the new editor to be "not of interest" to the readership.) Some bright news: Professor Peter Hagelstein of MIT told us that he has been discussing with a major science journal publication house the possible launch of a "Condensed Matter Nuclear Physics" journal.

Professor A. Takahashi of Osaka University discussed his experience in helping to found the Japan Cold Fusion Society. There was discussion of whether cold fusion communities in other countries should form similar national cold fusion societies, and should there be an "International Cold Fusion Society."

The latter question went unresolved. Prof. Hagelstein and Jed Rothwell are eager to have a more permanent web presence for cold fusion, in the form of permanently posted archival papers and notices. This will undoubtedly be launched before ICCF10. (Indeed, just as this issue went to press we learned that a skeletal site, www.LENR.org, has been posted.)

Final Thoughts: China

The struggle and ferment in the cold fusion field was exposed at ICCF9 amid the backdrop of the great business turmoil and industrialization now going on in China. This heretofore sleeping giant is clearly in the process of waking up to new ways. This is evident in huge billboards everywhere touting both Chinese and Western industries in the computer, energy, and biotechnology fields. Though the People's Republic of China may be a communist nation, capitalism is rampant there. New enterprises are popping up everywhere on the streets of Beijing—especially cell phone businesses. Many shops were lined up on a single street, each selling cell phones! In one bookstore I visited, a large number of items were Chinese translations of popular business-culture "how to" books from the West. Large numbers of bicycles and tricycle cargo-carrying vehicles were everywhere, but Beijing has millions of cars and new buses too. The infrastructure is being inexorably built up. It was very charming to observe the bamboo construction scaffolding on high-rise buildings in the works. Some ICCF9 attendees likened the atmosphere of China in 2002 to Japan in the early 1970s.

Across from the very Westernized hotel in which the conference was held, an entire city block of single-level masonry buildings was leveled during the five-day conference! This to make way for some new construction in the bustling Tsinghua University area. The leveling was begun by dozens of workers with sledgehammers and pick-axes, followed by only a single backhoe type machine. Most of the debris was carefully recycled and taken away by dozens of tricycle vehicles as well as numerous horse and donkey-drawn flat-bed carriages. Even the old bricks were carefully packed in regular arrays for recycling. Ditto for little pieces of scrap metal and old, worn wire. It was simply amazing. Perhaps the cold fusion field will trigger a similar and long-overdue leveling—a demolition—of weak structures and obsolete paradigms in physics, even though most cold fusioneers seem quite oblivious to this prospect.

References

1. Swartz, M.R. 1992. "Quasi-One-Dimensional Model of Electrochemical Loading of Isotopic Fuel into a Metal," *Fusion Technology*, Vol. 22, September, 296-300.
2. Swartz, M.R. 1994. "Isotopic Fuel Loading Coupled to Reactions at an Electrode," *Transactions of Fusion Technology*, Vol. 26, December, 74-77.