Pam Boss Receives Preparata Medal

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Dr. Pamela Mosier-Boss, an analytical chemist at the U.S. Navy Space and Naval Warfare Systems Center Pacific (SSC-Pacific, San Diego), was selected as this year's recipient of the Preparata Medal. The Preparata Medal, awarded by the International Society for Condensed Matter Nuclear Science (ISCMNS) to a scientist who has made significant contributions to the investigation and understanding of CMNS, was minted in 2003 to commemorate the late Italian physicist Giuliano Preparata. The award was presented to Boss on July 25 during the banquet at the 18th International Conference on Condensed Matter Nuclear Science (ICCF18), which was held at the University of Missouri in Columbia, Missouri during the week of July 22. The ISCMNS nomination committee chose Boss, in part, "because her experiments showed without any doubt the nuclear aspect of cold fusion. In her experiments of co-deposition of palladium and deuterium she detected unambiguously the production of neutrons." They also recognized the importance of the work being published in peer-reviewed journals, "an important step in the acceptance of the field by the scientific community."

Boss received degrees in biology and chemistry from Kent State University and a Ph.D. in analytical chemistry from Michigan State University in 1985. She has been employed at the Navy lab for 28 years. Dr. Frank Gordon, retired director of the Research and Applied Sciences Department SPAWAR Systems Center, has worked with Boss for all that time. At the ICCF banquet, Gordon introduced the honoree and said, "Pam quickly established a reputation as an outstanding employee. All of you know her for her work in LENR but that has never been her main job. In addition to more than 30 peer-reviewed papers related to LENR, she is also widely published in other fields with an additional 30+ peer-reviewed papers. If you count peer-reviewed papers, conference proceedings and book chapters, it's over 160 in total. She holds more patents than any other woman in the history of the lab at 16 with 5 more pending." Two of those patents are related to cold fusion, including one issued just this year in April (U.S. 8419919, "System and Method for Generating Particles," 2013 and U.S. 5928483A, "Electrochemical Cell Having a Beryllium Compound Coated Electrode," 1999).

According to Gordon, before a recent halt on cold fusion work at the Navy lab, Boss spent only about one-quarter of her time on research related to cold fusion. Her other research includes battery systems, polymers, piezoelectric ceramics and phages. Gordon explained, "One example of her work involved the use of phages, which are viruses that kind of look like a little dot with long legs. Phages are viruses whose hosts are bacteria, like anthrax. Pam developed a method to attach the phage head down onto a grid on a silicon chip. That way, they were able to bind to their specific bacterial host and the chip could be interrogated to determine what was present. The patent that she received for this work was selected as the Patent of the Year at SPAWAR."

Gordon recalls that at the time of the Fleischmann-Pons announcement in March 1989, "Pam was working on high energy density batteries for torpedo propulsion. She and Stan Szpak immediately started conducting cold fusion experiments." In a 2003 *New Scientist* story by Bennett Davis (http://newenergytimes.com/v2/news/2006/NET18.shtml #spawar), Boss indicates that she was willing to take on the cold fusion challenge because of Fleischmann's reputation: "We knew his abilities. I had to believe he had something

The Boss family: Jacob, Matthew, Kristen, Nathan, Pam and Roger.

Photo by Marianne Macy

Larry Forsley and Pam Mosier-Boss at ICCF18.

real going on there." During her award acceptance speech at ICCF18, Boss recalled, "Like everywhere else in the world, our lab was talking about it and there was a lot of discussion." She and Dr. Stanislaw Szpak made their own palladium electrode using co-deposition and saw a net energy gain in more than 100 initial trials. They concentrated on the production of tritium, as finding it would prove that nuclear processes were taking effect in cold fusion experiments. Boss recalled, "Actually Stan knew what Fleischmann and Pons were doing before the announcement. He knew about the long acquisition times to load the metal. He reasoned that if you plate the metal out in the presence of evolving deuterium gas, it would load instantly. Our cyclic voltammetry studies showed this was true. What we did not know is that the structures formed seem to promote the effect."

Nearly three years into the research, the Navy (at the urging of Dr. Robert Nowak, then a program manager at the Office of Naval Research, ONR) began a somewhat formal joint program on cold fusion—Nowak has reported that the Navy put about $1 million a year into the program, but it never had its own line item in the budget. Dr. Melvin Miles, then at the Naval Air Warfare Center at China Lake a bit north of SPAWAR, was doing his own cold fusion research and worked with Boss and Szpak in the ONR program. He said in the *New Scientist* interview, "We were allowed to publish our results, but we weren't supposed to say a lot about it. Some people were worried that word would get out and it would jeopardize the Navy labs' funding from Congress for other research. We didn't even call it 'cold fusion.' We called it 'anomalous effects in deuterated systems.'" Gordon said of that time, "I started to worry that someone from above might wake up and realize that we were generating nuclear reactions and producing radiation in our lab. In fact, we had published papers stating as much. We compiled a list of everyone that we had briefed so if anyone ever suddenly realized that we were conducting experiments that produced nuclear reactions including high energy particles and radiation, we could report that we had briefed people including the CNO and CNR on the military side and civilian leaders in the Navy, DOD, DTRA and others. We were hiding in plain sight!"

Miles came to know Boss' approach to science very well in those years. He wrote, "Pam set-up and conducted the Szpak-Boss cold fusion experiments. I knew that the SPAWAR co-deposition experiments were top-notch because Stan and Pam made a great team. Pam contributed excellent laboratory skills that were needed, as well as ideas for experiments. I was aware of other laboratories working on cold fusion during these early years that would have greatly benefitted by the electrochemical expertise and skills of someone like Pam."

When the ONR program ended in 1996, Gordon did not want the Szpak-Boss work to end. He used just a few thousand dollars per year to continue to fund the duo's cold fusion work, out of a discretionary fund he controlled. He said at ICCF18, "Having Pam working on LENR has frequently made my life exciting. I was the release authority for the 30+ peer-reviewed articles in LENR. More than once I was asked by my bosses about the papers that we were publishing in this controversial field and I would tell them that Pam had conducted experiments, repeated the experiments to validate the results and then reported the results in peer-reviewed journals. This is the scientific method."

In February 2002, Szpak and Boss released the co-edited two-volume Navy Technical Report 1862 *Thermal and Nuclear Aspects of the Pd/D_2O System*. The duo published three papers in *Volume 1: A Decade of Research at Navy Laboratories*, with a Foreword by Gordon and additional papers by Miles and the late Dr. Scott Chubb, who was at the Naval Research Laboratory. A comprehensive (at the time) list of Navy cold fusion publications, broken into labs, is at the end of the volume. *Volume 2: Simulation of the Electrochemical Cell (Icarus) Calorimetry* was written by Dr. Martin Fleischmann, on the "modeling and simulation of the Dewar-type calorimeter." (Both are available online: http://lenr-canr.org/acrobat/MosierBossthermaland.pdf and http://lenr-canr.org/acrobat/MosierBossthermalanda.pdf.)

At ICCF11 in 2004, Boss learned more about CR-39 work being carried out by Andrei Lipson *et al.*, George Miley *et al.* and Dr. John Fisher with Dr. Richard Oriani. Miley suggested that the Boss *et al.* team try the CR-39 approach. This new approach reinvigorated the SPAWAR team, and new collaborations resulted. Larry Forsley, of JWK International, recalled that Boss "began placing CR-39, a solid-state nuclear track detector, adjacent to a PdD co-deposition cathode. Although at that point I was primarily working out of my laboratory in Virginia, and she in San Diego, we both were using CR-39 and her and Stan Szpak's co-deposition protocol. One afternoon, while using an automated scanner with another colleague, I noticed that the track density was different than I'd seen previously, as were the tracks. I suspected we were focused on the wrong side of the detector, which I confirmed. We had been looking at the side of the detector away from the cathode. Charged particles would be hard pressed to pass through 1 mm of plastic. My colleague and I both realized they were tracks made by the atoms of the CR-39 recoiling after being hit by high-energy neutrons! I immediately called Pam, who, as it turned out, had just noticed the same thing, nearly at the same time on the other side of the country, with a different piece of CR-39. She also found tracks on the 'wrong side.' Our cells were producing hundreds of thousands of neutrons through nuclear reactions! We'd found one of the smoking guns of 'cold fusion,' or at least the smoke. Later, this same protocol became the basis for the Galileo Project and U.S. Patent #8,419,919 was granted on April 16, 2013."

Pam described the CR-39 approach: "CR-39 is a solid state nuclear track detector. When a charged particle traverses through the plastic, it creates an ionization trail along its path that is more sensitive to etching than the bulk material. Treatment with an etching solution reveals these ionization trails as tracks in the plastic. What makes CR-39 such a useful detector is that it is constantly integrating. This means that once an event is stamped in the plastic, it does not get averaged away. This is particularly advantageous for reactions that occur sporadically or in low fluxes. While our detectors may show as many as 30,000 tracks, this translates into a production rate of 0.02 particles per second over a two week long experiment. Also the particles that caused the tracks can be identified by the size and shape of the tracks. Detectors used in the SRI co-deposition replication have been subjected to microscopic analysis, scanning, sequential etching analysis by Lipson and Roussetski, and LET analysis by Zhou of NASA. These analyses showed evidence of >10 MeV protons, 2.45 MeV neutrons, 3 MeV protons, 14.1 MeV

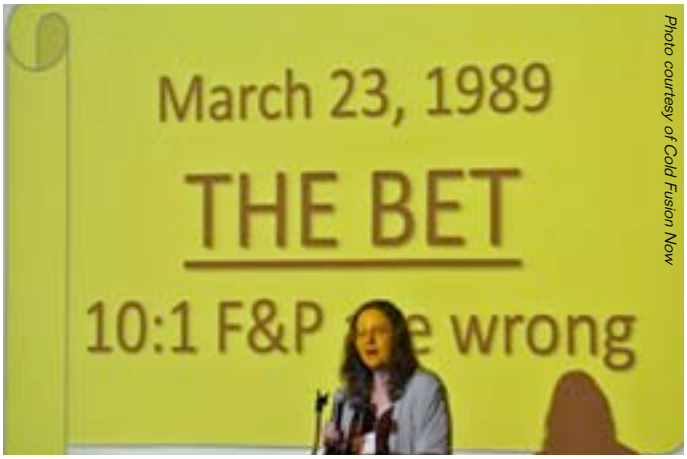

Photo courtesy of Cold Fusion Now

Pam Mosier-Boss accepting the Preparata Medal at ICCF18.

neutrons and long-range alphas."

In 2005, Boss *et al*. published "Evidence of Nuclear Reactions in the Pd Lattice" in *Naturwissenschaften* , a prestigious science journal published in Germany (http://www.lenr-canr.org/acrobat/SzpakSevidenceof.pdf). Based on research reported at ICCF11, the paper presents evidence of transmutation occurring when a cell is placed in an external electric field. The team also reported on morphology changes of the deposit in the presence of an external electric field ("The Effect of an External Electric Field on Surface Morphology of Co-deposited Pd/D Films," *Journal of Electroanalytical Chemistry*, 580, pp. 284-290).

In mid-2006, Steve Krivit of the New Energy Institute initiated the Galileo Project (see http://newenergytimes.com/v2/projects/tgp/2007TGP/2007TGP-Report.shtml). By late 2006, Krivit brought eight different teams together to test the SPAWAR protocol. He later wrote, "The replication of the SPAWAR results came relatively quickly. The group appeared to accept, by mid-January, that replicating the SPAWAR results was easy. Some members of the group began to ask questions about the characterization of the results. The main question was, How can we truly know that the 'pits' are 'tracks' from real nuclear events?"

Dr. Francis Tanzella of SRI International began collaborating directly with Boss on the Galileo Project and "had the pleasure to reproduce her work using CR-39 solid-state nuclear track detectors to show the presence of energetic particles during the co-deposition of palladium and deuterium on silver wires." He said of Boss: "Pam has a very honest and principled approach to her scientific studies. She welcomes external replication of her efforts and is happy to work with other researchers to help them evaluate her work independently. She also uses her scientific work to encourage young scientists to participate in the field. This latter can significantly impact the field's future."

Gordon told a story that not only illustrates the impact the SPAWAR work has had in the mainstream, but the importance of Boss' involvement in the work: "Pam's thorough, detailed and professional attributes always pulled us through potential landmines. One example was the ACS meeting in 2009. It was 20 years to the day from the announcement in 1989 and it was in the same city, Salt Lake City. Pam presented our CR-39 data including triple tracks that were indicative of 14.1 MeV neutrons from D-T fusion. The combination of time, location and neutrons combined to create critical mass and the story went viral. In my hotel room that night, I watched on the web as we showed up on Drudge Report, Yahoo Science, web newspapers in the U.S., and throughout the night, the story propagated around the world. Recalling the media circus that greeted Fleischmann and Pons, I considered that it might be best if we checked out of the hotel that we were staying in and registered someplace under different names. Over the next few days, the CBS Discovery Science channel program 'Brink' did a segment and it was the cover of *The Economist* in addition to many other stories. Then I realized that I had something that Fleischmann and Pons didn't have. I had Pam, and she had the data to respond to inquiries. By now the upper management at SPAWAR was getting used to these events and they, too, knew that Pam could cover for all of us."

During her acceptance speech on July 25, Boss relayed a story called "The Bet"—a personal story of redemption for cold fusion. On March 23, 1989 she and her husband Roger went out to lunch with colleagues, including Roger's branch head Chuck Hicks. In talking about the Fleischmann-Pons press conference, Hicks said he gave the work million-to-one odds. During the discussion, Hicks dropped the odds down twice, to ten-to-one. Roger delighted, "Chuck, the level of your confidence is showing!" One year later, after considering Boss and Szpak's own work and that of others in the field, Hicks saw some positives but mostly negatives. Roger paid Hicks $1. But Roger insisted the ante be upped, and they agreed on twenty-to-one odds if the work was proven. Fast forward through the many years of effort by Boss *et al*. in the field. In July 2006, during the height of SPAWAR's CR-39 work, Hicks headed a funding committee that Boss was approaching for support of the work. Hicks said, "It looks like something nuclear is going on." Boss recalled, "Actually, Chuck said it twice to Roger on separate occasions that day. After the second time, Roger said, 'Say it again and you owe me $20.' Chuck clammed up."

The Hicks and Boss family always got together for the holidays and during December 2008's gathering, Hicks handed Roger $20. When asked what changed for him to pay up on the bet, Hicks said it was the *Naturwissenschaften* paper. He overheard people talking about the triple tracks and finally he was convinced. Boss' husband was excited about the money; the story of "The Bet" and the $20 bill are hanging, framed in the Boss household. Boss said, "After all, it is Roger's trophy and that's what folks from the midwest do with their trophies!"

Boss, on the other hand, was excited to discover that "people outside the field read our papers!" She said in her speech, "They are looking at them, it's exciting and interesting, it's piquing their curiosity and starting to help gain us some acceptance."

The evolution of "The Bet" was clearly very influenced by the publishing track record of Boss *et al*. Tanzella said, "Pam's ability and insistence to publish in peer-reviewed journals may be the most important progress that the field has seen recently. She obviously has the most peer-reviewed publications in the field. This is very important to attract funding and gain credibility in the scientific community." Boss credits Szpak with teaching her the importance of writing up results and getting them published.

Amid busy science careers, Boss and her husband raised three sons (Matthew, Nathan and Jacob—all grown now).

Gordon told a story about a time when Boss was painting at home. Her five-year-old Nathan remarked that she should become a painter instead of being "just an ordinary mom." Pam recalled looking at him and thinking, "I have a Ph.D., I write papers and give talks, I do experiments and I'm just an ordinary mom to you. Heaven help your wife."

Tanzella wrote of one of the Boss' pastimes: "Pam and her husband Roger can be seen regularly wearing the San Diego Padres jackets even though she threatened to sue the team for fielding a minor league team and charging major league ticket prices."

Gordon concluded, "I first met Giuliano Preparata at ICCF2 in Como, Italy. I remember him as a colorful individual even by Italian standards. He was not shy about defending his ideas. He was also very smart. I'm sure that he would be proud to have Pam receive this recognition that was named after him. Everyone working in LENR has benefitted from Pam's thorough, detailed and honest professionalism and it has been my great privilege to work with her. She is most deserving of this recognition."