

MATERIALS SCIENCE & TECHNOLOGY



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MSTD Newsletter

April 2000

Message from the Chair



Dave Senior, Chair

As part of our continuing effort to increase Materials Science and Technology Division participation at the ANS national meetings, we are planning a couple of innovative technical programs for the Winter Meeting to be held in Washington, DC, in November. The MSTD is working with the Fuel Cycle and Waste Management Division (FCWMD) to jointly sponsor a series of sessions highlighting research conducted under recent Department of Energy programs, including the Nuclear Energy Research Initiative (NERI) that began in mid-1999.

The NERI program is designed to support innovative research on topics related to proliferation-resistant and/or advanced nuclear power systems. Of the 46 NERI projects funded in its first year, more than 25% were directly related to nuclear fuel or materials issues, and almost 50% had some materials aspects. These facts

highlight the importance of our field to the continued development of nuclear power systems, and I feel it is important for the MSTD to take a leading role in promoting this work.

The timing of the Washington meeting will allow investigators a perfect opportunity to present results from their first year of research, and it will provide a nice showcase to demonstrate the value of the NERI program itself. For more details on the technical sessions planned for the Washington meeting, refer to the article on page 6 or contact Sean McDeavitt (see page 3 for info).

At the ANS Winter Meeting in Long Beach last November, the Education and Training Division organized a workshop entitled "Crisis in the Workplace: Addressing the Growing Manpower Supply and Demand Imbalance in the Nuclear Industry." The fundamental conclusion was that there is now and will continue to be a shortage of qualified engineers and scientists in the nuclear field unless recent enrollment trends in nuclear engineering programs are reversed.

To encourage nuclear engineering and materials science students to continue working in the field, the MSTD has been expanding its student support programs. These include scholarships, travel support to ANS national meetings, and funding for ANS student conferences. In addition to these more traditional activities, Carl

Beard, MSTD University Liaison, is planning a technical session for the Washington meeting that will highlight student research in nuclear fuels and materials.

Our hope is that students and their advisors will take advantage of this session to promote their research and gain some visibility in the community. To encourage participation, the MSTD is offering a \$400 award to the authors of the top five papers, as selected by a group of MSTD Executive Committee members. Further, submission of a paper to this session followed by publication in one of the ANS peer-reviewed journals will make the authors eligible for the MSTD Student Literary Award. For more details, refer to the reports on pages 4 and 5.

At the MSTD luncheon held during the Long Beach meeting, I had the pleasure of receiving a gra-

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cious letter of appreciation and a check from the organizers of Global '99 – The International Conference on Future Nuclear Systems.

MSTD Executive Committee member Todd Allen, who also served as the Technical Program Associate Chair for the meeting, made the presentation at the luncheon. Although this conference is not traditionally sponsored by the MSTD, Global '99 Technical Program Co-Chair and past MSTD Chair Leon Walters noted that a significant fraction of the individuals involved in planning the meeting were in fact active MSTD members. Because of this, the organizers agreed to share a percentage of the meeting profits with the MSTD.

These funds will be put to good use as the MSTD expands its student support activities, prepares for its Honors and Awards Banquet to be held at the Washington meeting in November (see the article on page 5), and begins planning for the 2002 LWR Fuel Performance Topical Meeting (see the article on page 7). Thanks and congratulations are due to Leon, Todd and all the other members of the very successful Global '99 organizing committee.

The ANS Public Policy Committee, chaired by John Graham, has been conducting a review of ANS position statements regarding various aspects of nuclear science and technology. These statements represent the official position of ANS on these issues, and are used to communicate facts to public officials and the media. Many of these statements are dated and in need of revision.

In this age of instant access to information via the internet, it is

important that the Society provide timely and relevant information to those individuals in a position to influence opinions. Therefore, John has requested that each of the professional divisions examine the position statements related to their field and provide input (or better yet, volunteers) to the Public Policy Committee for endorsement, revision or withdrawal.

At the root of most issues there are materials problems, but the following statements (with their year of issue) appear most relevant to the MSTD: 1) Breeder Reactors (1989), 2) Fusion Energy (1994), 3) Storage of Spent Nuclear Fuel (1987), 4) Space Nuclear Power Propulsion (1995), 5) Protection and Management of Plutonium (1995), and 6) Plutonium Recycle (1977).

Several of these statements are available online at <http://www.ans.org/committees/pp/pub.pos/main.html>; the others are currently being reviewed by the Committee. In addition, there may be other topics that merit the preparation of new position statements (e.g. utilization of weapons plutonium in MOX fuel). If you have any interest in contributing to these efforts, please contact me or John Graham (jgraham@rmi.net).

Finally, our committee chairs are always in need of help. If you are interested in participating in MSTD activities outside the national or topical meetings, please contact one or more of the following individuals:

Brent Lewis, Technical Program Committee Chair;
 Jim Stubbins, Honors and Awards Committee Chair;
 Bob Seidel, Publicity Committee Chair;
 Carl Beard, University Liaison

(see page 3 for contact info) ☆

Dave Senor

World Oil Supply— Production, Reserves, and Enhanced Oil Recovery, 1/2000

by L.F. Ivanhoe, Coordinator of the M. King Hubbert Center for Petroleum Studies at Colorado School of Mines, Golden CO.

World oil production will peak in the year 2010 at 85 million barrels per day (MMBOD).

The permanent oil shock will begin 2010.*

Production will fall to ~42 MMBOD by ~2018, to 35 MMBOD by 2020, and to 8 MMBOD (including enhanced oil recovery and new discoveries) by 2100.

The roller coaster plunge in 2010 is beyond the world's experience. It is later than you think.

The Former Soviet Union's experience (1989) shows that the major oil production decline is realistic for global projections.

* A growing number of informed US and European evaluations put this crisis between years 2000 and 2014.

END NOTES: Based on end of 1997 data for supply, production, and claimed reserves (optimistic). Conservation—most of the world's energy flab was wrung out of global energy usage by 1985.

Hubbert Center Newsletter #2000/1-1

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 see *Oil Supply...*

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University Relations

The old cliché is often used, “the children are our future,” and while we hear this so often as it tends to lose its meaning, for us, a community of nuclear professionals, it is particularly applicable, although it would better be said “the youth of our profession are our future.”

Unfortunately, young scientists and engineers engaged in the nuclear profession have dwindled to alarmingly small numbers.

With the increasing competition from other high-tech industries such as computer science and microelectronics, it becomes increasingly difficult to attract top-notch technical talent in the nuclear field. This makes it all the more important that we engage those who have chosen nuclear as their profession.

We need to engage them in many ways, but in my opinion, none is as important as helping them get involved in our professional society. Only by making them feel like they are part of the “ANS family” will they be less likely to be lured into other industries...and make no mistake, nuclear engineering graduates are highly sought after by plenty of organizations that have little to do with the nuclear industry per se.

But as water will flow along the path of least resistance, so do people tend to travel towards the areas where they feel most welcome, and where they feel part of a larger whole.

In this vein, the MSTD is taking steps to reach out to the young professionals in our industry, to begin to engage them on a professional level and help them become active in our organization. As a first step, the MSTD activated its long dormant position of

University Liaison, which I now proudly hold.

This will provide a focused medium to reach out to the young professionals at our universities. In addition, the MSTD executive committee has voted to provide financial support to both the Eastern and Western ANS Student conferences which will be held at North Carolina State University and The University of Missouri-Columbia, respectively.

Finally, the MSTD will be sponsoring a technical session at the 2000 ANS Winter Meeting solely dedicated to student research in Materials Science and Technology. Hopefully, this will provide the initial step in engaging our next generation of nuclear professionals.

However, much can still be done. It is my hope that I can begin to reach out more aggressively to the ANS student chapters throughout the country to get them more involved in national ANS activities.

I am also proposing MSTD sponsor special events for students at national and MSTD sponsored-technical conferences, to provide greater enticements for students to attend such events.

Finally, I will continue to work with the division leadership to see if we can locate additional financial resources to support student activities. But I can not do this alone. I need the help of all the nuclear professionals in our division, and in our society as a whole.

I would like to encourage all of you to get involved in nurturing this next generation of nuclear professionals....whether by spon-

soring their student memberships, supporting students attending conferences, or just helping me to reach as many students as possible. Please contact me (512-232-6094; cbeard@mail.utexas.edu) with any suggestions of how we might continue to improve these outreach activities.

In this way, we can ensure the future of our division, the future of our society, the future of our industry, and yes, even the future of the world will be brighter than ever. ☆

Carl Beard

Oil Supply...

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The purpose of the Hubbert Center is to encourage a multi-field research approach to studies of petroleum supply, and disseminate such information to the public.

Contact: Professor Craig W. VanKirk, Chairman, Hubbert Center & Head of the Petroleum Engineering. Department, Colorado School of Mines, Golden, CO 80401-1887.

Accession provided by Fredric C. Olds, President, ENERGY COMMUNICATIONS, 910 Wildwood Drive West, Prospect Heights, IL 60070.

Summary prepared 2/8/2000 for the nuclear information database (CFRIDb). Dick Beatty, Facilitator, Center For Reactor Information. ☆

MSTD Honors and Awards

The next MSTD Honors and Awards Banquet will take place at the ANS Winter Meeting in Washington DC. The Banquet will be scheduled for 11:30 a.m. Wednesday November 15th. The location and ticket prices will be announced once final meeting arrangements are made. Please look for the MSTD Awards Banquet on the ANS Winter Meeting Registration Form and sign-up!

The Honors and Awards Banquet takes place every few years, so this is a chance to participate in honoring several of the outstanding contributors in the MSTD over the past several years. The banquet will honor the recent Mishima Award winners (granted by ANS) and a number of MSTD awards winners. The MSTD Awards are listed below and a complete description of the awards and past winners can be found at the ANS-MSTD web site at http://www.pnl.gov/ans_mstd/awards.html.

- Special Achievement Award: Single, unique special achievement – need nominees (multiple, annual)
- Outstanding Achievement Award: Sustained outstanding achievement – need nominees (multiple, annual)
- Literary Awards: Best, full length paper or review article – need nominees (2 – 1 for each type, annual)
- Award of Recognition (Significant Contributions): Best paper at ANS meetings – need nominees (2 – 1 for each meeting, annual)
- Past Chair Award: Recognize contributions of past chair – straight forward
- 25 Year Service Awards: MSTD members who have contributed to the field – need nominees (multiple, annual, straight forward with proper records)
- Student Literary Award: Best full-length paper submitted to Nuclear Technology or other ANS Journal from a

ANS meeting presentation by a student (annual)

- Graduate Scholarship Award: Encourage academic excellence and significant contributions – need nominees (annual)

The MSTD Honors and Awards Committee is soliciting nominations in all of the major categories. Since the Awards cover a four-year period, is appropriate to send nominations for activities in any of the past four years. Nominations can be sent by e-mail to jstubbins@uiuc.edu or to david.senor@pnl.gov or by regular mail to J. F. Stubbins, 214 NEL, 103 South Goodwin Avenue, Urbana, IL 61801 (217) 333-6474 phone, (217) 333-2906 fax. Please contact Jim Stubbins for further information. Nominations will be accepted through August 15th, 2000, but the Awards Committee would appreciate receiving nominations as soon as possible. ☆

James Stubbins

**Help us serve you and your MSTD colleagues better.
Please return this response form to Dave Senor by mail
or email a direct response to david.senor@pnl.gov.**

MSTD IS IS NOT my primary Technical Division of choice within ANS.

Send special MSTD-related announcements or alerts to me by email.

My email address is: _____

I'd like to help plan, organize and chair special sessions.

I'd like to serve on the Program Committee and develop themes/sessions for general and topical meetings.

I'd be glad to help review technical papers.

I'd like to assist with Honors and Awards.

I'd like to serve as an International Liaison.

I'd like to serve on the Planning and Membership Committee.

I'd like to serve on the Program Committee.

I'd like to serve on the Publicity Committee.

I'd like to assist with the Newsletter.

I'd like to serve as the Executive Committee and represent others in MSTD with similar technical interests.

Name: _____ Company: _____

Address: _____

Phone: _____ FAX: _____

Technical Program News

MSTD Programming at ANS National Meetings

The Materials Science and Technology Division sponsored one technical session on Advanced Nuclear Fuels at the 1999 ANS Winter Meeting in Long Beach, CA, last November. Only four papers were presented, but they were of excellent quality and they stimulated some very interesting discussions. The international nature of advanced nuclear fuels development was demonstrated by the fact that all four papers came from outside the United States (two from Japan, one from Switzerland, and one jointly from Russia, UK, Germany and Ukraine).

The MSTD received only a handful of papers for the five sessions planned for the ANS Annual Meeting in June. Unfortunately, there was an insufficient number to form any coherent technical sessions, so the papers were distributed to other ANS divisions for inclusion in their programming.

There are several MSTD sessions currently being organized for the ANS International Meeting in Washington, DC, in November. Extended abstracts for these sessions will be due to ANS Headquarters in late June or early July. Please contact the session organizers listed below for more details if you are interested in contributing a paper.

Materials Research Sponsored by Recent DOE-NE Initiatives

The advent of the Nuclear Energy Research Initiative (NERI) signaled a renewed interest in nuclear energy research in the United States. The U.S. Department of Energy designed the NERI pro-

gram to address key issues affecting the future of the nation's nuclear energy supply and to preserve the existing nuclear science and engineering experience base.

Of the 45 seminal NERI projects funded in 1999, approximately 20 involve materials science and technology issues that range from the corrosion of nuclear materials to the fabrication and performance of advanced fuel materials. In addition to NERI, other recent DOE-NE programs, including NEER and NEPO, also support research in materials science and technology.

These sessions will consider the full spectrum of materials research sponsored by DOE-NE and will provide a forum for the discussion of materials issues that are critical for the future of nuclear energy in the United States. Up to seven individual sessions are planned, in cooperation with the Fuel Cycle and Waste Management Division (FCWMD).

The anticipated topics of the individual sessions are listed below, along with the responsible division. This series of technical sessions should provide an excellent showcase for the research completed to date as part of the NERI, NEER and NEPO initiatives.

- Advanced cladding/structural materials development MSTD
- Advanced fuel matrix development MSTD
- Fundamental in-reactor phenomena MSTD
- Waste reduction and characterization FCWMD
- Instrumentation, control and assessment FCWMD
- Proliferation resistant reactor designs FCWMD
- Advanced reactor designs

FCWMD

MSTD Session Organizer: Sean McDeavitt (630-252-4308, mcdeavitt@cmt.anl.gov)

FCWMD Session Organizer: Bob Einziger (630-252-4064, einziger@cmt.anl.gov)

Advanced Nuclear Fuels Development

There is growing interest in advanced nuclear fuels development. This interest is driven by a variety of factors, including the decision of the United States to dispose of the majority of its surplus weapons plutonium inventory through the use of mixed-oxide fuel, as well as a desire to develop more proliferation-resistant fuel forms for use as more countries turn to a closed fuel cycle.

The intent of this session is to provide a forum for discussion and dissemination of results relevant to nuclear fuel development, both for near-term fuel forms and longer-term development activities.

Session Organizer: Carl Beard (512-232-6094, cbeard@mail.utexas.edu)

Student Research in Materials Science and Technology

Students are the future of nuclear research and development. The earlier students can become involved in professional society activities, the more likely they will continue that involvement throughout their careers.

The purpose of this session is to provide current and recent stu-

...continued on page 7
see *Technical Program News*

Technical Program News...*continued from page 6*

dents a professional-level forum to present their research in materials related projects relevant to nuclear technologies.

Session Organizer: Carl Beard
(512-232-6094,
cbeard@mail.utexas.edu)

Materials for Accelerator-Driven Systems

Several programs in the United States and around the world are developing accelerator-driven systems where neutrons produced by spallation are used for materials science, materials processing, spent fuel treatment, isotope production, medical therapy, neutron science, particle physics, and other applications. Target, blanket and structural materials in these systems are exposed to severe environments.

Performance considerations include radiation damage from neutron and charged particle irradiation, corrosion from contact with a variety of fluids, and high temperature operation. The proposed session will explore radiation and other effects on materials in accelerator-driven systems. Selection criteria and severe life assessments for materials in these systems will be considered as well.

Session Organizer: Jim Stubbins
(217-333-6474,
jstubbins@uiuc.edu)

Please contact the MSTD Technical Program Committee Chair, Brent Lewis (613-541-6611, lewis_b@rmc.ca), if you have ideas for technical sessions to be held at the upcoming ANS Annual Meeting in Milwaukee (June 2001) or the ANS Winter

Meeting in Reno (November 2001).

**Plutonium Futures—
The Science 2000**

La Fonda Hotel
Santa Fe, New Mexico
July 10-13, 2000

This conference will cover scientific topics in plutonium and actinide sciences including actinides in the environment and the science underlying plutonium disposition.

Anticipated conference subtopics include:

- Separations
- Matrix interactions
- Materials compatibility
- Plutonium metallurgy
- Detection and analysis
- Environmental and biosphere chemistry
- Nuclear fuels
- Novel plutonium/actinide compounds and complexes

<http://www.lanl.gov/orgs/nmt/nmt.do/PuConf2000/PuConf2000.html>

For More Information Contact Andria Liesse, Conference Coordinator, by calling (505) 665-5981 or sending email to puconf2000@lanl.gov

Future Topical Meetings

Pending MSTD Executive Committee approval, an organizing committee led by Prof. Jim Tulenko and Dr. Jean-Louis Boutard is prepared to go before the Screening Subcommittee of the ANS National Program Committee to request calendar placement for the 2002 Light Water Reactor Fuel Performance

Topical Meeting. The meeting is tentatively planned for Spring 2002, and the desired location is Lyon, France.

A mutually beneficial financial arrangement has been worked out between the French sponsoring organizations and the American Nuclear Society, and the proposed location appears to be excellent.

The last LWR Fuel Performance Topical to be held outside the United States was in Avignon, France, in 1991. By all accounts, that was a very successful meeting, and there is every reason to think the 2002 meeting in Lyon would be equally successful, particularly considering the strong and growing European contribution to nuclear fuels development.

The 11th Conference on Environment Degradation of Materials in Water Reactors is in the very early stages of planning. The meeting is expected to occur in July or August 2003, and the location is still to be determined. The Technical Program Chair for the meeting is Prof. Gary Was (734-763-4675, gsw@umich.edu). Please contact Prof. Was if you need more detailed information.

Electronic Paper Review

Fully electronic paper reviews are now a reality within the MSTD. Brent Lewis developed the e-review site, located at <http://www.rmc.ca/lewis/index.htm>. A password is required to perform paper reviews; if you are interested in helping with future paper reviews please contact Brent at 613-541-6611 or lewis_b@rmc.ca to obtain a password. ☆

Brent Lewis

MSTD Awards Luncheon Photos ONLINE!

Materials Science and Technology Division

MSTD Luncheon

1999 ANS Winter Meeting - 17 November 1999



The Materials Science and Technology Division held a luncheon on Wednesday, 17 November 1999 during the 1999 ANS Winter Meeting. The guest lecturer was Prof. Nasr Ghoniem of the University of California-Los Angeles who spoke on mechanistic modeling of irradiation damage in materials. The photographs below were taken by MSTD Publicity Committee Chair, Bob Seidel. Click on the thumbnails below to see a larger version of each photograph.

<p>The Long Beach Convention Center, site of the 1999 ANS Winter Meeting</p>	
<p>The Long Beach Hyatt, official hotel for the 1999 ANS Winter Meeting, and site of the MSTD luncheon on 17 November 1999.</p>	
<p>Attendees at the MSTD luncheon, including (front to back) David Senior, MSTD Chair; Jim Tulenko, MSTD Past Chair; and Carl Beard, MSTD University Liaison</p>	
<p>More attendees at the MSTD luncheon, including (back to front) Jim Stubbins, MSTD Honors and Awards Committee Chair; and Prof. Nasr Ghoniem, Guest Lecturer</p>	
<p>Todd Allen (right), MSTD International Liaison and Global '99 Technical Program Associate Chair presents David Senior, MSTD Chair, with a letter of appreciation and a check for a share of the conference proceeds on behalf of the Global '99 organizing committee in recognition of significant contributions by MSTD members to the success of the meeting.</p>	

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Guest Lecturer Prof. Nasr Ghoniem of the University of California-Los Angeles, presents his talk on mechanistic modeling of irradiation damage in materials

Keep in touch via the MSTD website!