Overview of ICCF16 in India

Marianne Macy

The International Conference on Condensed Matter Nuclear Science (ICCF16) at the GRT Convention Centre in Chennai on February 6 to 11 marked the first time that one of the ICCF conferences was held in India. The conference was co-sponsored by the International Society for Condensed Matter Nuclear Science (ISCMNS) in collaboration with the Indian Physics Association (IPA) and Indian Nuclear Society (INS).

Researchers from fourteen countries—India (52), U.S. (22), Italy (7), Japan (6), South Korea (6), UK (3), France (2), Germany (2), Israel (2), Russia (2), Ireland (1), Malaysia (1), Ukraine (1) and Kazakhstan (1)—attended the meeting, many going on to subsequent workshops that delved more deeply into materials and transmutation issues. ICCF16 Chairman Dr. Mahadeva Srinivasan was successful in achieving a high media profile for the conference, with articles on the conference running in Indian newspapers and online journals.

The hospitality of the organizing committee—particularly that of business advisor and Organizing Committee Head C.V.K. Maithreya, his wife Dr. Sunita Maithreya, and their daughter and other volunteers—saw to it that spouses and companions of the ICCF16 delegates were accommodated with assistance in touring, sightseeing, cultural events, shopping and other explorations of Chennai and southern India, details of which will follow in this report. Events were carefully planned and support provided for everything from outing research to negotiating transit in the busy city of Chennai and surrounding areas. Likewise, Dr. Srinivasan's wife Vasantha was everywhere making sure every possible support and assistance was available.

This conference had a major news precursor. Headlines from the January 14 University of Bologna test of inventor Andrea Rossi's "energy catalyzer," in which a small reactor using hydrogen and nickel produced over 10 kW of energy, provided additional interest and impetus to the conference. The possibility of a workable industrial technology and the subsequent media coverage, as well as Dr. Srinivasan and his team's outreach, succeeded in attracting students to two events at the Indian Institute of Technology Madras (IITM) to meet with scientists in the field.

Shaul Lesin, C.V.K. Maithreya, Mike McKubre, Sunita Maithreya and Upasika Maithreya. *(Photo courtesy of ICCF16.)*

While ICCF17 had been scheduled to take place in North America, a strong interest in hosting the next ICCF conference as well as the goal of increased research activity was expressed by representatives from Korea's scientific community. It will be decided in the new few months where ICCF17 will be scheduled.

ICCF DELEGATES AT IITM

Due to the strong interest in what historically was known as "cold fusion" and now referred to as low-energy nuclear reactions (LENR) and condensed matter nuclear science (CMNS), a number of scientists arrived prior to registration for the Chennai main session, to IITM in nearby Madras.

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 at 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. 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, 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."

William Moses, Jr.
(Photo courtesy of ICCF16.)

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 ICCF 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 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 addressing 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 statements about devices in the field by saying "*If* this goes commercial. . ." but now says "*When* this goes commercial. . ." Nagel allowed that in the weeks since the demonstration, 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 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 sciened 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."

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!"

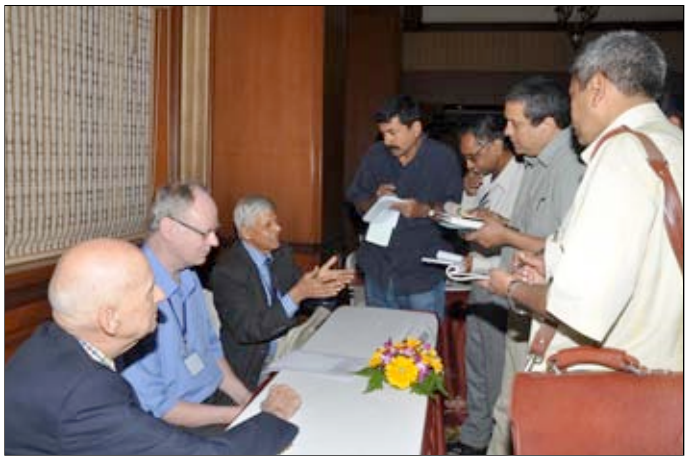
Questions arose about whether there is any theoretical understanding of what is going on in LENR. Can we extend what we know about nuclear physics models into LENR? Meulenberg tackled this issue in his talk. In the roundtable discussion, he stated, "The initial enthusiasm [about cold fusion] got put 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."

Late in the morning of the tutorial school, an impromptu press conference was held. After Srinivasan provided an opening statement, he, McKubre and Nagel responded to the questions of a half dozen reporters, mainly from regional newspapers.

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



David Nagel, William Collis and Mahadeva Srinivasan field questions from reporters. *(Photo courtesy of ICCF16.)*

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."

On Wednesday, February 9, due to the student's excitement about the topic and a request to accommodate others who had not been able to attend the weekend session, an additional presentation took place at IITM with ICCF16 delegates. This group consisted of some scientists from the tutorial school—Dr. Yasuhiro Iwamura, Dr. Michael McKubre, Dr. Michael Melich, Dr. Andrew Meulenberg and Dr. David Nagel. They were joined by: Dr. Igor Goryachev (Kurchatov Institute, Russia); Dr. Vittorio Violante (ENEA CR, Frascati, Italy); Dr. Edmund Storms (Retired, Los Alamos National Laboratory); Dr. Jean-Paul Biberian (Editor-in-Chief, *Journal of Condensed Matter Nuclear Science*); William Collis (International Society of Condensed Matter Nuclear Science, ISCMNS); Dr. Akito Takahashi (Technova Inc., Tokyo, Japan); Dr. Sunwon Park (Korean Advanced Institute of Science and Technology, KAIST) and Dr. Kew Ho Lee (Korean Research Institute of Chemical Technology). Over 160 students turned out for the afternoon session, at which the panelists made themselves available for questions regarding the field after an introductory talk by David Nagel.

THE OFFICIAL START

The theme of hospitality and care of the conference attendees was extended throughout the week. After registration on Sunday, February 6, a cocktail reception was held in a beautiful room upstairs from the elegant GRT Grand lobby, with its long expanse, multiple restaurants and glass enclosed elevators. Drinks and light Indian food and appetizers were served as the registered delegates arrived and greeted each other in the genuinely relaxed and lovely setting.

ICCF16 opened officially on Monday, February 7. Conference Chairman Srinivasan's welcoming remarks reiterated that this was "the first time an ICCF conference has been held in India. We hope to ignite interest in India!" He read a message from Dr. P.K. Iyengar, Former Chairman of the Atomic Energy Commission (AEC) for the government of India, whose welcome pointed out that the dates of the meeting coincided with the centenary of the discovery of the atomic nucleus and the birth of the discipline of "nuclear" science.

Dr. Mustansir Barma, Director of the Tata Institute of Fundamental Research, gave the inaugural address, saying that as a scientist, he found the development of this field interesting as viewed from outside. He spoke of the related areas in condensed matter nuclear science and nuclear physics, raising the question of how condensed matter could affect matter enough to get large energies. He discussed the interesting parts of the dynamics of the lattice, and how loading a metallic lattice with hydrogen or deuterium triggers reactions generating large energies. These were central questions facing this community, he said, and science would like to understand this phenomenon.

Mustansir Barma
(Photo courtesy of ICCF16.)

The keynote address by Dr. Robert Duncan could not be delivered by Duncan, who did not make it to the conference due to weather-related travel problems. It was read at the opening session of the conference by Dr. Michael Melich. Much of the address, "Eighty-Five Years of Cold Fusion, and Counting," is reproduced here:

. . .Interest in nuclear reactions in the solid state have

an intermittent history, starting to my knowledge in Berlin, Germany in 1926, and proceeding up to the current day, and there have been many pivotal moments in the development of this courageous and bold scientific community. This history has benefited from exciting innovations from many outstanding minds, including those here today, and at least two physics Nobel Laureates.Yet it has been hindered by a widespread failure of the scientific method. While it certainly made sense to question the experimental accuracy of these episodic excess heat observations initially, more recent statements along the lines of "this does not agree with what we expect to happen, so therefore these empirical results must be wrong" directly violate the scientific method, and disrespect the fact that all scientific progress is based upon surprising and conclusive experimental observations. The reason for the widespread failure of initial attempts to repeat the excess heat effects that were reported by Pons and Fleischmann in 1989 have subsequently been elucidated through work of Michael McKubre and others, who observed the need to obtain a minimum threshold of deuterium loading in palladium, and that this loading is experimentally challenging to obtain. Recently, observations have been made by numerous groups throughout the world of nuclear emissions associated with deuterated palladium and hydrogenated nickel. These results suggest the possibility that multiple physical phenomena may be active in these systems. More recently still, there have been interesting and fully reproducible reports using nanoparticles of anomalously large heat of absorption, typically that are about twenty times higher than one would expect due to conventional surface chemical reactions, that are much larger than the heat of desorption, and these observations are very sensitive to hydrogen isotope effects. These results suggest immediately that systematic absorption/desorption cycles may be designed that produce net excess heat. Please note that this could readily lead to a useful technology even before the physical mechanism for these effects have been conclusively identified, and that this is often the case with innovations that are based upon initial empirical results that are repeatable.

I suspect that it will take years of careful study to elucidate the physics underlying these various observations, and this will require extensive materials characterization and development to realize the appropriate experimental controls that will permit these systematic studies to be completed. But this state of affairs is in no way new when you consider the natural progression of emerging technologies: In the mid-1950s, when solid state devices were first being commercially produced, this emerging industry lacked the silicon and germanium process control technologies that we take for granted now. Hence transistors were mass produced in the 1950s, and the functional ones were identified in post-production testing, often with very low yields. Similarly, before the oxygen deficit requirements were understood in carefully prepared YBCO samples, high temperature superconductor materials were mass produced, and then sorted in post-production tests to identify what part of the material in a given production run displayed a definite Meissner effect and was hence actually superconducting. It is useful to note that these process and materials controls would never have been developed in these important new technologies without substantial government research investment, and that an investment in such work related to cold fusion remains opposed by many governments throughout the world today.

It is of paramount importance now that we proceed boldly with a determined, yet dispassionate, focus on the objective study of these fascinating "cold fusion" phenomena. In my opinion, we should leave speculations on what this may someday lead to behind us, in exchange for a highly self-critical assessment of advancements within this field. The scientific method is all that we have, and fortunately it is all that we need to see this discipline come to full fruition, whatever that endpoint may be. It is important that major problems from the past be corrected now, such as the current policy of automatic rejection of all patent applications without technical review in most patent offices around the word that are submitted on inventions utilizing cold fusion. Such a policy has a negative impact globally, forcing current and future innovators in this discipline to resort to trade secrecy to protect their equity interests, thus resulting in opacity instead of transparency, staggering the development of this field. At this point I know that the excess heat effect is real, and that we do not fundamentally understand the origin of it yet, and that this alone is enough to mandate serious scientific study. As with all surprising developments, I cannot say conclusively where this may lead. Many have speculated that this may soon have substantial consequences in global energy engineering, and while that is a possibility, it is something that none of us can really guarantee. But I think we can all guarantee that the world's scientific community would be remiss if it does not pursue these fascinating new observations seriously. Hopefully intellectual property protection agencies worldwide will start to respect innovative devices that are based upon these empirical excess heat observations. In return, scientist working in this field must respect the equity of private investors by openly conveying that this stands as little more than an interesting scientific anomaly until such time as an engineered system has been established that clearly demonstrates positive net power output that can be gainfully utilized by society. As you know, on January 14, 2011, a group from Bologna, Italy presented such an engineering claim. I personally cannot vouch either way, neither in favor of, nor in opposition to these claims, since I have not critically examined this apparatus. But I can assure you that such open and transparent processes will not be possible for this and future inventions in this field until the patent reforms that are recommended above

are implemented globally.

> At the heart of this policy of rejecting patents without review are misguided arguments that any type of hydrogen nuclear fusion reaction within the solid state is physically impossible. Many great theorists, such as the late Nobel Laureate Julian Schwinger, have suggested plausible theories in this regard, but their contributions have generally been met with ridicule by the main stream physics community today. As scientists it is critical that we accurately convey the principles that we think may be at the essence of this field in a manner that can be readily understood in an introductory undergraduate physics class. While the actual mechanisms underlying the excess heat effect have not been conclusively identified yet, many viable hypotheses exist today that are physically plausible. Hence it is reasonable for the cold fusion community worldwide to expect that patent applications concerning their innovations be critically reviewed by government agencies that are charged to protect intellectual property.

Dr. Srinivasan introduced Dr. Bikash Sinha, saying it was a great pleasure to introduce a member of his "Department of Atomic Energy family." Sinha was director of the Variable Energy Cyclotron Centre and Saha Institute of Nuclear Physics and in 2010 was awarded the Padma Bhushan, the third highest civilian award in India, which recognizes distinguished service of a high order to the nation.

Dr. Sinha, a former president of the Indian Physics Association (IPA), said that the IPA gave their full support of the conference and "this adventurous journey to capture cold fusion." He continued: "I am somewhat of an outsider of this field but have been a keen observer, if not a participant, in this business of cold fusion. And, I might add, I am glad the word 'cold fusion' is going on to 'condensed matter nuclear science.' Because you know, cold fusion from an outsider gives an impression you don't believe in hot fusion and that's not fair to either of the two fields. . .I say all these things because I think the particpants in the field are heroic people, particularly my good friend Dr. Srinivasan. I have seen since 1989 how this field has gone through many resurrections, disasters, premature death and come back again and again, which is a wonderful thing that indicates the strength of the field and its participants."

Bikash Sinha
(Photo courtesy of ICCF16.)

Sinha declared he was not in a position to state what India's position should be, yet that as a working physicist he believes the nuclear, plasma and particle physics communities "must take a stand and work on this field vigorously, as indeed it is happening in Russia, the U.S., Korea, Israel, the UK, Germany, France, China, Japan. . .I put in a call to my Indian colleagues to make our position more stringent." Sinha spoke of an experience in his life in which he believed there was a hint of CMNS fusion, relating that in the tsunami in Sumatra production of a deuterium peak in the gas that escaped was an anomaly that could not be explained. "It is like this field, cursed by conventional scientists hesitant and afraid to go out of the traditional way. Something is cooking under the earth and has some similarity to what you are doing here. . .Dr. Iyengar, who I respect for scientific courage and spirit, is convinced something is going on, something having to do with the earth." Sinha spoke of the historical example of Galileo giving his life, to make a point. "I am not saying we should do that but I am saying don't give up." He added, "In today's environment of climate change, the greenhouse effect, heating up of the earth, hot fusion is a long way off still to commercialization. The whole area of CMNS and production of power is very, very crucial. I think there is the potential of serving humanity. . .We have a tremendous need to pursue this area apart from the deep scientific involvement. . .The proof of the pudding is to prove it exists; the reason why this conference is important is it gives a glimpse to me that this is certainly not dead."

Sinha finished his talk by quoting Mark Twain who, upon finding his own obituary notice published, stated that reports of his death were greatly exaggerated. "I think people who talk of the field coming to an end this way have similarly somewhat exaggerated."

A NEW CMNS TECHNOLOGY?

The January 14 report from Bologna, Italy, of a demonstration of inventor Andrea Rossi's 10 kilowatt nickel-light water reactor received a great deal of news coverage and worldwide discussion. Accordingly, it was much discussed at ICCF16. Two related presentations took place, one later in the week about techniques of measuring such systems, covered by David Nagel in this issue. Earlier in the conference plenary session, on February 7, Dr. Francesco Celani of the National Institute of Nuclear Physics (INFN) in Frascati, Italy, who was present at the demonstration, and Dr. Michael Melich of the Naval Postgraduate School in Monterey, California, spoke on the topic.

Celani ran through slides showing the demonstration and provided his perspective thus far: "It is not my work but I was there and observed what happened. A week later I made several calls to Rossi and other people present. The Rossi experiment is not a typical cold fusion experiment. Perhaps it is a completely different reaction. They used undisclosed elements (besides nickel) that could be the main sources of excess heat. These elements are kept strictly secret." Celani hypothesized from his own experience that the "nickel is in the nano-particle state and is intimately mixed with the other key elements. Perhaps the trigger element is nickel itself (more or less loaded by hydrogen) which is forced (by the heater) to operate close to its Curie temperature (350°C)."

He noted that the demonstration was not without problems. The main heater (a component inside Rossi's reactor) had a failure. Celani said, "After some chaotic work and people in room making noisy and bitter comments, at the end, the reactor was started."

Celani noted that, while on January 14 the reactor did not produce as much power, he was told that on January 13 in a previous run it worked very well. He said that the power gain on January 13 was 100 to 200, as compared to 30 to 40 on

January 14.

Celani indicated that he took some gamma measurements during the demonstration, with counts fluctuating between 60-120 cps in the room where the catalyzer was demonstrated. He measured only one large spike, a few minutes after the heater was turned on.

One critique raised by Celani was the lack of measurement of the temperature at the exit of the black box. He noted that Rossi should consider using conventional flow calorimetry to measure steam flow. He suggested other techniques and ideas for how Rossi should move forward with further demonstrations and tests.

Francesco Celani
(Photo courtesy of David Nagel.)

Melich came to the podium next and spoke without slides. He explained that he was also invited to attend the demonstration, but that "the experimental design which Francesco has criticized was not available in advance, and having some experience measuring water heaters I was concerned that not having seen the experimental design before the trip would be less than useful."

Melich described the involvement he has had with Rossi's efforts: "Rossi and his partners approached us at the Navy and we basically said we would not talk about what it is we were doing until such time as a report could be produced. We are still not at the stage where we could say a report will be produced. There will be a presentation on how one designs these kind of experiments during this ICCF16. David Knies will be doing the presentation and our colleague at NRL, Ken Grabowski, is the principal designer of the instrumentation to do essentially the kind of measurements that Francesco has suggested."

At Saturday's tutorial school, Michael McKubre had explained the evolutions of the trials and methods for evaluating new techniques. Melich elaborated on that idea: "I think it would be fair to say that the first time is rarely successful. I think maybe also the second time around, the third time around, fourth. I guess I would caution trying to qualify what Francesco has been saying today by saying that it is once." Melich suggested what most others were also voicing, that repeated experiments are needed and outside replication is key. He said, "How much attention/confidence should we place in a one-off demo on the 14th of January in Bologna? Does it encourage you to go on or do you say, 'It didn't work this time so I give up'? I think of all scientific organizations and research groups I've ever been associated, [the cold fusion field] is the most dogged group I've ever met. The fact I've seen the same faces for 22 years convinces me that if we gave up after the first try we wouldn't be here."

Melich mentioned that conference participant P.J. King said, "If you know that something is there and it works, that is information in and of itself." Melich commented, "We are in that fuzzy period with Rossi where there are hints that it works. There are inconsistencies in what is reported. There are difficulties in the operability of the device of the kind Francesco has described. So to say definitively if it works or not, I don't feel comfortable making such a statement. But generally in dealing with uncertainty, what you'd like to do is associate with these experimental operations some probability that is going to encourage you to continue or not continue."

Melich explained that he has approached this field, and others, based on probabilities of success. He said, "I've seen enough of Rossi's work. . .to keep trying. I can't tell P.J. exactly what the probability is, but I have looked at a fair number of cold fusion experiments over the years and the question as to whether or not they work and whether or not they will turn into a technology has been something I've had to grapple with over and over again to see whether or not I'd put my efforts into trying to bring them along. I considered anything that had in my estimation the odds of producing a technology to be 1-in-1000. . . I have tried to figure out how to compute these propabilities and Rod Johnson and I produced a few papers on that topic."

What does Melich think about the probability of success for Rossi's energy catalyzer? "I think Rossi's experiments, interestingly enough, are rising to the level of the hot fusion world. Dave Nagel in Saturday's presentation reported that the goal of ITER is to have a power gain of 10 after expenditure of over $10 billion in ten more years. Francesco Celani just now complained when Rossi's Bologna power gain dropped to 30! I think it is worth giving time, pushing along Rossi to the extent he is willing to be pushed along to let us make these measurements. . .I can't tell you for sure, but it seems closer to 1-in-10 odds rather than 1-in-1000 that there is something here, and that's enough to keep me going."

Melich cautioned the audience not to be overly-suspect of inconsistencies with Rossi's communications or shortcomings of the demonstration. He said, "The problem Rossi has, as I've understood it, is that of all independent inventors. This history of independent inventors is not a history one should be pleased with. Tesla is one of the most famous independent inventors who was not rewarded for all his inventions. Those lessons are known to Rossi. I say, cut him a little slack and support him. Sometimes paranoid people are justified, in that people are out for them. I would suggest people in this community have an interest in cutting him a little slack and helping him. . .The safety and engineering issues and all the rest are way down the road for me. I am hoping the nominal 10 kW system demos will be [subsequently] taken care of and looked at more closely. . .But it strikes me when we have the kind of complaint with a power gain of 120 dropping to 80, when a project like ITER is hoping for 10, well, that should be kept in mind."

A question and answer session followed. Yuri Bazhutov from the Terrestrial Magnetism, Ionosphere and Radiowave Propagation Institute of the Russian Academy of Science, asked if the explanation for the experiment was the same as Francesco Piantelli's experiments. Celani responded, "Piantelli is a conventional cold fusion experiment, only nickel and hydrogen. The experiment of Rossi is another thing. He used other elements as the main source of energy, and nickel and hydrogen help. It is completely different. . . Without such key elements you get almost nothing or a very low level. . .He never said, 'My experiment is cold fusion.' He always said, 'Mine is an energy catalyzer.' So he is honest. It is another thing."

Ehud Greenspan from Energetics Technology asked, "Are you convinced when you say there was some radiation that was coming out of the experiment? Not all the time, but are

you convinced that you measured extra radiation coming from this experiment?" Celani responded, "From what I've seen with my instrument, I can testify that a few minutes after he swithced on the power, I got one gamma burst. . . Later almost nothing. When I could come inside the room with my gamma detector and the geiger to check each other, I saw little increasing counts, but little when I tried to move." Greenspan continued: "Was there lead shielding?" Celani said, "Yes, one or two centimeter when I asked but never clear answers. There was some lead shielding. I tried to open the aluminum foil and they said to me, 'You can't open it.'" Greenspan persisted, asking, "Can you think of another source of the radiation, the pulse you measured, other than the experiment itself?" Celani thought about it. "Cosmic ray? Too much insulation."

Celani was pressed by Greenspan to discuss the reliability of Celani's measurement of a possible energy pulse at a time prior to the announced start-up of the Rossi boiler. Celani made that measurement from the conference room adjacent to the laboratory where the experiment was being conducted. So with the exception of this "pre-cursor" signal, Celani's instruments appear to be consistent with the radiation levels reported on January 21, 2011 by Dr. David Bianchini of the Physics Department of the University of Bologna. Bianchini reported his background measurement before "ignition" of the reactor 15:45 to 16:22 and then during the ignition period 16:22-16:45 using photon and neutron counters adjacent to the Rossi boiler and at points 50 m from the reactor. He concludes that using the ambient equivalent dose H*(10) as a measure: ". . .there are no evidence of meaningful differences of H*(10) compared to the background environmental radiation. Furthermore the dosimetric measures are not dissimilar from the environmental background measurement both as average and as maximum peak values."

Michael McKubre asked Celani, "I'm confused by your distinction of cold fusion and not cold fusion. How do you know Rossi gets no results if his magic ingredient is not in? Did he say something to confirm that? Why do you make this distinction?" Celani responded, "According to our general thinking, cold fusion means the deuterium-palladium system, just two elements. But according to him, if you don't have a deep element it doesn't work. So it means, start from cold fusion here and add something more important than nickel. I don't have the recipe. . ."

Melich said, "What this field is doing in these experiments is that we are affecting the state of nuclear systems with chemical level energies. I can't say if what Rossi is doing is or is not that, but I have a strong suspicion that running a chemical system and having an effect on nuclear states of whatever is in [it] is what he is doing."

Cultural Programs and Excursion

There were many instances where Indian cultural traditions were represented at the conference. The cover of the ICCF16 Abstracts book had a depiction of the sculpture of Nataraja, the Dancing Shiva, which has a history dating back to the sixth century. A note about the sculpture was presented at the back of the abstract book. It mentions that Fritzhoff Capra relates Nataraja's dance with modern physics in an article and later in his book *The Tao of Physics*: "Every subatomic particle not only performs an energy dance, but also is an energy dance; a pulsating process of creation and destruction. . .without end. . .For the modern physicists, then Shiva's dance is the dance of subatomic matter. As in Hindu mythology, 'it is the continual dance of creation and destruction involving the whole cosmos; the basis of all existence and of all natural pheonema.'" Conference organizers added, "In the context of the ICCF16 conference in Chennai, we would like to believe that Nataraja symbolizes the dance of the deuterons in the dynamic lattice, destroying old elements and creating new ones, while unleashing cosmic energy in the process."

On Tuesday, February 8, many of the ICCF16 delegates attended the Kalakshetra School of Fine Arts' variety dance program comprised of its staff, students and selected alumni. Buses took delegates to Kalakshetra, which is located in Thiruvanmyur, about 10 km from the conference venue.

Kalakshetra was founded in 1936 by Rukmini Devi Arundale, and is today an internationally renowned center of artistic training and performance. Kalakshetra literally means a "holy place of arts" and was established with the sole purpose of resuscitating in modern India recognition of the priceless artistic traditions of India. The training of young and talented people by masters of art, with the background of a religious spirit, has been its main aim.

The auditorium was built in the traditional "Koothambalam" style of the state of Kerala, wherein founder Rukmini Devi has created a temple atmosphere in which "the audience and the dancer are one and nature outside becomes a part of each performance." Indeed, bats flew

Kalakshetra performers. *(Photo courtesy of ICCF16.)*

Akito Takahashi and Vasantha Srinivasan. *(Photo courtesy of ICCF16.)*

about the stage and audience, eating any mosquitos before they could bite. The music was traditional with percussion and string instruments. The dancers wore bright dance costumes and exotic makeup and jewelry. Their precision was matched by their grace as they performed the classical dance form originating in Tamil Nadu, which is the national dance of India. The dance is accompanied by classical Carnatic music. Many of the ancient sculptures in Hindu temples are based on Bharata Natyam dance postures called karanas. The celestial dancers are depicted in many scriptures dancing the heavenly version of what is known on earth as Bharata Natyam.

On Wednesday, February 9, delegates could elect to take buses to Mamallapuram (formerly Mahabalipuram), 58 km away. There five monoliths sit near the sea. These are the Pancha Pandava Rathas, or five chariots named after the five Pandava brothers. The largest structural panel in bas-relief in the world is nearby, Arjuna's Penance. Varahaa Mandapa Cave Temple and Mahishururamardhini Cave also depict elaborate carvings and stories, as does the beautiful Shore Temple. The site is a World Heritage site.

The latter part of the tour was at Dakshina Chitra, a nonprofit community service project for the promotion and preservation of the culture of the diverse people of India, emphasizing arts of Tamil Nadu, Kerala, Andhra Pradesh and Karnatka. Here beautiful handworked painting, crafts, beadwork, clothing, jewelry and other works were sold. A tour of buildings depicting various South Indian lifestyles followed. They included a Hindu house and granary and Syrian Christian House from Kerala. The Tamil Nadu section contained an original 1895 merchant's house, an agriculturist's and potter's house, as well as a weaver's house. The styles of living, doing crafts, farming and food and clothing processing were demonstrated.

The outing culminated with a traditional vegetarian dinner and music and dancing. A large green dancing ostrich with cymbals awarded delegate Roger Stringham with a lei of flowers at the end of his dance.

The conference banquet took place on Thursday evening, February 10. First, attendees returned to the elegant cocktail reception room in which the opening cocktail party had been held, this time slightly different with flowers and pinpoint spotlighting done softly. The group had cocktails there for an hour and then the signal came to move down the hallway to a large room with beautifully decorated tables. The dinner was served in courses with wine and the finest examples of southern Indian vegetarian cuisine. After the conference and cultural events, the group was in an exuberant mood, with some Russian and Italian participants bursting into song. At the end of the lovely dinner, Srinivasan and a number of people stood up to give thanks and tribute to the excellent conference and the extraordinary effort of the support staff, participants and dignitaries who gave their attendance and support. Toasts were raised and there was a general air of celebration, and sense that the CMNS field had come a long way due to the persistence of the people involved.

Yuki Miyoshi, Akira Kitamura, Akito Takahashi and Yasuhiro Iwamura. *(Photo courtesy of David Nagel.)*

Korea Re-Explores Interest in Cold Fusion

At ICCF16 in India, a significant new presence was that of researchers from South Korea—Dr. Sunwon Park and Dr. Do Hyun Kim from the Korea Advanced Institute of Science and Technology (KAIST) and Kew-Ho Lee from the Korea Research Institute of Chemical Technology (KRICT)—who were involved at the start of cold fusion research and are poised to play a significant new role. At the end of the conference, Dr. Park announced that South Korea would welcome hosting the next ICCF conference. The continental rotation of the conference series calls for a North American session, but if a chairperson does not volunteer then the meeting can be held elsewhere.

Dr. Park, a professor of chemical engineering at KAIST, was hopeful that research will move forward in his country, predicting, "I can guarantee that participation of Korean researchers would expedite the practical application of cold fusion knowledge."

Park's interest in the field was re-initiated in 2009. He noted, "My interest had dated back to the original announcement from Fleischmann and Pons a long time ago. I was disappointed when after one or two years of the initial excitement worldwide, interest disappeared. About two years ago, at the time of the twentieth anniversary of the Fleischmann and Pons announcement and the ACS meeting, there was a lot of news coverage related to a paper from SPAWAR about tracks that indicated a high-energy neutron generated in their experiment. Also I saw the '60 Minutes' story. That really made us decide to get back to the research again."

During the week of the conference, it circulated that the South Korean government had put forth money and interest in cold fusion research. Park clarified, "[F]or now, just a small portion of money to investigate our initial work in the cold fusion technologies." He explained that around the time of the ACS meeting in 2009, he was Dean of the University-Industry Cooperation and he decided to look into the area more closely. "There was a request from the Prime Minister to do so. I formed a team of scientists and engineers to see this work. I was disappointed at reading the 2004 report of the review committee of the U.S. DOE on this topic, which claimed that not much had changed since the first review. They were suggesting using state-of-the-art measurement technologies to study the materials aspect. I was very curious about what people who worked in this area in the last twenty years, many without funding, were doing. . .I wanted to meet them, so that is why I came to this conference. They turned out to be very sincere, honest people who have

worked very hard and they believe in what they are doing."

As a result of positive interactions at ICCF16, Park does plan to pursue work in the field and perhaps host the next conference. He noted, "I will be involved with this area. By hosting a conference we can get more excitement of people in Korea when they see all these nice people who have dedicated their lives to this area. Whatever we do, we will do it carefully. We are good at making products. . .I would like to have fairly good-sized funding to investigate every related area, which is important to make this technology successful."

Park foresees that work from the field could potentially benefit his country (and others): "If we can make this work, we can solve all our [energy] problems. Not only energy problems, but also environmental problems. The world would be a lot better place to be."

If the International Advisory Committee for the ICCF conference series targets South Korea for the next conference, or one thereafter, Park stands at the ready to help organize it: "Last year we had a hot fusion conference in Korea. We could do a cold fusion conference and invite the hot fusion people also. . .I would like to invite critics of cold fusion to come. We'd invite them, and they could have a discussion with the scientists working in the cold fusion field. People working on the ITER project and the KSTAR project in Korea. They can have discussion and debate. I would like to bring a working cold fusion device to the next conference to show people how it works and show them that the people working in the field are not crazy people."

In the meantime, when Park returns to South Korea he plans to "make a presentation to the advisor on Science and Technology to the President of Korea and let them know this is a good area to focus on."

Progress in India

One of Chairman Srinivasan's goals in organizing ICCF16 was to re-invigorate interest in cold fusion in India. Clearly, from the size of the audiences at some sessions, this field interests many faculty and students. And, from the stellar list of those associated with the conference who held or hold high positions in government and industry in India, it appears that the interest still exists. As shown in *IE* #95, India had an early, important impact on the cold fusion history. Srinivasan hopes that India will once again come to the forefront of research. He notes, "I undertook the responsibility to organize ICCF16 in Chennai mainly with a view to help revive the field in India. The satellite meetings were conceived with this objective. I am satisfied and happy that the main custodians of nuclear science and technology in India, namely the Department of Atomic Energy, have awakened to the fact that the field of CMNS/LENR is real. I have been assured by the Chairman of AEC and Directors of BARC and IGCAR that this subject will be looked into."

Mahadeva Srinivasan and C.V.K. Maithreya
(Photo courtesy of ICCF16.)

Srinivasan continues: "It was a fortuitous coincidence that the Rossi-Focardi announcement came just three weeks prior to the conference. This certainly helped make people sit up and think. I am confident that by the end of 2011 at least half a dozen groups in India will take up experiments to investigate LENR related phenomena inclusive of biological transmutations. Actually the prognosis is even better than what I have conveyed, but I am not in a position to spell out further details at this point in time."

Srinivasan is grateful to all of the volunteers who assisted him in organizing the conference, but also appreciates the efforts of the scientists in the field. "I would like to take this opportunity to thank all the stalwarts of the field who came to Chennai, especially those who participated in the satellite meetings, for having played a key role in conveying the message to the Indian scientific community. So if events take a positive turn, they deserve much of the credit for the turnabout."