



# THERMAL HYDRAULICS DIVISION NEWSLETTER

## Fall 2008

### Message From The Chair



Greetings! Members of the ANS Thermal Hydraulics Division (THD), colleagues, and friends! On behalf of THD executive committee and other committees as well, I am very delighted to report you that the THD has had another good year in terms of maintaining good numbers of THD membership and proactive participation of most of you in our THD-sponsored

technical sessions at ANS National Meeting in Anaheim. I appreciate that most of you have shown me the “ownership” of the technical sessions and other activities you may have been involved in the past. Before I address my other messages to you, last, but not least, I wish to thank the previous leaders in THD. Thanks to their hard work and endeavors, the THD was recognized as the outstanding division reviewed for the critical vitality measures by the ANS Professional Development Committee.

I am very saddened to report you that we lost our friend and colleague, Professor Lawrence Hochreiter at Penn State University on September 3. Professor Hochreiter collapsed at the beginning of his NuCE 501 (Reactor Design) class and was pronounced dead at Mount Nittany Medical Center. He was an outstanding educator, a wonderful friend, and a nice person. An article of reminiscing him will be shown in great details in the following section below contributed by Professor Bill Cheung.

As you know, research in the nuclear engineering has been very strong since the inception of the Generation-IV program implemented by the U.S. Department of Energy (DOE) and the world in year 2002. Both the President’s National Energy Policy and the Energy Policy Act (EPAAct) of 2005 recognize the potential for nuclear energy to help meet our Nation’s growing need for safe, reliable, and environmentally responsible energy supply. The goal of the Generation IV Nuclear Energy Systems Initiative is to address the fundamental R&D issues necessary to establish the viability of next-generation nuclear energy system concepts. Successfully addressing these issues will allow these advanced systems to be considered for future commercial development and deployment by the private sector. The Gen IV

program is focused on very high temperature reactor technologies for use in a Next Generation Nuclear Plant (NGNP) to produce hydrogen and other energy products, and on developing sodium-cooled fast reactor technologies that may be used to close the nuclear fuel cycle in the Global Nuclear Energy Partnership (GNEP).

Under the current circumstances of the skyrocketing oil prices, the Next Generation Nuclear Program (NGNP) managed by the U.S. DOE and Idaho National Laboratory (INL) is very promising in terms of generating electricity and hydrogen production. Hydrogen production is a key element of ongoing R&D worldwide researches that allow producing hydrogen at reasonable price for fuel cell vehicles, the fertilizer industry, and petroleum sweetening processes. GNEP based on the fast sodium reactor is an evolving U.S. global nuclear strategy aimed at reducing global dependence on fossil fuels, providing reliable, abundance energy necessary for economic growth, and reducing the risk of nuclear proliferation.

Next I report the status of the technical sessions we had in Anaheim and the proposed sessions for the upcoming conferences is reported in a later section by Kurshad Muftuoglu, the program committee chair.

THD had successful sessions at the Anaheim meeting. The session information is summarized in a table below.

Session	Number of Speakers	Chair(s)
Computational Thermal Hydraulics – I	5	Woods
Thermal Hydraulic Aspects of Nuclear Hydrogen Systems (Panel)	6	Oh, Revankar
Two-Phase Flow Experimentation	8	Sun, Hassan
General Thermal Hydraulics – In Memory of Gunol Kojasoy	8	Vierow, Kim
Computational Fluid Dynamics Analysis of Rod Bundles	3	Nimokata
Computational Thermal Hydraulics – II	5	Guillen

**Chang H. Oh**  
Chairperson (2008-2009)  
Thermal-Hydraulics Division  
Idaho National Laboratory

## In Memory of Professor Lawrence E. Hochreiter



A long-time member of the ANS Thermal Hydraulics Division, the late Professor Lawrence E. Hochreiter, died on Wednesday, September 3, 2008 at the Mount Nittany Medical Center in State College, Pennsylvania. Professor Hochreiter collapsed at about 10 am Wednesday at the beginning of his Reactor Engineering class held on the main campus of the Pennsylvania State University at which he taught since 1997. He was pronounced dead at 11:07

am at the emergency department of Mount Nittany Medical Center. He was 67. Professor Hochreiter was born in Buffalo, New York. He is survived by his wife of 42 years, Susan; his daughter, Sarah, 36; and his son, Paul, 28.

Professor Hochreiter received his B.S. in mechanical engineering from the University of Buffalo, and his M.S. and Ph.D. in nuclear engineering from Purdue University. After receiving his Ph.D., he spent 26 years working in the Nuclear Energy Systems Division at Westinghouse in the nuclear safety area before joining Penn State. His early work at Westinghouse involved the development of the THINC-IV PWR subchannel analysis code for thermal-hydraulic analysis. This was the first subchannel code that included lateral momentum equations to calculate cross flow in rod bundle arrays. In 1972 he was appointed Manager of Safeguards Development (first level manager) and supervised light water reactor safety experiments, as applied to pressurized water reactors. These experiments included large full-length rod bundle blowdown film boiling, two-phase level swell, and reflood heat transfer tests; the Nuclear Regulatory Commission/ Westinghouse Full Length Emergency Core Heat Transfer (FLECHT) reflooding experiments, the 1/14 and 1/3 scale cold-leg steam/water mixing tests, and the Westinghouse transient departure from nucleate boiling (DNB) tests. In 1977 he was appointed to Advisory Engineer and was the Principal Technical Investigator for the Full Length Emergency Core Heat Transfer-Systems Effects and Separate Effects Tests (FLECHT-SEASET) program which examined reflood heat transfer. This was a joint research program between the Nuclear Regulatory Commission, Electrical Power Research Institute, and Westinghouse. He also developed and modified the COBRA-TF code to analyze combined radiation and film boiling heat transfer situations for rod bundles with top spray cooling for boiling water reactor LOCA situations. He also served as Westinghouse safety analysis technical expert for the Three-Mile Island-II accident. In 1987 he was appointed as a Consulting Engineer, which is the highest technical position at Westinghouse Electric Corporation. At that time, he was the youngest individual to be appointed to this position. He led and participated with engineers to develop a Best-Estimate Thermal Hydraulic Methodology to analyze Westinghouse

two-loop reactors with upper plenum injection. As part of this effort, he developed the code assessment and code uncertainty efforts which were applied to the WCOBRA/TRAC code. He was also responsible for developing the conceptual test and safety analysis plan and its integration into the AP600 licensing efforts to support the AP600 design certification. For his efforts at Westinghouse, Professor Hochreiter was awarded two General Manager "E" Awards, for Engineering Technical Excellence. At the time, this was the highest technical award in the business unit. He was also awarded three George Westinghouse Signature Awards of Excellence. He also won the Westinghouse Business Unit Product Introduction Award as well as Technical Article Award for new product innovation. He also won several technical achievement and excellence awards associated with the AP600 Design Certification Efforts.

Since joining Penn State in January 1997, Professor Hochreiter continued to work in the safety analysis and development, reactor thermal-hydraulics, reactor safety, and two-phase flow and heat transfer areas. He was the Principal Investigator for the NRC sponsored Rod Bundle Heat Transfer (RBHT) Program aimed at providing fundamental experimental data for model development for the NRC advanced computer codes. The RBHT test facility is a full-length, heated rod bundle array which simulates a PWR fuel assembly and is the only facility of this type in the US. He was also the Principal Investigator for several projects with the Bettis Atomic Power Laboratory including mixed convection small hydraulic diameter heat transfer experiments and high pressure subcooled jet condensation experiments. He was also involved with the Framatome -ANF (Siemens Power Corporation now AREVA) investigating the effects of spacer grids on dryout in BWR bundles. In addition to research, Professor Hochreiter had made a significant contribution to the nuclear engineering curriculum at Penn State. Specifically, he developed two graduate-level courses in Reactor Core Subchannel Analysis and Reactor Safety based primarily on the knowledge he gained from the nuclear industry. He also completely revised and updated five undergraduate-level courses. He brought his extensive experience from the industry to the classroom and helped students relate the fundamental knowledge they learned in the classroom to real-world applications. He had supervised the thesis works of several university scholars and a large number of graduate students, some of them are now faculty members at major universities and nuclear engineers in large companies and national laboratories. He was the recipient of the 2005 Penn State Engineering Society Outstanding Teaching Award and the 2008 THD Technical Achievement Award. The latter is the highest technical honor given by the American Nuclear Society to a member of the Thermal Hydraulics Division. He was the General Chair of the 12<sup>th</sup> International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-12) held last October.

Professor Hochreiter was a world-renowned researcher and scholar whose technical accomplishments were well recognized and admired by his peers. He had made long-lasting contributions to the nuclear community through the application of science and art of thermal hydraulics. But his most rewarding accomplishments are his students. He loved his students and his

students loved him. His son, Paul, said, "He absolutely loved his job at Penn State." His wife, Susan, said, "His students and his life at Penn State were his No. 1 priority. He lived for teaching." Professor Hochreiter had touched the lives of many, especially his students. He was with them, imparting his wisdom and knowledge upon them, until the very end of his life. Professor Hochreiter was a blessing to many who had the privilege to know him, learn from him, and work with him. May his life be like a seed that fell into good soil from which many new seeds will sprout. May those whose lives were touched by him touch the lives of many. May the blessings continue to multiply.

**Fan-Bill Cheung**  
*Past Chair, THD (1999-2000)*  
*Professor of Mechanical and Nuclear Engineering*  
*Pennsylvania State University*

## Honors and Awards Committee Report

### 2008 Thermal Hydraulics Technical Achievement Award

The recipient of the 2008 Technical Achievement Award is the late Dr. Larry E. Hochreiter. The award citation reads "In recognition of his significant contributions toward advancing the knowledge of thermal hydraulics phenomena and for his impact on the thermal hydraulics community as a researcher and educator promoting technical excellence and nurturing next generation nuclear engineers". With unanimous votes, Professor Hochreiter was selected before his departure as the recipient of the award.

### 2008 Best Paper Award

The 2008 best papers were awarded to the following two technical papers:

(1) RCCS Experimental and Validation for High Temperature Gas-Cooled Reactor, authored by Chang Oh, Cliff Davis, both from INL, and Goon C. Park from Seoul National University.

(2) Applicability of Small Scale Integral Test Data to the 4500 MWt ESBWR Loss-of-Coolant Accidents, authored by Pradip Saha, Robert Gamble, Bharat S. Shiralkar, and James R. Fitch. from GE -Hitachi Nuclear Energy.

Both these papers are from NURETH-12 papers.

**Yassin Hassan**  
*Honors and Award Committee Chair*  
*Texas A&M University*  
*y-hassan@tamu.edu*

### Treasurer's Report

For 2008, the Division's income of \$16,416 comes from the 2007 carry forward and our member allocation. The Division income from meeting revenue support is no longer received because the membership allocation has been increased from \$1/member to \$2/member. THD expenses are support for awards and plaques, the student conference at Texas A&M University in Feb.-March

2008, student travel support to the ANS Annual Meeting (June 2008) and the ANS Winter Meeting (November 2008), and scholarships including the NEED program.

### Awards-related expenses for the year 2008

- Technical Achievement Award at \$1000
- Technical Achievement Award plaque at \$60
- Recognition plaque for Division Chair at \$60
- Young Professionals Thermal Hydraulic Research Presentation Award plaque at \$60
- Best Paper Award at \$500
- Best Paper Award plaque at \$60

### Income from NURETH-12

The Division will be credited with \$10,698.32 as income from the NURETH-12 conference held in October 2007.

<b>Revenue</b>		
<b>Type</b>	<b>Item</b>	
Member Allocation	\$2/THD Member	1,986
Carry Forward from 2007		14,430
Division Income from meeting revenue support		0
<b>TOTAL REVENUE</b>		<b>16,416</b>
<b>Expenses</b>		
<b>Type</b>	<b>Item</b>	
Awards, Plaques		0
Student Conference Support	Texas A&M Univ. meeting	2,500
Student Travel Support	June 08 Meeting	0
Student Travel Support	Nov. 08 Meeting	0
Scholarship/NEED	Scholarship/NEED and THD award support	0
<b>TOTAL EXPENSES as of 03/31/08</b>		<b>2,500</b>
<b>Balance as of 03/31/08</b>		<b>13,916</b>

### 2008 Budget

For 2008, the Executive Committee approved the following expenses at the November 2007 meeting:

- \$1800 for awards and plaques (same as in 2007)
- \$2500 for ANS Student Conference support (down \$1000 from 2007)
- \$500 for student travel support to the ANS Annual and Winter meetings (same as in 2007)
- \$500 for Scholarship/NEED (same as in 2007)

### Spending Plan

An ad-hoc Committee (Vierow, Rempe, and Cheung) was appointed by the Division Chair at the November 2007

Executive Committee meeting to evaluate the THD's long-term finances and recommend a spending plan. This plan was presented to the Executive Committee at the June 2008 meeting. Although the budget must be approved by the Executive Committee annually, the Executive Committee unanimously agreed to adopt the Ad-hoc Committee recommendations.

In order to ensure that there are sufficient funds available to withstand the three years between conferences in which revenue is generated, the Ad-hoc Committee recommended that the expenses be limited to \$3216/year. Currently, the Division has a 7-year reserve, including the NURETH-12 income. The ad-hoc committee recommended that this excess reserve be reduced to a 3-year reserve by allowing higher student support over the 2009-2013 years. Recommended spending would consist of \$1800/year for awards and plaques, \$2500/year for student support, and \$1000/year for scholarship/NEED support. The current practice of providing no funding for Division Officer expenses and national meeting costs is continued in the proposed spending plan.

**Kune Suh**

*2008-2009 Treasurer  
kysuh@snu.ac.kr*

## **Memorial Session for the Late professor Gunol Kosjasoy**

A technical session dedicated in memory of Late Professor Gunol Kosjasoy was held at the ANS summer meeting in Anaheim CA. The session was a great success; it was attended by Late Prof. Kosjasoy's friends, collaborators and others. The room was packed and some people were standing in the back of the room. Prof. Seungjin Kim and Prof. Yassin Hassan were the co-chair of the session. Seungjin had a collection of Prof. Kojasoy's photos in a slide show. Yassin gave a very nice speech about Prof. Kojasoy. The video for the session was recorded and was mailed to Mrs. Kosjasoy along with the poster displayed in the session. She was quite thankful to the committee for organizing the session in memory of late Professor Kosjasoy.

**Seungjin Kim / Xiadong Sun**

*Penn State University / Ohio State University  
[Sxk86@psu.edu](mailto:Sxk86@psu.edu) / [sun.200@osu.edu](mailto:sun.200@osu.edu)*

## **Program Committee Report**

ANS Winter meeting will be held in Reno, NV from November 9 to 13, 2008. Technical sessions proposed are:

- Panel NUTHOS-7 Highlights (Suh, J.H. Kim, Ninokata)
- Young Professional Thermal Hydraulics Research Competition (Todd, Marshall)
- High Temperature Gas-Cooled Reactor Technology (Marshall, Sun, Hassan, Oh)
- General Thermal Hydraulics (Revankar, Vierow, Rempe, S.J. Kim, Saha)

- General Two-Phase Flow (S.Kim, Sun, Cheung, Vierow)
- Computational Thermal Hydraulics (Woods, Powers, Saha, Ninokata)

ANS Annual Meeting to be held in Atlanta, GA June 14 to 18, 2009 will organize the following technical sessions:

- General Thermal Hydraulics (Hassan, Cheung, J.H. Kim)
- Rod Bundle Thermal Hydraulics (S. Kim, Ninokata)
- Thermal Hydraulics of Advanced Reactors (Woods, Hassan, Leon)
- Computational Thermal Hydraulics (Muftuoglu, Guillen, Luxat)
- General Two-Phase Flow (Sun, Kim, Saha)
- Severe Accidents and Fluid-Structure Interaction (Guillen, Rempe, Vierow, Unal)
- Thermal Aspects of Nuclear Material Handling and Environmental Monitoring (Lee, Oh)

NURETH-13 will be held in Kanazawa, Japan from September 27 through October 2, 2009. The meeting category is Class IV. The Local Organizing Committee was established and had its first meeting in February 2008 at Nikko Hotel, Kanazawa, 100 km north of Kyoto, Japan. The website can be found at <http://www.nureth13.org/>.

**Kurshad Muftouglu**

*Program Committee Chair  
[muftuok@westinghouse.com](mailto:muftuok@westinghouse.com)*

## **Web Page Report**

Want to know what's going on in the nuclear thermal-hydraulics community and the ongoing business and activities of your favorite ANS professional division? The THD website (<http://thd.ans.org>) includes links to our latest newsletter and recent and upcoming events of interest to thermal-hydraulic practitioners (e.g., NUTHOS-7, NURETH-13, ICAPP 09). Follow the sidebar links and learn a little about the THD and current topics of interest. Archives of historical records (meeting minutes and newsletters) going back nearly 20 years are also available. For the truly inspired, the THD website includes our rules for conducting business, recognition of current and past committee members, and contact information of THD officers. Also, if you are interested in nominating a colleague for our prestigious Technical Achievement Award, you can find the necessary application and instructions. Your comments and suggestions about content appearing on our site can be directed to me.

**Robert Martin**

*[robertp.martin@areva.com](mailto:robertp.martin@areva.com)  
Web Site Manager*

## Nominating Committee Report

Based on election early this year the current Division Officers and Executive Committee members are listed below.

### *Executive Committee (3 year term)*

#### **Current Year THD Officers:**

**Division Chair:** Chang Oh, *chang.oh@inl.gov*

**Vice Chair:** Karen Vierow, *vierow@ne.tamu.edu*

**Treasurer:** Kune Suh, *kysuh@snu.ac.kr*

**Secretary:** Hisashi Ninokata, *hninokat@nr.titech.ac.jp*

#### **Executive Committee Members**

Fan-Bill Cheung (2009) *fxc4@psu.edu*  
Whee Choe (2009) *whee.choe@txu.com*  
Yassin Hassan (2009) *y-hassan@tamu.edu*  
Hisashi Ninokata (2009) *hninokat@nr.titech.ac.jp*  
Don Todd (2009) *donald.todd@areva.com*  
Kurshad Muftuoglu (2010) *muftuoak@westinghouse.com,*  
Xiadong Sun (2010) *sun.200@osu.ed*  
Robert Martin (2010) *RobertP.Martin@areva.com*  
Brian Woods (2011) *Brian.Woods@oregonstate.edu*  
Hee Cheon No (2011) *hcno@kaist.ac.kr*

#### **Committee Chairs:**

Program Committee – Kurshad Muftuoglu,  
Honors and Awards Committee – Yassin Hassan  
Nominating Committee – Shripad T. Revankar  
Membership Committee – Bob Martin

The Nominating Committee is responsible for the nomination of THD members to leadership positions on both the Program and Executive Committees. The THD would like to encourage members interested in becoming more involved to contact one of the officers listed above. In particular, the division is usually in need of volunteers for technical meeting session organizers and paper reviewers.

*Shripad T. Revankar*  
2008-2009 Chair  
THD Nominating Committee  
*shripad@ecn.purdue.edu*

## NUTHOS-7 Report

NUTHOS-7 was held in Seoul Korea from October 5 to October 9, 2008 and its website is listed as <http://www.nuthos-7.org>. Among eight plenary and eight keynote presentations, one of the highlights of the conference was a plenary session dedicated to the memory of Larry Hochreiter. Jong Kim and Yassin Hassan co-chaired the session that featured three distinguished speakers, Professors B. Raj Sehgal (Royal Institute of Technology, Sweden), Mujid Kazimi (MIT), and Dr. Myung Jae Song (Sr. VP of Korea Hydro & Nuclear Power Co.).

A number of technical papers were listed at 220 with 260 attendees from 27 different countries. The conference organizers

appreciate the corporate sponsor for the banquet, snacks, coffee, etc. The distinguished sponsors are Korea Hydro & Nuclear Power Co., Ltd, and Doosan Heavy Industries and Construction Co. A KAERI tour to the thermal hydraulics facility at KAERI was arranged on Friday of October and 37 people joined the tour.

Selected papers from this conference will be recommended for publication in archival journals of Nuclear Science & Engineering, Nuclear Technology, Nuclear Engineering & Design, and Nuclear Engineering & Technology.

*Kune Suh*  
NUTHOS-7 Technical Program Chair  
*kysuh@snu.ac.kr*

# NURETH-13

13th International Topical Meeting on Nuclear Reactor Thermal Hydraulics  
 September 27-October 2, 2009, Hotel Nikko Kanazawa and Ishikawa-ken Ongakudo,  
 Kanazawa City, Ishikawa Prefecture, JAPAN  
<http://www.nureth13.org/>



International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH) is an important series of international topical meetings in the fields of thermal hydraulics.

NURETH has served for international nuclear society as an open forum where high-quality and up-to-date information is actively discussed and exchanged among world-class experts. Now NURETH-13 is organized by the Thermal Hydraulics Division of Atomic Energy Society of Japan and American Nuclear Society and will bring together all the experts, together with new information and research results from all over the world. It is our utmost pleasure to welcome you to this significant international conference. (TPC Chairs)

## Topics

- Two-Phase Flow and Heat Transfer Fundamentals
- Boiling and Condensation Phenomena
- Rod Bundle Thermal Hydraulics
- Subchannel Analysis
- Nuclear Reactor Core Thermal Hydraulics
- Nuclear Reactor Plant Thermal Hydraulics and Safety
- Code Development and Applications
- Computational Methods, Modelling, Verification/Validation
- Applications of Computational Methods to Nuclear Systems
- Advanced Code Development and Validation/Verification/Applications
- Experimental Methods and Instrumentation
- Severe Accidents, Phenomena, Modeling and Experiments
- Combustion and Fires, Modeling and Experiments
- Thermal Hydraulics in Accident Management
- Operating LWRs Thermal Hydraulics and Safety
- Thermal Hydraulics in Power Up-rating/Life Extension
- Neutronics/Thermal-Hydraulics Coupling
- Fluid-Structures and Materials Interactions
- Sodium-cooled Fast Reactor Thermal Hydraulics
- Next Generation LWR Thermal Hydraulics
- Next Generation Gas-cooled Reactor Thermal Hydraulics
- Generation IV and Future Innovative Nuclear Reactors Thermal Hydraulics
- Application of Nano-Fluid Science and Technology to Nuclear Systems
- Micro-Scopic Fluid Flow and Heat Transfer Phenomena in Nuclear Systems
- Thermal Hydraulics of Non-Electricity Generating Nuclear Equipment
- Thermal Hydraulics of Waste Management
- Miscellaneous Subjects

## Special Topics (Organized Sessions)

- Thermal Hydraulics and Structural Integrity in Connection to Aging and Life Extension
- Fusion Reactor Thermal Hydraulics
- Issues and Future Directions of Thermal Hydraulics R&Ds
- BEPU (Best Estimate code Plus Uncertainty) method, CSAU, Statistical Methods
- Radiological Hazard Related Thermal Hydraulics – Aerosol behaviors, consequences

## Key Dates (Updated October 15, 2008)

Dec.31, 2008	Electronic submission of abstracts due
Jan.31, 2009	Notification of acceptance to authors
Mar.31, 2009	Full Manuscripts due for review
April 1 to May 31	Review Period
May31, 2009	Review results and comments back to authors
July31, 2009	Final paper manuscripts due
Aug.31, 2009	Last day of early-registration
Aug.31, 2009	Last day of hotel reservation
Sep.27 –Oct. 2, 2009	Date of Meeting
Oct. 2, 2009	Technical Tour to FBR Monju, KEPCO Mihama PWR site

## Conference Web-Site for More Information:

<http://www.nureth13.org/>

## Organizers

### Honorary Chairs

Neil E. Todreas (MIT)  
 Mamoru Akiyama (Inst Applied Energy)

### General Chairs

Hideki Nariai (JNES)  
 Jong H Kim (KAIST- EPRI WW)

### Advisory Committee

Chair Hisashi Ninokata (TITech)

### International Steering Committee

Chair Soon-Heung Chang (KAIST)  
 Co-chair Yassin Hassan (Texas A&M)

### Technical Program Committee

Chair Hisashi Ninokata (TITech)  
 Co-chair Joy Rempe (INL)  
 Assistant Chair Isamu Maekawa (KHI)  
 Secretary Hideki Kamide (JAEA)

### Local Organizing Committee

Chair Michio Murase (INSS)  
 Co-chair Takashi Nakanishi (Kanazawa Univ)  
 Katsuhisa Yamaguchi (JAEA)  
 Hiroyasu Mochizuki (Fukui Univ)

## Kanazawa Tourist Guide:

<http://www.kanazawa-tourism.com/>

