

ICCF16 DELEGATES AT IIT MADRAS

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The Indian Physics Association, the Science Club of Chennai and the Federation of Science Clubs of Tamil Nadu organized a day-long “tutorial school” presentation, “Introduction to the Science of Low Energy Nuclear Reactions,” on February 5, 2011 at the Indian Institute of Technology Madras (IITM). A group of Indian graduate students from IITM and many others from various colleges in the city and from afar filled the auditorium to hear the program, their interest perhaps piqued by articles in the *The Times of India*, including a short interview with Dr. Mahadeva Srinivasan which ran the day before the session:

<http://timesofindia.indiatimes.com/home/opinion/interviews/Our-dream-is-a-small-fusion-power-generator-in-each-house/articleshow/7419731.cms>

Dr. Mahadeva Srinivasan, chairman of ICCF16, began the session by asking, “LENR and CANR—what [are] condensed matter nuclear reactions? This is a new discipline as you will discover, essentially covering nuclear reactions in the solid state.” Assuring students that they would “discover many new things” they “have not yet heard about,” Srinivasan introduced the speakers as people “pushing the frontiers of the subject.”

M.R. Sridharan, organizer of the Science Club of Chennai, noted that the Club’s main purpose is to examine issues of science and technology. He’s been working with the club for six years and feels “the clock is ticking” for the world to address urgent environmental issues, particularly related to energy. The Club debates a variety of topics, including LENR. They became involved with organizing the tutorial school because they felt the subject matter was controversial and not well understood.

The delegate speakers on Saturday, February 5 were: Dr. David Nagel, a research professor at The George Washington University, who earlier was at the U.S. Naval Research Laboratory in Washington, D.C.; Dr Michael McKubre, electrochemist and Director of Energy Research at SRI International in Menlo Park, California; Dr. Yasuhiro Iwamura, experimental physicist at Mitsubishi Heavy Industries Laboratories in Yokohama, Japan; Prof. Vladimir Vysotskii, head of the Theoretical Radiophysics Department of the Kiev National Shevchenko University in Ukraine; Dr. Andrew Meulenberg, who holds a doctoral degree in nuclear physics and is visiting professor at the University of Science Malaysia in Penang; and Dr. Michael Melich, research professor at the U.S. Naval Postgraduate School in Monterey, California.

With the intent of illustrating aspects of the spectrum of work involved in the field historically known as “cold fusion”—now called low-energy nuclear reactions

(LENR) and condensed matter nuclear science (CMNS)—presentations were made by McKubre on reproducibility in LENR work, Iwamura on transmutation work, Vysotskii on nuclear transmutation reactions catalyzed by microbial complexes, and Meulenberg on “Extension to Physics: Low-Energy Nuclear Reactions.”

Delegates also responded to student questions about what it’s like working in the cold fusion field.

William K. Moses, Jr., a second year master’s student in computer science and engineering at IITM, introduced speakers on Saturday and later commented upon his impressions of the presentation: “It was very interesting to be a part of the events of the day. While the first talk set the stage for the rest of the day by introducing the topic in a fun and exciting way, the remaining talks illuminated interesting facets of the problems, trials and tribulations of those who researched cold fusion. To think that something I once saw in a Val Kilmer movie [“The Saint”] and shrugged off as science fiction could be so real and so practical; it was a thoroughly exhilarating experience.”

The speakers conveyed difficulties in the field—the complexities of experiments, reproducibility, verification of results, and the long road involved in developing this research, along with the problems of dealing with a stigma that had remained from the early years. Meulenberg spoke of recent events involving rejection of publications relating to LENR, pointing out that three books had recently been dropped by organizations such as the American Institute of Physics. Melich mentioned that there are journals publishing papers on LENR. The delegates discussed how publication of proceedings of the ICCFs has developed to become an important source of information in LENR research.

The first presentation by Nagel touched upon historic and current research into LENR. He showed a Gene Mallove illustration of the original Fleischmann-Pons (FP) experiment to illustrate electrochemical loading and heat measurements. Nagel stated, “Even earliest experiments from FP illustrate a ten-degree jump after a number of days. The point of showing this is that early on, people who did not think FP were liars could look at this data and say, ‘Hmm, there is something here.’”

Showing a slide of McKubre’s work at SRI, Nagel declared, “This is not amateur hour. This field has a strong data base.” He next showed work by Energetics Technologies, which exhibited a large gain, 1 unit of energy in and 26 units of energy out. “There are two reasons to show you this data. One is that it’s a spectacular result, and the other is the magnitude of the results. It’s more than the hot fusion community has produced so far.” In a feisty mood, he said he would challenge audiences to show him they could make data go away.

Students and audience members asked questions about the January 14 demonstration at the University of Bologna, Italy, by inventor Andrei Rossi, sponsored by Prof. Focardi, in which a small reactor using hydrogen and nickel

produced over 10 kW of energy. This topic reappeared throughout the day in a series of questions and answers, as well as individual speaker comments touching upon the subject of whether or not the field was more likely to advance via science or engineering.

Nagel touched upon the Rossi demonstration, saying that he once would have made the statement “*If* this goes commercial...” but now says “*When* this goes commercial...” Nagel allowed that in the weeks since the demonstration, a lot of discussion has ensued around the world. He said, “They showed power and energy gains over 10. Steam out—good for making electricity. Rossi has said he will have products on sale soon. Maybe this year you can buy a LENR-based steam boiler. We’ll see.” Nagel stated that what needed to be developed was a reactor controller for the higher energies. He said, “This could lead to a new nuclear energy industry.”

Some discussion about the Rossi-Focardi demonstration centered around whether, if the steam was dry, did they just get above boiling? Nagel offered, “It was run for an hour. Many of us want to see the test run for many hours, a test that is so robust that the world cannot find something to pick apart.”

Srinivasan, asked to comment, stated that points of controversy over Rossi were interesting to study and a necessary part of the experimentation process. Questions came about reproducibility being essential in LENR experiments.

McKubre, speaking later, posited, “The Rossi demonstration and Energetics work has raised the question: Can this technology, LENR, be turned to practical application? I don’t know, but I don’t know why not. “ Addressing this theme, Melich reminded him that, “McKubre has said that science will never get us anywhere in this business; engineers will build it and ‘they’ will come.”

McKubre responded: “You are capturing the essence of one of my flippant remarks, which doesn’t mean I haven’t repeated it! You can science it into existence, do good papers, have them published in good journals. Scientific methods with theorists and experimentalists can happen. We tried it in good faith and discovered we couldn’t get our papers published; it was far too challenging to go through the layers of review from possibly well-meaning editors of journals who send it out to skeptical friends who returned with criticism not related to the papers! The methods that have existed since the seventeenth century—scientists do work, peers evaluate it, work goes on—isn’t working in LENR. So that is why [the website] lenr-canr.org evolved, to give us a place. The papers in the proceedings volumes that appear after these conferences are much more important. It has been what sustains the field to this point. We are trying to use that tool as we know how. We aren’t making much progress. Things don’t happen by and large by science and science alone. Most of technology you live with didn’t get scienced into existence. I’m an electrochemist and most batteries, well, we don’t understand how they really work. We understand the periodic table and how charges accumulate, but the detailed mechanism of the lead acid battery in all the automobiles on this planet—scientists fiddled with it,

gave it to an engineer and they took 150 years and haven't optimized it but made a reality of it. Every piece of technology, it is the engineers that made it happen. I predict that is what will happen in this field."

Yet at the same time, McKubre stressed that publication of scientific papers was very important and he did not see the question of engineering or science in developing the field as an "either/or" proposition. He saw both as being valuable. He repeated a theme that many of the speakers touched on throughout the day, namely, for students, professors, scientists and others to get involved. McKubre said, "I urge anyone who has a useful experiment—radio isotope, heat production, whatever CMNS experiment you have—get it to a prototype, take it to an engineering company and take it to the marketplace and it will come on market before the science community will have any idea what took place. When it comes to market they will play catch up! Engage the public in this exercise. Who stands to benefit from a cheaper and less hazardous energy source? The public! I don't see the U.S. Department of Energy turning on a significant amount of money until a clamor comes from the American populace or unless, alternatively, a competitive nation comes in and threatens the energy science of the U.S."

Theory also came up in the course of the day's discussion. Nagel commented that the field's history "shows experiment has led strongly and the theoreticians developed ideas early on. Schwinger, a Nobel Prize recipient, had a paper at the first cold fusion conference. This field is far and away experimental. . . We have an experimental basis that is solid and wonderful 'confusion' in the theoretical sense."

McKubre, asked by a Bhabha Atomic Research Centre scientist about theory, responded, "I'm an experimentalist, so you know my answer. Experimentalism is huge, but without theory it is hard to go out, which is why the scientific method is so powerful. One discovers the zone of interest and makes some predictions. That pairing has served us well in the past and I suspect will in the future. The problem in LENR isn't lack of theory, it's excess. Theorists are enthusiastic and fertile people. Give them a few scraps of information and they can spend life working on it. Perhaps here the fault lies with experimentalists, that we haven't defined enough parameters for precise theory."

It was asked how many incidences of theory and experimentation overlap have occurred in the field. The answer to the question, Nagel responded, was one, in a paper by Widom and Larson when they calculated transmutation rates as a function of atomic mass. They computed the rates using a simple optical model and plotted it against George Miley's data and both sets of data showed a series of peaks and valleys as one went on to heavier and heavier nuclei. It was important work, Nagel said, but did not provide a core test. It was a separate and important calculation but the key ideas of the experiment and theory match-up were inadequate there. "I wanted to emphasize that there has been incredibly little contact between theory and experiment in the 22 years of this field; that was the origin of my bringing it up," Nagel stated later. "It was one isolated calculation dealing with interaction of theory

and experimentation in this field. I meant to have it come across that more of that interaction is desirable.”

The importance of Indian students pursuing the field was emphasized throughout the day, and opportunities enumerated. “In the U.S.,” McKubre reported, “A \$25 million project was funded to study palladium. One of the reasons I’m excited to be in India is there are many people who could take this area up. I’d like to have Indian physicists and metallurgists on this problem!”

To this Srinivasan added, “Materials play the crucial role in this business and for that reason we are having a materials workshop after the conference. The Materials Research Society of India is participating. Materials are the key issue—even more than physics!”

Questions arose about whether there is any theoretical understanding of what is going on in LENR. Can we extend what we know about nuclear physics models into LENR? Meulenberg tackled this issue in his talk. In the roundtable discussion, he stated, “The initial enthusiasm [about cold fusion] got put on hold when it appeared it wouldn’t happen quickly. Now I believe with the new things afield, nuclear physics, which has become stagnant, can open up. One question or argument against models is, ‘If that is so, why don’t we see it all the time?’ It may be there all the time but we haven’t looked for it. I am hoping nuclear physics and other fields can open up because of the dedication of the people who have been involved.”

In the panel discussion, Iwamura, who works on transmutation, stated, “I want to comment on the reproducibility of my experiment and experiments in the field. Cold fusion tends to be thought of as being simple. But the experiments are very complicated. When we perform the experiments in our laboratories, almost every time we get positive results. If we go to another university or institution, we don’t get the same rate of reproducibility. Why? Because we don’t understand all the conditions. We should investigate factors about the conditions. It is tough work. Experiments are important. I hope many researchers join this field.”

Vysotskii’s presentation focused on transmutation. He said, in part, “Our report was compiled and revealed that there are small differences between biology and atomic physiology, not only for nuclear physics but life-saving technologies. What is the mechanism of the reactions at very low energies is the question. Maybe there are different mechanisms. Maybe there are positive results for medical and chemical industries that would solve problems around the world.”

The ICCF delegates made a strong impression on many of the IITM students. M.V.K. Chaithanya, a second year master’s student in computer science, noted: “Today’s science is tomorrow’s technology. Whatever inventions are done today will be a great support to the next generation. Developing a technology where the whole world can be self-sustainable in terms of energy is a great thing.”

Subhashini Venugopalan, another student in IITM's computer science program, said: "The last I had heard about cold fusion was in high school, where we had written off the idea of extracting energy via cold fusion as being impractical. It was a really big surprise when I heard about this conference. I thought it was a wonderful opportunity for me to participate as an organizing volunteer. The tutorial school was immensely enlightening. The professors were lucid in their explanations, which helped laypersons like me understand a lot about their efforts and results. They were also very specific regarding the drawbacks of their experiments, especially reproducibility, which appeared to be the main aspect which made studies in cold fusion and LENR less popular. The panel discussion was highly informative and also a lot of fun. We discussed topics varying from evolutionary biology to electrochemistry. The speakers were demographically varied and were forthcoming to collaborate with young student researchers. I thoroughly enjoyed attending and got an opportunity to meet and interact with some brilliant scientists. I think spreading the message about LENR and the impact it could have on a country like India would definitely help attract more young students to the field."

I.V.S. Sandeep, a chemical engineering major at IITM, also commented on the dedication of researchers in the field: "It was wonderful to know that the collaboration between the researchers at the international level is very well-networked. The perseverance that the researchers in this community have shown for 20 years gives an insight into how much dedication goes into this research. It was good to hear that experiments have led the way for theory."

Another student, M.K. Bharadwaj, brought healthy skepticism to the presentation for someone who was learning about LENR for the first time. Bharadwaj, a graduate student at KL University, noted: "At first I was doubtful about how a nuclear reaction can be initiated even at low energies. But from the introduction until the end of the talks, I was very much fascinated by the topic. It was a great experience and a great opportunity to share our thoughts with the most experienced scientists from all over the world. They helped us realize the true potential of what a young mind can really do, by motivating us."

M. Najeeb Shariff, a master's student in structural engineering at IITM, plans to do what researchers in the field hoped their presentations would encourage, pass the information on: "I am enthralled to see this remarkable development. I have passed this information to some of my old teachers and friends who are working in physics." Additionally, Sridutt Tummalapalli, an electronics and communication engineering major at KL University, hopes to pursue work in the field: "I will work on this branch of 'new science,' as Dr. Meulenberg called it. I talked to him about the way to go forward in this field and he gave me excellent suggestions."

Additional reporting on this and other ICCF16 conference events will follow in *Infinite Energy* #96 and will also be posted online.