

FOREWORD

1. HISTORY

Eleven years have passed since Professors Fleischmann and Pons (FP) announced that they had observed the fusion of two deuterium nuclei at room temperature within the lattice of a metal. This announcement produced great excitement, and there were many attempts to reproduce the experiment. It turned out that it was neither easy, nor easily reproducible, and the eventual outcome was the growth of enthusiasm and skepticism at the same time: the enthusiasm of those who succeeded in repeating the experiment and the skepticism of those (the majority) who did not. Within a few months the scientific community took the "semi-official" position that none of it was true and that "Cold Fusion" (CF) did not exist.

This history has created a very strange situation, a divergence increasing in time between official science and a small group of researchers, most of whom have participated in this Conference, who have continued to do research in this field. They had the conviction, better the awareness, that the phenomena under investigation were real and scientifically very interesting. The hope that this research could also have an important practical result, mainly as a new energy source, added charm and passion to this enterprise.

Research in CF has been going on all these years, producing continuous, albeit gradual, progress, mostly in USA, in Japan, in Italy, in Russia, in China, and, to a lesser extent, also in other countries. There have been difficulties in communicating the results obtained within and outside of the CF community: many scientific journals have *a priori* denied access to papers related to CF. In this situation an important role has been played by the International Conferences, of which the present, ICCF8, is the most recent. They have offered an occasion to meet and exchange information among the researchers active in this field, and have provided an important resource with their Proceedings, amounting to a good archive, witnessing the development of CF. I think that it is worthwhile, at this time of the CF history, to review them, thus producing a concise outline of the main events in the field.

The first Conference was sponsored by the "National Cold Fusion Institute" (NCFI), founded by the University of Utah, and was held in Salt Lake City at the end of March 1990. It was called "The first annual Conference on Cold Fusion". There were already major difficulties: the official scientific community had already pronounced its verdict against CF; the NCFI would close shortly afterwards; within the CF community there were two diverging schools, those who believed only the nuclear evidence (mainly neutrons), barely accepted by the scientific community, and those who believed in excess heat, spurned by the scientific community. I must confess that I belonged to the first school, being quite skeptical about heat production, and I participated in the organization of a "dissident" Conference, called "Anomalous nuclear effects in deuterium/solid systems", sponsored by "The Electric Power Research Institute" (EPRI), by the US Department of Energy (DOE) and by the Brigham Young University at Provo (BYU): the Conference was held in Provo, Utah, in October 1990.

At this point two parallel initiatives were proposed: I was asked by the "neutron" people to organize the next Conference in Italy and Giuliano Preparata was asked to perform the same task by the "excess heat" people. There were discussions and correspondence was exchanged between the representatives of the two schools, but eventually wisdom prevailed and it was decided that there would be only one Conference, in Italy, covering all aspects of CF. This was the "Second Annual Conference on Cold Fusion": Tullio Bressani, Emilio Del Giudice, and Giuliano Preparata were the Chairmen, and for the first time an International Advisory Committee (IAC) appeared. The Conference was sponsored by Italian universities, research agencies and industries, and was held in Como at the end of June and beginning of July 1991.

I think that the Como Conference was very important in the development of CF. There were at least two results that have influenced future research: the statement that heat excess in electrolytic cells with heavy water and palladium cathode could be obtained only if the amount of deuterium absorbed in the palladium lattice (the D/Pd ratio) exceeded a threshold value (McKubre), and the correlation between heat excess and the presence of ^4He , understood to be a nuclear ash of the fusion process (Miles). Both these features were consistent with the theory presented by Preparata, Bressani and Del Giudice in April 1989. The many confirmations of the production of heat excess also had an important effect on me and on the ENEA Frascati Group: we decided to move from neutron and tritium detection to calorimetry, and eventually we obtained very convincing evidence of the existence of excess heat.

Next Conference was organized in Japan, with the strong encouragement of IMRA, the research enterprise that owed its existence to the determination of Minoru Toyota, an influent member of the Toyota "dynasty". It was sponsored by many Japanese scientific institutions, was held in Nagoya in October 1992, and was chaired by Prof. Hideo Ikegami. This was the first for which the present name and acronym were used: "3rd International Conference on Cold Fusion" (ICCF3). The IAC was also active in this Conference, and a general rule was informally accepted about the frequency and location of the subsequent conferences: there would be a rotation among the three most active continents: Asia, America, and Europe, with roughly one and a half years between successive conferences. Thus we had ICCF4 in December 1993 in Maui, Hawaii, USA, sponsored by EPRI and by the Stanford Research Institute (SRI), chaired by Drs. Tom Passell and Michael McKubre, followed by ICCF5, in April 1995, in Monte Carlo, (almost) France, Europe, organized again by the IMRA laboratories, chaired by Prof. Stanley Pons. Then came ICCF6, in Toya, Japan, in October 1996, organized by the Japanese government enterprise, "The Institute of Applied Energy" of the "New Energy Technology Development Organization" of MITI (the Ministry of International Trade and Industry): it was chaired by Prof. Makoto Okamoto. Finally ICCF7 was held in Vancouver, Canada, in April 1998, and was organized by Eneco, a private company that has always followed attentively the development of CF. Fred Jaeger was its Chairman.

After Asia and America, it was once again the turn of Europe. In Vancouver I was appointed by the IAC to be Chairman of ICCF8, to be held in Italy. The period envisaged was October 1999, but a number of management problems that I had to face in Frascati forced me to propose to the members of the IAC to postpone ICCF8 to the Spring of 2000. They accepted and it seemed advisable, in order to avoid the congestion to be expected in the Rome area during the Holy Year, to have it in a different site. Antonella De Ninno proposed Villa Marigola, a beautiful 18th century

villa upon a hill in a delightful park in Lerici, which is a small town on the Tirrenian sea not far from Genoa. In retrospect it seems to me that this choice was appreciated by the participants in the Conference.

In the course of these years many new features of CF have appeared, only a few of which I will mention here: In FP-type experiments, the "heat after death", i.e., the production of excess heat after the total evaporation of the electrolyte; the possibility of having CF phenomena by coupling hydrogen and nickel (rather than deuterium and palladium); the increasing evidence of "transmutations", i.e., the appearance, after the CF experiment, of nuclei that were absent before; the increasing accuracy in the evidence of nuclear emissions, both in passive and "active" experiments, where by active I mean those in which a stimulation is applied to the system under study (energetic particles, e.m.-radiation, ultrasound). Much theoretical work deserves to be cited: I will limit myself to stating what is, in my opinion, the most important notion, presented first by Preparata as early as in 1989: a collective and coherent interaction among the entities that participate in the CF phenomena is required in order to explain them. The multiplicity of phenomena, together with the limited resources dedicated to this research activity, results in a sparse but fascinating panorama, with many holes still to be filled. Furthermore, all these features have continued to be haunted by the old ghost of the "lack of reproducibility". But in this direction too important progress has been achieved. I will mention here just one episode: at ICCF6 the ENEA Frascati Group presented a measurement in electrolytic cells with heavy water, in which an easily measurable heat excess was obtained with quite good reproducibility; what is most important is that this had been obtained by facing and solving material science problems connected with the absorption of deuterium in palladium, and by carefully designing the samples and the protocol of the experiment.

It is worth remembering that in these years there were three major initiatives:

1. EPRI made an important investment in CF research, initially in a number of areas, eventually mostly in excess heat experiments with D/Pd systems, that were performed at SRI. This project was active for many years and, in spite of good results, was terminated in 1995.
2. I already cited IMRA, an institution tied to the Japanese industry Toyota: three laboratories were created, two of them in Japan (in Sapporo and in Nagoya), and one in Europe, at Sophia Antipolis, near Cannes. This project, too, has been terminated quite recently.
3. Another important Japanese initiative was taken a few years later by the MITI, with an additional contribution from a consortium of industries. A specialized laboratory was built for the purpose, and universities collaborated on more fundamental aspects. This project was terminated in 1998.

One could be tempted to interpret the end of these three important projects as a demonstration that CF research is failing in its objective to become a well defined discipline in science. I am convinced that this interpretation is wrong. Let me explain why. One of the common characteristics of these projects is that they were promoted by agencies (in a general sense) highly interested in the potential energetic applications of CF. Thus, their expectation was to be able to develop practical applications of CF in a few years. This has not happened: in spite of the indubitable scientific realities, progress in CF research has been quite slow, both because of the intrinsic difficulties of the field, and of the very scarce resources that have been dedicated to its study. Thus, it is not surprising that enterprises that were born with the aim of a practical fall-out in short time would give up.

I am convinced that a lot of basic research is still needed in order to better understand the science underlying CF, before practical objectives can be seriously addressed: this can be better pursued by small groups that proceed with this idea clearly in mind. And this is, in my opinion, what is happening. As an example, let me note that at this Conference there were 15 communications by Japanese scientists (more than 20% of the total), mostly from universities, in spite of the disappearance of the two big initiatives quoted above. The research program at ENEA Frascati, funded by the Italian Government, is another meaningful example, which, I hope, will be followed by other initiatives of this kind.

2. ICCF8

2a. Generalities

The Italian research agency for energy and environment, ENEA (*Ente per le Nuove tecnologie, l'Energia e l'Ambiente*), accepted the task of organizing this Conference. There were other important sponsors. One of them was CNR (*Consiglio Nazionale delle Ricerche*), the largest public research agency in Italy. The others were the INFN (*Istituto Nazionale di Fisica Nucleare*), an important research institution, operating in symbiosis with Italian universities in the field of nuclear and sub-nuclear physics, and the Italian physical society, SIF (*Società Italiana di Fisica*). The latter is responsible for publishing these Proceedings. The decision of ENEA to sponsor ICCF8 is part of a more general initiative, taken by the Board of Administration of the Agency in 1998, including the start of a research program, proposed by Giuliano Preparata, with a new laboratory to be built at the ENEA Center of Frascati. This program was started in 1999, and the first results were reported at this Conference.

Unfortunately, on April 24, less than a month before the beginning of ICCF8, Giuliano Preparata died, leaving a sad void in our Group, in the world of CF, and in science. We decided that we would memorialize him in this Conference, dedicating to his memory the very beginning of the meeting. On Monday, May 22, after a brief introduction by me, Martin Fleischmann gave a speech in his memory. The reader will find both texts in the Proceedings.

In organizing ICCF8 I benefited from the expert advice of the IAC, which helped me take the difficult decision to delay the Conference by half a year. When the real work started, I could not have succeeded, without the efficient and intelligent contributions of Dr. Antonella De Ninno. Becoming the head of the Secretariat, she set up and directed a wonderful team, and all together we worked out all the stages of the Conference, from the decision about where to hold it to the editing of the Proceedings. Last, but not least, I wish to recall here the very important contributions of the Scientific Program Committee (SPC): initially a small group of Italian colleagues, it was then enlarged, substantially doubled, by representatives of other countries, in order to help take decisions on the program of the Conference, on its format, and on the publication of the Proceedings.

2b. About criteria

The experience accumulated from the past conferences prompted us to have a single session and to divide the contributions into orals and posters. We decided also to repeat once more the well tested technique of the "poster presentation sessions", preceding the poster discussion sessions: for each poster there would be a three-minute oral presentation, the whole session lasting one hour. We did not have invited talks, and divided the oral presentations into longer ones, the majority (35 minutes, including discussion), and shorter ones (25 minutes, including discussion). We had a total of 26 oral presentations and 51 posters, out of 110 abstracts presented. These criteria were founded on the awareness that, in spite of the eleven years that have passed, this discipline is still young, and it is important to do our best to allow the maximum possible number of participants to communicate the results of their research work.

Knowing that ICCF8 would take place at the end of May at an appealing sea-side site, we decided that we would leave the participant free time to enjoy the place: thus, we concentrated all the oral presentations in the four mornings, Monday to Thursday, from 9 a.m. to 1 p.m.. Then the participants were free for three hours. The afternoon sessions, for three days (we left the Wednesday afternoon free) started at 4 p.m. with the poster presentation session, and continued up to 7 p.m. with the poster discussion. We had three social gatherings: on Sunday afternoon we had a get-together party, on Wednesday evening we had the social dinner, and on Friday 26, after a session on "conclusions", we had a brunch offered to all participants and to their companions.

2c. Attendance

There were 145 participants in the Conference: 41 from Italy, 40 from USA, 24 from Japan, 12 from Russia, and smaller numbers from 14 other countries. We succeeded in helping colleagues who had financial difficulties plus a number of students (a total of more than 20 persons), by waiving the Conference fee, by providing free lodging in Lerici during the Conference, and, in a few cases, we also paid travel expenses.

2d. The scientific outcome

Here, of course, I am expressing my own point of view, for which I take full responsibility. I think that the picture of CF that I described briefly at the beginning of this foreword has been substantially confirmed, but there have also been many important new results, and I would have difficulty in quoting all of them. Let me just mention a few items that, in my opinion, deserve to be emphasized:

- There have been quite convincing confirmations, at least three, of the detection of ${}^4\text{He}$, understood to be a nuclear ash, in experiments with palladium and deuterium, obtained with different experimental procedures. In some cases the correlation with the heat produced gives support to the figure of 24 MeV per atom as a consequence of a D+D reaction. There was also an interesting evidence of ${}^3\text{He}$ production. The presence of these nuclei is the indubitable signature of a nuclear reaction.

- We had the first presentation of the effect proposed by Giuliano Preparata with the name of Cohen-Aharonov effect, which it has been proposed to rename as the Preparata effect. There was also the first experimental evidence of this effect. This effect could represent a shortcut to most of the material science problems, with the aim of achieving high loading ratios in palladium.
- There were many reports on problems of material science, most of them worked with very advanced techniques and with a sound scientific approach.

But there was such a variety of different experiments and fascinating theories that I would have difficulty in quoting them here. The Conference was quite lively, with interesting discussions.

Given these observations of the state of the art of this discipline, and the indubitable progress that has been achieved in these eleven years, I am still astonished by the lack of communication between the CF world and the "official" scientific community. This is also witnessed by the absence of research on CF in most of the European Countries and by the ostracism to CF publications in most prestigious scientific journals (we are very grateful to "Il Nuovo Cimento" for its open position in all these years, witnessed once more by the decision to publish these Proceedings). In my opinion, there is no doubt that we are facing a subject of enormous scientific interest: it can no longer be denied that there are many different kinds of nuclear reactions that take place at substantially low energies, and that this implies the existence of collective and coherent interactions among the participants in the events under study. Following Preparata's suggestion, one can envisage a totally new way of looking at most of the problems of condensed matter. This should stimulate the "curiosity" of all scientists: physicists, chemists, biologists, and engineers.

Another stimulating aspect is the hope that CF could lead to the solution of the very serious problems that mankind is facing concerning the production of energy. I have no doubts that we are producing particularly "clean" nuclear energy, without nuclear emissions and wastes. On the question of practical energy sources, my opinion diverges from that of many enthusiastic supporters of CF. As I said before, I am convinced that much research has still to be performed in order to better understand the physics at the basis of CF. Considering practical applications will become more and more sensible as we progress in this kind of understanding, and thus it is too early to foresee important practical applications. But, even if there is no certainty that we will succeed in this task, it seems to me that the target is so important that the scientific community should feel the duty of working at it, and this is my invitation to all those who will read this foreword.

4. THESE PROCEEDINGS

On 24th and 25th of February this year at the ENEA Center at Frascati there was a meeting of the (extended) SPC, mostly dedicated to examining the 110 abstracts submitted for presentations at ICCF8. We decided which would be the 77 presentations accepted, and their distribution between oral (long and short) and poster presentations. We discussed the program of the conference and its format. Finally, we discussed the procedure for the publication of the Proceedings. The first decision was to shift the deadline for the presentation of the manuscripts from the date of the Conference to the end of June: it was stressed that in a Conference the authors should be allowed to take inspiration from what they learned during the Conference, if this can

help them to produce more up to date and more critically conceived manuscripts. The other important decision concerned refereeing the manuscripts before accepting them for publication. Here a compromise was necessary, to assure good quality manuscripts but still bring out the Proceedings promptly. It was decided that every manuscript would be submitted to one referee, and that there would be only one interaction between referee and author. Thus, the procedure would consist in sending the manuscript to the referee, obtaining comments, transmitting the comments to the author; and if the referee required a revision of the manuscript, a second version would in turn be sent to the referee, who would give a definitive "yes" or "no" to the publication. In case of controversy, the final decision was left to the editor, i.e., to me. We would use e-mail communication wherever possible. It worked rather well on the average. But I did not succeed in sending the final manuscripts to the publisher before the end of September, as promised in the program. I had to have a one-month delay.

Most of the manuscripts were properly prepared and respected the length limit of 6 pages that we had asked to the authors. However, some were presented with an excessive number of pages. There were also some papers that were presented using a quite poor English, and sometimes the logic of the presentation itself needed to be improved. For each of these cases we asked the authors for a correction: in some cases we succeeded, in some others not. As far as the length is concerned, I decided to accept the papers that exceeded the six pages in the second version (I want to make clear that the paper by Martin Fleischmann was accepted in a version 15 pages long for intrinsic reasons: without all the figures included, he could not have presented his arguments). For the persistent poor presentation of some papers I decided to adopt another "compromise" between pursuing a most thorough and complete diffusion of the information presented at the Conference, and satisfying the quest for a rapid publication of its Proceedings. Thus, in those occasions in which I had not succeeded in obtaining a clear version of the paper in English, and the final decision on its publication was demanded of me, I decided to adopt the following criterion. Let me forget about good English and ability in presenting a scientific paper. I'll just ask the following question: after reading the manuscript, more than once if necessary, do I succeed in understanding what the author is trying to communicate? If the answer is yes, and what the author is communicating is scientifically sound, then I will accept the paper for publication. This happened in a few cases, and I hope that the reader of these Proceedings will forgive me: I thought that the most important issue was to have the information as complete as possible.

In editing the Proceedings I had to decide whether to divide it into categories (chapters), to make it easier to consult. We had not tried to make separate sessions in the Conference on purpose, both because many papers touch different aspects of CF research, and because we thought that a certain variety within a session was recommendable. The former feature occurs also in the editing of manuscripts. In spite of all these considerations, I decided to divide the papers into the seven categories that the reader will find, trying to evaluate in those papers referring to different items which was the most meaningful one. Also here I ask for the clemency of the reader for any mistake that I might have made.

5. ICCF9

On Wednesday May 24 there was a meeting of the IAC. The most important item of the agenda was the decision to be taken for next Conference, ICCF9. It was unanimously decided that next Conference will be held in China, presumably in Beijing in the Spring of 2002: Prof. Li, Xing Zhong, will be its Chairman. This decision was announced to the participants in the Conference both during the dinner party and at the session on conclusions on Friday 26, where Prof. Li gave a short speech in accepting the nomination.

6. ACKNOWLEDGMENTS

I want here to thank warmly the members of the IAC, of the SPC, the referees and the chairmen, who made this Conference rational and well conducted, and the Proceedings accurate and appealing.

I also thank the sponsors for their much appreciated help. Besides the great Agencies that I quoted above, I want to thank ST Microelectronics, an advanced multinational industry operating (in Italy among other countries) on semiconductors, and Balzers, the well known vacuum industry from Liechtenstein: both gave a financial contribution to the management of the Conference, and both participated with a presentation in the Conference.

A specially warm note of thanks goes to the Secretariat, starting from its head, Antonella De Ninno, to Ms. Maria Luisa Ciceroni, who, together with Ms. Simona Ferri, helped during the Conference preparation, during the Conference itself, and in the editing of the manuscripts; I want here to express my gratitude to Ms. Franca Vinciguerra, who took charge of all administrative procedures, and Mr. Fabio Simoni, who was in charge of the information technology aspects of ICCF8, including the web-page.

A sincere thank goes to the personnel of the ENEA laboratory in Santa Teresa, close to Lerici: their help has been really precious during the development of the Conference. We want to thank in particular Ms. Patrizia Maffei, who gave invaluable help, and the Director of the Center, Dr. Giovanni Scabbia.

Thanks also goes to the personnel of Villa Marigola, starting from the very efficient Mr. Bruno Di Stefani, always ready to solve every problem, and to the personnel of the Symposia Agency, who took care of most of the management problems of ICCF8.

Last but not least, I want to express my gratitude to all participants in the Conference, who made it lively, interesting, and pleasant.

Franco Scaramuzzi
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