



# AMERICAN NUCLEAR SOCIETY REACTOR PHYSICS DIVISION Winter/Spring 2012 Newsletter



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## Message from the Outgoing Chair

*By Benoit Forget  
(bforget@mit.edu)*

It is with great pleasure that I am writing this message as the outgoing Chair of our division, little did I know that accepting to run for secretary four years ago came with ever increasing responsibilities and I am now glad to hand over all these responsibilities to our new Chair, Alizera Haghighat! With the continuous support of our strong and dedicated membership, I am sure that he will be very successful in his new role.

In the past year, the reactor physics division has made a strong showing at both National meetings and also held a very successful PHYSOR meeting in Knoxville, TN. I would like to thank everyone that contributed their time and efforts in making this a very successful year for RPD.

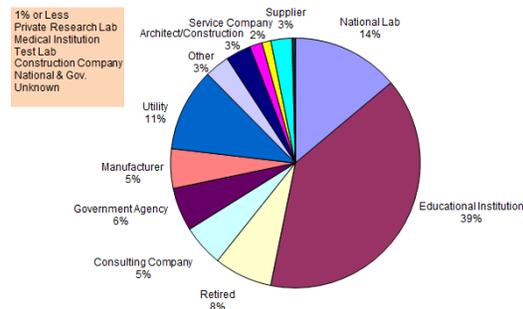
Additionally, no newsletter could be complete without recognizing the hard work of our technical program chair, Dr. Fausto Franchescini, who just

recently decided to step down from this very demanding position. Over the past four years, Fausto has done an amazing job in maintaining the strong quality of the papers, adding many special sessions and recruiting a dynamic program committee. He will be succeeded by Dr. Alex Stanculescu of INL. Please join me in thanking Fausto for his hard work and in welcoming Alex!

## The Reactor Physics Division: An Overview

*By Ron Ellis  
(ellisrj@ornl.gov)*

The primary objective of the Reactor Physics Division of the American Nuclear Society is to promote the advancement of knowledge and understanding of the physics of reactors - the fundamental physical phenomena characterizing nuclear reactors and other nuclear systems. The Division encourages research and disseminates information through meetings, publications and the Division's web site (<http://rpd.ans.org>).



The Division's areas of technical interest are defined by its membership, and include nuclear data, particle interactions and transport, reactor and nuclear systems analysis, methods design, validation and operating experience and standards. The Reactor Physics Division is one of the largest (currently third out of 21 professional divisions, with a membership of approximately 2200) and one of the most active professional divisions within the ANS. RPD's vibrancy and high level of activity is due to its volunteers, excellent national meeting participation, well organized and attended technical sessions and topical meetings, a very active standards program (described later in this newsletter), and the very high profile Wigner Award. The Division currently sponsors the Allan

F. Henry/Paul A. Greebler Scholarship for students of any nationality pursuing graduate studies in the field of reactor physics. The Division is also studying the establishment of a second endowed scholarship for undergraduate students.

The Reactor Physics Division serves the international reactor physics community. However, it is important to note and stress that the Division is operated and maintained by Division-elected members who voluntarily serve on the Executive Committee. The Executive Committee oversees the activities of a number of other committees (Program, Scholarships and Awards, and Standards, to name a few). These are largely volunteer-driven activities. New volunteers are always in demand and are encouraged to participate. If you would like to become more involved in the various activities of the Reactor Physics Division (many of which are described in this newsletter), feel free to contact any of the Division's officers or representatives for more information.

**CASL Activities in Nuclear Reactor Analysis Methods Development**

By Bill Martin  
(wrm@umich.edu)

**Consortium for Advanced Simulation of Light Water Reactors (CASL)**

CASL is a DoE Energy Innovation Hub for Modeling and Simulation of Nuclear Reactors. CASL applies existing modeling and simulation capabilities and develops advanced capabilities to create a "virtual reactor" for predictive simulation of light water reactors. This article presents a summary of the CASL activities in the area of nuclear reactor analysis methods development, which will be of interest to the membership of the ANS Reactor Physics Division. activities.



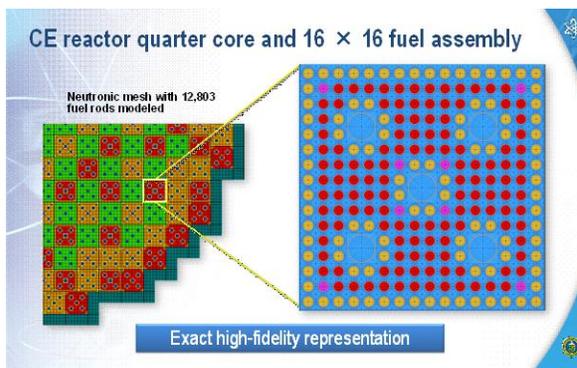
A brief overall description of CASL will be given, followed by the summary of the reactor physics analysis. There are ten institutional partners in CASL, including four national laboratories (Idaho, Oak Ridge - the lead institution, Los Alamos, and Sandia), three industry partners (EPRI, TVA, and Westinghouse), and three universities (Michigan, MIT, and NC State).

CASL is organized into six technical Focus Areas:

- *Materials Performance and Optimization (MPO)* – Develops improved materials performance models for fuels, cladding, and structural materials to provide better prediction of fuel and material failure.
- *Radiation Transport Methods (RTM)* – Develops next-generation neutron transport simulation tools for the Virtual Environment for Reactor Analysis (VERA) simulator, with a focus on full-core, pin-resolved transport using Sn methods, MOC methods, and Monte Carlo/hybrid methods.
- *Thermal Hydraulics Methods (THM)* – Advances existing and develops new modeling capabilities for thermal-hydraulics (T-H) analysis and its integration with solver environments deployed on large-scale parallel computers.
- *Validation and Uncertainty Quantification (VUQ)* – Develops the methods for verification and validation and uncertainty quantification of VERA and its component models.
- *Virtual Reactor Integration (VRI)* – Develops VERA by integrating the models, methods, and data developed by MPO, RTM, THM and VUQ.
- *Advanced Modeling Applications (AMA)* – The primary CASL interface to the physical reactor applications and the external community including the NRC.

**Radiation Transport Methods (RTM) Focus Area**

The reactor physics analysis methods development effort is centered in RTM. The primary long-term objective for RTM is to deliver to VERA the capability for 3D, full-core, pin-resolved transport for both steady-state (including depletion) and transient conditions, including multiphysics coupling of neutronics to heat transport, fluid flow, structural response, and fuel performance.



To accomplish this objective, RTM is divided into three projects:

- Pin-resolved transport (PRT)* – The primary long-term objective for PRT is to develop and implement a deterministic transport capability for VERA to analyze a 3-D, full-core configuration with sufficient resolution to model axial, azimuthal, and radial variations in flux/power distributions within fuel pins and strong absorbers including partially inserted control rods and burnable absorbers including IFBA (integral fuel burnable absorber) coatings, and accounting for multiphysics feedback. Several alternative paths are being pursued to accomplish this goal with deterministic transport methods, including (1) Sn with embedded MOC, (2) 2D/1D transport, which is planar MOC with axial diffusion, (3) 3D MOC, and (4) unstructured mesh Sn. The principal investigators (PIs) for the PRT project include Dmitriy Anistratov (NCSU), Tom Downar (UM), Tom Evans (ORNL), Ed Larsen (UM), Bill Martin (UM), and Max Rosa (LANL). There are a number of technical staff and graduate students at the partner institutions who are actively involved with these projects, as well as the MCH and SUP projects described below, but only the PIs are mentioned in this brief article.
- Monte Carlo and hybrid transport (MCH)* – The primary long-term objective for the MCH project is to develop an efficient Monte Carlo capability for VERA that will allow full-core, pin-resolved transport analysis with hybrid Monte Carlo methods, consisting of conventional Monte Carlo accelerated with deterministic transport. MCH also includes improvement of conventional Monte Carlo methods. An example is data decomposition which involves dynamically grabbing data for

a domain when the neutron enters it and releasing it when the neutron leaves the domain. An alternative to domain decomposition, this approach may be substantially slower than domain decomposition for current day computers but may scale to an arbitrary number of processors. For hybrid Monte Carlo, there are two distinct approaches being pursued. The FW-CADIS (forward weighted consistent adjoint driven importance sampling) method uses deterministic transport to determine weight windows and source biasing parameters that bias the Monte Carlo solution and reduce its variance, resulting in substantial reductions in the number of histories to achieve the same statistical error. The second approach consists of "low-order, high-order" methods that use an exact low-order operator (e.g., transport-informed diffusion) to accelerate a high order operator, in this case Monte Carlo. The CMFD (coarse mesh finite difference) method and the FMC (functional Monte Carlo) are specific examples of this approach. It is believed that efficient simulation of realistic full-core configurations with acceptable statistics will require substantial improvements in Monte Carlo performance and both the FW-CADIS and the CMFD-FMC approaches are promising candidates to achieve this, possibly in concert. The principal investigators for the MCH project include Tom Evans (ORNL), Benoit Forget (MIT), Ed Larsen (UM), Bill Martin (UM), and John Wagner (ORNL).

- Supporting methodologies (SUP)* – The activities in the SUP project provide "infrastructure" support to the PRT and MCH projects such as cross section library generation using ENDF-VII, development of improved solvers for multiphysics coupling to neutronics, an alternative energy condensation scheme to replace conventional multigroup methods, development of methods for time-dependent full-core transport, and improved resonance absorption models, including an alternative to the subgroup method. The principal investigators for the SUP project include Tom Evans (ORNL), Benoit Forget (MIT), Tim Kelley (NCSU), John Lee (UM), Bill Martin (UM), and Mark Williams (ORNL).

This brief article was focused on activities in RTM. However, many of the activities underway in the other focus areas may be of interest to the RPD membership. Additional information on the

CASL initiative can be found at the following URLs:

- <http://www.casl.gov>
- <http://www.ne.doe.gov/AdvModelingSimulation/casl.html>

### **PHYSOR 2012: Topical Meeting Overview**

By Ron Ellis (Technical Program Chair)  
([ellisrj@ornl.gov](mailto:ellisrj@ornl.gov))



The ANS Topical Meeting on Advances in Reactor Physics (PHYSOR 2012) was held in Knoxville, TN, from April 15 to 20, at the Knoxville Convention Center. The theme of PHYSOR 2012 was “Linking Research, Industry, and Education.” The webpage for PHYSOR 2012 is located at <http://physor2012.org>, and RPD members are encouraged to visit the site.

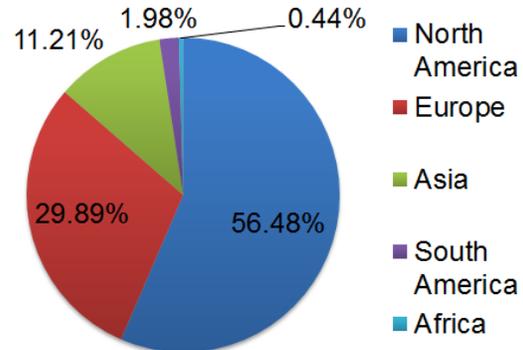
A total of 445 papers were submitted into the PHYSOR 2012 review process. Ultimately, there were 375 papers accepted for PHYSOR 2012 and presented in the technical program in the technical sessions, poster session, and as panel session presentations. The papers were submitted to 16 topical tracks and two special sessions:

- 1 - Core Analysis Methods
- 2 - Deterministic Transport Theory
- 3 - Monte Carlo Methods & Developments
- 4 - Reactor Concepts & Designs
- 5 - Education in Reactor Physics
- 6 - Reactor Operation & Safety
- 7 - Fuel Cycle & Actinide Management
- 8 - Advanced Modeling & Simulation in Reactor Physics
- 9 - Research Reactors & Spallation Sources
- 10 - Nuclear Criticality Safety
- 11 - Nuclear Data
- 12 - Sensitivity & Uncertainty Analysis
- 13 - Fuel, Material, Mechanical Analysis & Behavior
- 14 - Reactor Transient & Safety Analysis
- 15 - Experimental Facilities & Experiments
- 16 - Radiation Applications & Nuclear Safeguards
- SS1 - Special Session in honor of Nils Göran Sjöstrand
- SS2 - Radiation Transport Methods for Whole Reactor Core Analysis

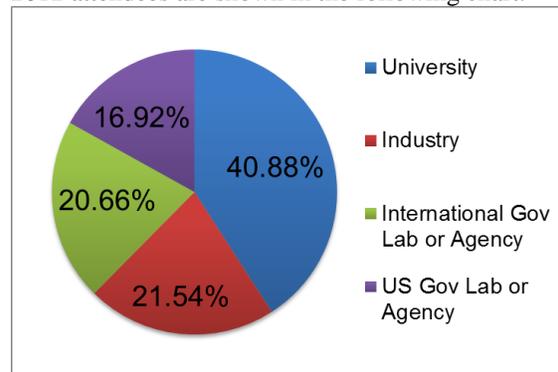
The technical program at PHYSOR 2012 included 65 oral sessions (including two technical panels) organized in five parallel tracks; there was also a wine and cheese poster session.

For the technical program committee paper review, a total of about 150 experienced and knowledgeable volunteers worldwide helped as reviewers. There were approximately 110 session chairs and session co-chairs who volunteered.

There were a total of 491 participants in PHYSOR 2012. We were pleased that there was an unprecedented large participation (about 140) by students, including many from outside of the U.S. About half of the students and other participants at PHYSOR 2012 were from outside of the U.S., as seen below.



Some additional demographics of the PHYSOR 2012 attendees are shown in the following chart.



These pie charts were prepared by Trent Primm, Financial Chair for PHYSOR 2012. Many photographs taken primarily by Hanna Shapira and Blair Bromley, are featured on the website.

Below, a selection of PHYSOR 2012 photographs is presented.



During one of the planning meetings for the PHYSOR 2012 Technical Program.



During the PHYSOR 2012 Opening Plenary Session



Rakesh and Ron during break in the Sessions



At the Welcoming Reception



Arriving at the Evening Event at the Women's Basketball Hall of Fame (WBHOF) in Knoxville..



During the PHYSOR 2012 Banquet



At the WBHOF Reception



At the ORNL Booth at PHYSOR 2012



During the popular Poster Session



At the Sunsphere Evening Event



At the Sunsphere Evening Event



At the WBHOF reception



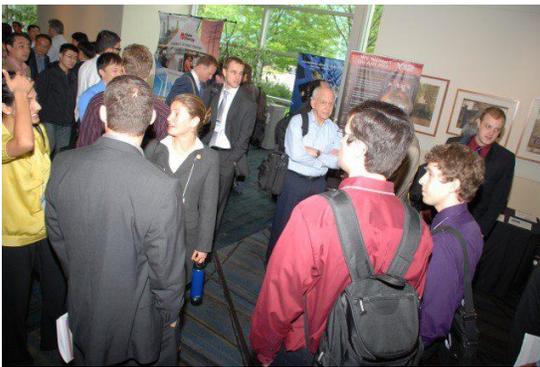
At the Wine & Cheese Poster Session



At one of the Technical Sessions



At the Wine & Cheese Poster Session



During a break in the Technical Sessions.



At the WBHOF Evening Event



At the WBHOF Evening Reception



At Sunsphere Gala Event, during PHYSOR 2012



PHYSOR 2012 Technical Tour at the HFIR, at ORNL



PHYSOR 2012 Technical Tour of CASL, at ORNL

**EBR-I: 60 years since first time production of useful nuclear electricity in December 1951**

*By Mark DeHart  
(mark.dehart@inl.gov)*

The nuclear industry celebrated a historical milestone this December. Sixty years ago, at 1:50 pm on Dec. 20, 1951, the Experimental Breeder Reactor-I (EBR-I) produced useful electricity for the first time. EBR-I lit four light bulbs to demonstrate the first usable amount of electricity from nuclear energy.

It was barely enough to power a simple string of four 100-watt light bulbs, but the 16 scientists and engineers recorded their historic achievement by chalking their names on the wall beside the generator.

Housed in a small building that today still sits alone on a wind-swept plain in southeastern Idaho, EBR-I spawned a huge international industry that now plays a major role in meeting the world's energy needs.

During its 15-year career, EBR-I was the site of many historical firsts, and retired scientist Kirby Whitham was an integral part of several of them. On that raw December day in 1951, scientists and technicians readied for the first test of the power-generating system. "We got the reactor critical, which was a rather slow process," Whitham said. "Generating steam for the first time was a problem, because we hadn't done it before. Technicians were running everywhere, measuring temperatures and so on.

"It took quite a while to get the turbine up to speed, then we had to load the generator. The generator put out 440 volts, so we used four light bulbs wired in series." When the bulbs lit up, "we didn't clap our hands or anything," Whitham said. "We were just glad it worked. There was lots of work to do - checking oil pressures and other things we weren't used to doing." After that, except for normal shutdown to perform maintenance or to attend to experiments, EBR-I provided all its own electricity throughout its operating career.

EBR-I provided the first proof that breeding is possible: On June 4, 1953, the U.S. Atomic Energy Commission announced that EBR-I had become the world's first reactor to demonstrate the breeding of plutonium from uranium.

In 1962, EBR-I became the world's first reactor to produce electricity with a plutonium core. For the next year, the reactor provided valuable data on breeding in a plutonium-fueled reactor and helped to improve scientists' understanding of the behavior of plutonium in an operating reactor.

On Dec. 30, 1963, its scientific mission complete, EBR-I was officially shut down. On Aug. 26, 1966, President Lyndon B. Johnson presided over ceremonies that designated the retired reactor a Registered Historical National Monument. Before 15,000 witnesses, he said, "We have come to a place today where hope was born that man would do more with his discovery (of atomic fission) than unleash destruction in its wake."

### **JBC Benchmark Workshop**

*By Glenn Sjoden  
([sjoden@gatech.edu](mailto:sjoden@gatech.edu))*

As you know, we held a "RPD/RPSD/Member-Sponsored JBC Benchmark Workshop" of which the RPD was a major sponsor. This was attended by key individuals from RPD, RPSD, and MCD and followed with valuable input regarding how to advertise and document a consolidated list of current, well established benchmarks for use in computations for code benchmarking, etc. Good progress was made at the workshop, held Saturday, October 29, 2011, 6:00 PM - 9:00 PM, Omni East Parlor # 215, Washington DC.

This workshop was a new focus activity for the JBC, and participants discussed better ways to facilitate use of existing evaluated criticality safety ([icsbep.inl.gov](http://icsbep.inl.gov))\*\*, evaluated reactor physics benchmark experiments ([irpheap.inl.gov](http://irpheap.inl.gov))\*\*, and SINBAD benchmarks, as well as other benchmarks that have proven useful in a wide variety of applications. Also discussed was a plan to increase awareness regarding these existing benchmarks and their utility in code/benchmark applications, and assess their potential for use in current/forward leaning research using web resources. Glenn Sjoden from Georgia Tech will be following up with a report and new work on a website (with the assistance of RSIC and

Bernadette Kirk and members of the JBC) to establish links to world-wide benchmarks. We thank the sponsors for their valuable support of this activity: Reactor Physics Division, Radiation Protection & Shielding Division, Dr Barry Ganapol.

### **Program Committee News**

*By Fausto Franceschini  
([francef@westinghouse.com](mailto:francef@westinghouse.com))*

#### ***New Chair for RPD Program Committee***

Dear RPD membership, my three-year tenure as RPD PC Chair will conclude in June 2012. As it is now time for me to step aside, I am thrilled to announce that Alexander Stanculescu will succeed me at the PC Chairmanship starting June 2012. Dr Stanculescu is the Director of the Nuclear Science and Engineering Division at the Idaho National Laboratory, a position of great prestige obtained after his brilliant tenure at the International Atomic Energy Agency as the Head of the Fast Reactor section.

Dr. Stanculescu, a renowned and extremely accomplished member of the scientific community, will certainly greatly enrich RPD and ANS in general. The breadth of his expertise, his worldwide reputation and the grace he is endowed with will make it possible for our Division to reach out top-notch researchers worldwide and build bridges between established and emerging realities in the nuclear scene. It is truly a great pleasure to me to leave the PC Chairmanship in such capable hands.

Please join me in welcoming Dr. Stanculescu to the leadership of our Technical Program and in offering him all the support that he may need in his new role.

I would also like to remark what great honor and joy has given me to work with all of you during my tenure. I am deeply grateful for your unwavering support and encouragement. I am deeply convinced that whatever accomplishments have been made, I owe them to you: the authors, the reviewers, the members of the committee, the session organizers, the chairs, and the friends. Your dedication, professionalism and generosity have not gone unnoticed and will not be forgotten.

I am also grateful to ANS and to the Chairs of the other Divisions for their patience and kindness

during many meetings and paper reviews. I would also like to acknowledge the support of my Company throughout my tenure, with the many trips and much time consuming (but fully rewarding) activities that it demands.

I am finally profoundly indebted to Prof. Bojan Petrovic, my predecessor at the Chairmanship of the PC. The opportunity he gave me represented a stepping stone in my professional and personal development.

#### ***RPD Best Paper Awards: 2011 ANS Annual Meeting and Winter Meeting***

Based on the scores provided during the review process and the presentations at the meeting, the RPD Best Paper Award for the ANS 2011 Annual Meeting (Hollywood, FL) has been awarded ex aequo to the papers:

“A Method for Computing Fixed-Source Driven Subcritical Multiplication using Batch Mode in MCNPX”, by Michael Lorne Fensin, Gregg W. McKinney, Eric Relson, Michael R. James, and

“An Integral Response-Based Concept for Solving the Time-Dependent Transport Equation” by Farzad Rahnama and Justin M. Pounders.

The RPD Best Paper Award for the ANS 2011 Winter Meeting (Washington, D.C.) has been awarded to the paper:

“Assembly Discontinuity Factor for Angular Flux in Transport Calculation”, by Akio Yamamoto and Tomohiro Endo.

Congratulations to the authors of the papers and appreciation to the judges.

#### ***ANS 2011 Winter Meeting, Washington, D.C.***

The 2011 Winter Meeting was held in Washington, D.C. (October 30-November 3, 2011). A total of 46 papers have been accepted and presented in 6 technical sessions.

The three standing RPD sessions featured 27 papers divided among Reactor Physics General I and II– 10 papers, Reactor Analysis Methods (cosponsored with MCD) – 9 papers and Reactor Physics Design, Validation and Operating Experience – 8 papers.

In addition there have been three special sessions with 19 papers overall:

“Model Adaptation and Data Assimilation for Reactor Core Calculations”, organized by Aldo Dall’Osso (AREVA)- 5 papers;

“Current Activities in Reactor Physics Methods Validation Based on Experimental Measurements, organized by Gilles Youinou and Mark DeHart, (INL)- 7 papers;

“Reactor Physics Design and Analysis for Compact Power Systems for Terrestrial and Space Applications”, organized by Blair P. Bromley (AECL), Shannon M. Bragg-Sitton and John D. Bess (INL) from ANST, and Pavel V. Tsvetkov (Texas A&M) - 7 papers.

RPD has also co-organized a tutorial with RPSD on VESTA, a Monte-Carlo depletion interface code. The tutorial has been conducted by Wim Haeck from IRSN (France), who is the main developer of VESTA. VESTA 2.0.3 is now available at RSICC.

Thanks to the reviewers, the special session organizers, the chairs and Wim Haeck for their excellent contributions.

#### ***ANS 2012 Annual Meeting, Chicago, IL.***

For the 2012 Annual Meeting (Chicago, June 24-28 2012), RPD organized the special sessions and panel listed below, in addition to the standing sessions Reactor Physics General, Reactor Analysis Methods and Reactor Physics Design, Validation and Operating Experience.

#### **RPD Special sessions for the 2012 ANS Annual Meeting**

*Initial Experience with ENDF/B-VII.1.* Version VII.1 of the United States’ Evaluated Nuclear Data File (ENDF/B-VII.1) is scheduled for public release at the end of 2011, following an extensive verification and validation effort by members of the Cross Section Evaluation Working Group (CSEWG). This is the first upgrade to the ENDF database since ENDF/B-VII.0 was released in 2006. In addition to dozens of new and revised neutron cross section evaluated file revisions, a significant component of the new release in the inclusion of covariance data for more than 100 of the 418 evaluations. Papers describing the content of the revised file, the processing of these data into multi-group and continuous energy application libraries or sensitivity files, and the performance

of the resulting calculations with these new evaluations were solicited for the special session. These papers were of general interest to the broader technical community.

*Organizers:* Albert (Skip) C. Kahler (LANL), Richard D. McKnight (ANL)

*ENDF/B-VII.1: Data Measurements, Evaluation and Processing.* A new release of the US nuclear data library, Evaluated Nuclear Data Library version VII release 1 (ENDF/B-VII.1) is available from the National Nuclear Data Center at the Brookhaven National Laboratory. The intent of the proposed ANS session was to gather abstracts describing the updates that motivated the development of the ENDF/B-VII.1. Papers addressing issues on the processing of the new released library were also solicited. Authors contributed papers on nuclear data measurements, evaluations and processing that led to the new ENDF release.

*Organizers:* Luiz Leal (ORNL), Mike Herman (BNL)

*Experiences and Challenges in RERTR Core Redesign.* In 1978, the international community established the Reduced Enrichment for Research and Test Reactors (RERTR) program. Its mission was to develop technology necessary to enable the conversion of civilian facilities using high enriched uranium (HEU) to low enriched uranium (LEU) fuels and targets with a U-235 enrichment of less than 20%. To date, over 40 research reactors have been converted from HEU to LEU fuels. However, a significant number of reactors remain to be converted, pending completion of fuel type testing. Validation of new analysis methods for updated designs remains a key issue; new fuel designs introduce new uncertainties that must be addressed in core modeling methods. Hence, this session was developed to provide a forum for exchange of information related to RERTR core redesign. We solicited papers describing experiences from facilities that have completed the conversion process together with papers describing technical challenges for cores that have not yet been converted. We remain interested in all aspects of core physics, including kinetics analysis and improved thermal/hydraulic modeling requirements needed to address changes in fuel element design and core power distributions.

*Organizers:* Mark DeHart and Sean Morrell (INL)

*Research Applications of Neutron Spectrometry and Dosimetry.* This special session featured the broader medical, industrial, environmental and other pertinent applications of experimental neutron spectrometry in the context of research and test reactors and accelerator neutron sources, in addition to traditional power plant applications. Papers illustrating the use of modern least-squares and other spectral deconvolution methods in conjunction with current advanced computational neutron transport methods were of particular interest. Co-organized with RPSD.

*Organizers:* David W. Nigg (INL) and F. Arzu Alpan Karacan (Westinghouse)

*Panel: Current Issues in LWR Core Design and Reactor Engineering Support.*

*Organizers:* David Orr (Duke Energy) and Moussa Mahgerefteh (Exelon)

#### ***ANS 2012 Winter Meeting, San Diego, CA***

Thank you to those who considered submitting papers to one of the RPD sessions for the upcoming ANS 2012 Winter Meeting, which will be held in San Diego in November 11-15, 2012.

In addition to the RPD standing sessions, RPD also organized the following special sessions.

*In Honor of John Rowlands.* John Rowlands passed away on September 9, 2011. John has been an outstanding reactor physicist and his research work, achievements and leadership have been crucial in addressing and solving a number of the most challenging issues of reactor physics. He had a unique deep understanding of both experimental and theoretical approaches and of their interplay in the process of developing and validating new reactor physics methods. Moreover, his vision and seminal scientific contributions have been essential in establishing a robust link between reactor physics and applied nuclear physics that has become a key element in the development of modern nuclear data files. John has been a true mentor of more than one generation of reactor physicists in Europe and has inspired young scientists all over the world. The intent of this session was to honor John's memory giving the opportunity to re-examine the value, impact and perspective of his work in areas as diverse as heterogeneity and self shielding effects, control rod reactivity assessment methods, low density region treatment, neutron thermalization and solid state effects, nuclear data assimilation techniques,

nuclear data requirements and their justification, clean integral experiments, etc. A number of prestigious physicists that have known and have worked together with John were invited, to provide to the audience a critical review of the most important contributions of John Rowlands, together with some younger researchers still developing his ideas within new simulation tools. *Organizers: Massimo Salvatores (CEA) and Giuseppe Palmiotti (INL)*

*(The following, for the interest of RPD members, is a listing of the interesting papers to be presented in the special session in honor of John Rowlands. – Ron Ellis.)*

**“I WONDER IF ...” SPECIAL SESSION  
IN HONOR OF JOHN ROWLANDS,  
ANS Winter Meeting 2012, Town and Country  
Resort in San Diego  
Windsor Room – Wednesday November 14  
starting at 1 PM**  
sponsored by RPD  
*Session Organizers: Massimo  
Salvatores (CEA), Giuseppe Palmiotti (INL)*  
*Chair: Massimo Salvatores*

#### **WINDSOR**

##### **1:00 P.M.**

Reactor Physics Development from the Early Sixties to Yesterday: John Rowlands Contribution, J. Bouchard, M. Salvatores (*CEA France*)

##### **1:20 P.M.**

John Rowlands' Contribution to the Development of Nuclear Science and Engineering, Phillip J. Finck, David J. Hill (*INL*)

##### **1:40 P.M.**

The Ongoing Impact of the U.S. Fast Reactor Integral Experiments Program, John D. Bess (*INL*), Michael A. Pope (*Battelle Energy Alliance*), Harold F. McFarlane (*INL*)

##### **2:00 P.M.**

John Rowlands and the “Journey” to the Roots of Transport Equation Solvers, R. Dagan (*KIT Germany*)

##### **2:20 P.M.**

On Perturbation Components Correspondence Between Diffusion and Transport, G. Palmiotti (*INL*)

##### **2:40 P.M.**

Improvement of Reactivity Temperature Coefficient Calculation. Contribution of John Rowlands, A. Santamarina (*CEA*)

##### **3:00 P.M.**

I Wonder If the CADENZA Assemblies Can Resolve Pin-Plate Discrepancies, Richard D. McKnight (*ANL*)

##### **3:20 P.M.**

John L. Rowlands Contributions to Reactor Physics, G. Rimpault (*CEA, Cadarache*)

##### **3:40 P.M.**

Memories of John Rowlands and an Overview of His Contribution to the UK Reactor Programme, Jim Gulliford (*OECD/NEA*)

*Physics Issues for Small, Compact Reactors.* The purpose of this session was to discuss technical issues and progress in the physics design and analysis of small, compact reactors. This included validation of physics codes, improvements for nuclear data for special isotopes and elements used in small reactors, and evaluation of reactivity coefficients, burnup, and power distributions under normal and abnormal operating conditions. This session is of relevance to researchers working on Small Modular Reactors (SMRs), and reactors for space power and propulsion applications. This technical session is also of interest to the following ANS divisions: Mathematics and Computation, Radiation Protection and Shielding, Operations and Power, Nuclear Criticality Safety, and Fuel Cycle and Waste Management. *Organizers: Blair Bromley (AECL) and Shannon Bragg-Sitton from ANST.*

*IAEA Reactor Physics and Technology Development Activities.* This Special Session assembles contributions from IAEA staff and representatives from Member States that participate in IAEA sponsored activities. In particular, contributions from a range of areas, including the following, were sought: Nuclear Data, Research Reactors (including the Reduced Enrichment for Research and Test Reactors (RERTR) program), advanced reactor and fuel cycle technology development, and, possibly, accelerator applications. The technical papers describe results obtained by IAEA Coordinated Research Projects (CRPs) performed jointly by a group of interested IAEA Member States. In some cases, the papers also touch upon information exchange and/or training and educational activities sponsored by the IAEA in areas pertinent to the Special Session's scope. *Organizers: Alexander Stanculescu (INL) and Pablo Adelfang (IAEA).*

*Hybrid Monte Carlo Deterministic Methods for Reactor Analysis.* This session features research focused on improving Monte Carlo (MC) reactor analysis capabilities through the combined use of deterministic and MC methods, referred to as "hybrid" transport methods. MC allows explicit geometric modeling and continuous-energy physics representation, and thus is playing an ever-increasing role in reactor analyses. However, due to its stochastic nature and computational requirements, the role of MC is currently limited to benchmarking deterministic-based results. The accuracy of MC and success of previous work on hybrid methods for fixed-source applications motivate research in this area. Papers describing hybrid methods for variance reduction, improved source convergence, improved statistical reliability, and improved parallel utilization, are of particular interest.

*Organizers:* John C. Wagner (ORNL) and Hany Abdel-Khalik (NCSU)

#### **The Request for Proposal for PHYSOR 2014:**

The first Request for Proposal (RFP) to host the next PHYSOR topical meetings was broadcasted in July 2011. Three interested organizations made a formal presentation at the Reactor Physics Program Committee meeting which was held on Sunday, June 24, in Chicago within the 2012 ANS Annual Meeting.

All three proposals were well-received, and after a very close vote, the next PHYSOR will be held in Kyoto, Japan, in 2014.

#### ***Involvement with RPD activities:***

**The success of our division is due to the active involvement of its members.** I would like to encourage you to contribute by submitting technical papers, organizing special sessions, reviewing papers, chairing sessions, and as members of the Program Committee and RPD governance in general. Those who would like to increase their involvement with RPD or would like to know more about its activities, are welcome to contact me at as well as the next Chair Alexander Stanculescu:

[FranceF@westinghouse.com](mailto:FranceF@westinghouse.com)  
[Alexander.Stanculescu@inl.gov](mailto:Alexander.Stanculescu@inl.gov).

Everybody is welcome to attend the next Program Committee meeting that will be held on Sunday June 24 at 2 PM at the 2012 ANS Annual Meeting

conference hotel. Please consult the last pages of the final program to confirm room and time of the meeting.

Finally, we are open to any suggestion you may have to improve our Division. Please do not hesitate to communicate your ideas.

#### **Reactor Physics Standards**

*By Dimitrios Cockinos*  
([cockinos@bnl.gov](mailto:cockinos@bnl.gov))

The principal activities of the members of the Standards for Reactor Design Committee, ANS-19, have been in the areas of review, revision and updates for the existing standards and in the development for the new, proposed standards. A brief summary of activities in each of the currently on-going projects is given below.

***ANS-19.1 - Nuclear Data Sets for Reactor Design Calculations.*** Work continues on the revision and expansion of the standard. The revised version reflects the latest national and international developments in nuclear data sets. A draft is expected in the near future.

***ANS-19.3-"Steady State Neutronics Methods for Power Reactor Analysis".*** The revision of this standard has been completed, approved and is now in circulation as an ANSI/ANS-19.3 American National Standard.

***ANS-19.6.1- "Reload Startup Physics Tests For PWRs".*** Comments received have been addressed and the standard is on its way to publication.

***ANS 19.11 - "Calculation and Measurement of the Moderator Temperature Coefficient of Reactivity for Pressurized Water Reactors".*** This revised standard awaits approval by the members of ANS-19.

***ANS 5.1 - "Decay Heat Power in LWRs".*** Progress continues on the revision of this standard. A draft to be circulated among the members of the Working Group is expected in the near future.

***ANS-19.9 - "Delayed Neutron Parameters for LWRs".*** This proposed standard is in the process of development.

***International Standards.*** As reported earlier, a group of ANSI/ANS-19 standards, including the Decay Heat standard, ANS-5.1 had been

submitted for possible adoption by the International Standards Organization (ISO), as ISO standards. These standards had to be resubmitted in order to secure a speedier approval process. At a meeting held in Washington on November 3 and 4, 2011, preliminary work proposals were thus submitted for the following standards: ANSI/ANS-19.1, ANI/ANS-19.3, ANI/ANS-19.6.1, ANS-19-12 and ANS-5.1.

### **CALL FOR VOLUNTEERS**

ANS-19 is seeking qualified people to work on the revision of the following standards:

**ANS-19.3.4 – Determination of the Thermal Energy Deposition Rates in Nuclear Reactors.** Required knowledge: Atomic Physics, Nuclear Physics and Reactor Physics

**ANS-19.4 - Reference Power Reactor Physics Measurements for Nuclear Analysis Verification.** Required experience: 3D power reactor simulation, analysis and methodology benchmarking; core follow calculations; measured power data, code verification and validation

**ANS-19.5 – Requirements for Reference Reactor Physics Measurements.** Individuals are needed to work on identifying and documenting high quality measured data obtained from critical and subcritical experiments carried out at various institutions to date.

### **Honors & Awards**

*By Dimitrios Cockinos*  
([cockinos@bnl.gov](mailto:cockinos@bnl.gov))

#### **ANS FELLOW AWARD**

RPD members are invited to nominate candidates worthy of elevation to the ANS Fellow status. Candidates must be ANS members for at least the past five years. Five sponsors, geographically dispersed, are needed to submit letters of recommendation for their candidate, with one sponsor being the principal nominator. Selection of new ANS Fellows is made twice a year. More details can be found at the [ans.org](http://ans.org) web site.

#### **NEW YOUNG ENGINEER AWARD ESTABLISHED**

A new Reactor Physics divisional award entitled “Early Reactor Physicist Award has been established. This yearly award is intended to recognize the technical achievements of a younger

RPD member. Details of this award will soon appear on the web site.

#### **EUGENE P. WIGNER REACTOR PHYSICIST AWARD**

Nominations are invited for candidates for the prestigious Wigner Award. This award, in its 21st year of its existence, has been established in 1990 with Professor Wigner being the inaugural recipient, to recognize significant individual contributions to the field of reactor physics. Three letters of recommendation by individuals familiar with the achievements of their candidate must be submitted. The candidate need not be an ANS member or even a U.S. citizen. Details for this yearly, whenever possible, award may be found at the ANS web site, [ans.org](http://ans.org). Deadline for submission of nominations is April 1st.

#### **2011 WIGNER AWARD WINNER**

As announced during the June 2011 ANS Annual Meeting in Florida, Emeritus Professor Nils Goran Sjostrand of Chalmers University Technology in Goteborg, Sweden, was selected the winner of the 2011 Wigner Award for his pioneering work in the 1950’s and 1960’s with pulsed neutron sources and the theoretical prediction of the diffusion cooling effect among other achievements.

A well-planned award ceremony and formal dinner took place at the House of Chalmers in Goteborg, where the Chair of the RPD Honors and Awards Committee presented the Wigner plaque to Prof. Sjostrand.

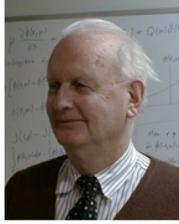
During PHYSOR 2012 in Knoxville, TN, this past April, a special session was organized and successfully held. The session was chaired by Imre Pazsit, Dimitrios Cockinos, and Piero Ravetto. It was well-attended and, in addition to a presentation on Prof sjostrand’s life, career, and scientific discoveries, a presentation was given about the Wigner Prize Ceremony, and a select group of papers was presented, all of which were based on Prof Sjostrand’s scientific career.

The following excerpt is from an article and associated photographs, from Chalmers University, commemorating Prof Sjostrand at the Wigner Dinner and Prize Ceremony.

## FIRST CHALMERS PROFESSOR AWARDED FOR OUTSTANDING CONTRIBUTIONS

2011-11-24 av Christophe Eléhn

For his outstanding and groundbreaking achievements in reactor physics and reactor theory, Nils Göran Sjöstrand received 2011 Eugene P. Wigner Reactor Physics Award.



Nils Göran Sjöstrand, one of the founders of the predecessor of the division of Nuclear Engineering, received the ANS Wigner Prize for his seminal and pioneering contributions in reactor and neutron physics. Maybe his most contributory establishments are (i) the area ration method of pulsed reactivity measurements (Sjöstrand method) and for (ii) the theoretical prediction of diffusion cooling phenomenon. Nils Göran was also the division of Nuclear Engineering's first professor.

ANS Wigner Award was established in the 1990 by the Reactor Physics Division to honor individuals who have made outstanding contributions to the advancement of the field of reactor physics. Nils Göran, unquestionably, met the criteria. To his nomination for the award, ANS (American Nuclear Society) received nominations from three sponsors, all being ANS Fellows, and two of them former recipients of the prize. Four additional informal letters - which two were written by another ANS Fellow and a Wigner Prize winner - were also submitted, supporting Nils Göran as a nominee. The sponsoring and letters of recommendation came from three continents, showing world-wide recognition of Nils Göran's achievements.

"It is with great pleasure that I am writing to you to officially inform you that you have been selected as the 2011 winner of the 'Eugene P. Wigner Reactor Physicist' award. Please accept my warmest congratulations. Your contributions to the field of reactor physics have been truly outstanding and your selections of this year's winner lends additional prestige to the Wigner award", - Dimitrios Cokinos, Chairman of ANS.

Those words were written in the official letter to Nils Göran as 2011's Wigner award winner. Those were also the words Dimitrios Cokinos embedded in his speech to Nils Göran at the price ceremony.



Nils Göran Sjöstrand with guests

The atmosphere at the price ceremony at House of Chalmers was intimate and warm when Nils Göran's family, friends and colleagues were gathered in his honor. Several speakers held honoring speeches about their relation to Nils Göran and his work. The speeches consisted only of beloved words, describing everything from places to laboratory research with such details that even an outsider could understand how much he meant to his friends.

The price ceremony was followed by a dinner where small talk and stories were combined with longer speeches - a perfect end of an unforgettable evening.



Nils Göran Sjöstrand and Dimitrios Cokinos



Small talk before the price ceremony



Imre Pazsit holds a speech at the dinner.

## 2012 Election Results

The following individuals constitute our new RPD Executive Committee leadership team:

Alireza Haghighat – Chair  
 Mark D. DeHart – Vice-Chair  
 Ronald J. Ellis – Treasurer  
 Pavel V. Tsvetkov – Secretary

The following individuals have been elected to serve in the Executive Committee:

Sandra Dulla  
 David S. Orr  
 Mark Pierson

We thank those members who have recently completed leadership terms in our division:

David Griesheimer  
 Dumitru Serghiuta  
 Glenn Sjoden

**Current 2012-2013 RPD Executive Committee and Program Committee Membership**

*By Ron Ellis  
(ellisrj@ornl.gov)*

The most recent meetings of the RPD EC and PC took place on June 24, 2012, during the ANS 2012 Annual Meeting in Chicago. Below, several photographs with RPD members and some picture memories from Chicago are shown.

Thanks to Blair Bromley, photographs were taken of those that attended the Program Meeting and the Executive Meeting. These pictures are presented on the next page. Tables of the current member rosters of the RPD PC and EC are included at the end of the newsletter.



Blair Bromley (AECL) and Ron Ellis (ORNL) at the ANS 2012 Annual Meeting in Chicago.



Ron Ellis (ORNL) and Maria Okuniewski (INL) at the President's Reception during the ANS 2012 Annual Meeting in Chicago.



Michigan Avenue in Chicago, during the ANS 2012 Annual Meeting.



During the ANS 2012 Annual Meeting in Chicago: Kayaks on the river.

The following pages list the 2012-2013 membership rosters of the Reactor Physics Division Executive Committee and Program Committee, and display photographs of the committee meeting attendees at the recent ANS 2012 Annual Meeting in Chicago.



The Meeting of the ANS Reactor Physics Division Program Committee (June 24, 2012)



Meeting of the ANS Reactor Physics Division Executive Committee (June 24, 2012)

**ANS Reactor Physics Division Executive Committee  
(Effective June 2012)**

**2012-13 Reactor Physics Division Officers**

<b>Chair</b>		<b>Vice Chair/Chair Elect</b>	
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<b>Treasurer</b>		<b>Secretary</b>	
Dr. Ronald J. Ellis Oak Ridge National Laboratory Reactor and Nuclear Systems Division 1 Bethel Valley Road, PO Box 2008 Oak Ridge, TN 37831 Phone: (865) 574-6107; Fax (865) 574-9619 Email: ellisrj@ornl.gov		Pavel V. Tsvetkov, Ph.D. Associate Professor Department of Nuclear Engineering Texas A&M University E-mail: tsvetkov@tamu.edu	
<b>Executive Committee</b>			
<b>2013</b>	<b>2014</b>	<b>2015</b>	
Dr Tunc Aldemir Ohio State University E427 Scott Laboratory 201 W 19th Ave Columbus, OH 43210 Phone: (614) 292-4627 Email: aldemir.1@osu.edu	Dr. David W. Nigg Idaho National Laboratory Corporate Fellow, Nuclear Systems Design & Analysis Division PO Box 1625 Idaho Falls, ID 83404 Phone: (208) 526-7627 Email: David.Nigg@inl.gov	Dr. Sandra Dulla Politecnico di Torino, Dipartimento Energia Corso Duca degli Abruzzi, 24 10129 Torino, Italy Phone: (+39) 011 090 4416 Email: sandra.dulla@polito.it	
Mr. Robb Borland Manager, Nuclear Fuel & Analysis FirstEnergy Nuclear Operating Company Phone: (330) 384-2483 Email: rjborland@firstenergycorp.com	Dr. Mohamed Ouisloumen Westinghouse Electric Company 4350 Northern Pike Monroeville, PA 15146, USA Phone: (412) 374-2148 Email: ouislom@westinghouse.com	David S. Orr, PE Duke Energy P.O. Box 1006 Charlotte, NC 28201-1006 Phone: (704) 382-8673 Email: david.orr@duke-energy.com	
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<b>Program</b>		<b>Standard/Honors &amp; Awards</b>	
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Dr. Benoit Forget Massachusetts Institute of Technology 77 Massachusetts Ave. Room 24-214 Cambridge, MA 02139 Phone: (617) 253-1655 Email: bforget@mit.edu		Dr. G. Ivan Maldonado University of Tennessee 311 Pasqua Engineering Knoxville, TN 37996-2300 Phone: (865) 974-7562; FAX: (865) 974-0668 Email: ivan.maldonado@utk.edu	

**ANS Reactor Physics Division Program Committee  
(as of June 2012)**

Chair	Alternate
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2010/2013	2011/2014	2012/2015
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<b>Prof. Piero Ravetto</b> Politecnico di Torino Professor of Nuclear Reactor Physics Dipartimento di Energetica Corso Duca degli Abruzzi, 24 10129 Torino Phone: +39 011 5644443, Fax: +39 011 5644499	<b>Justin Pounders</b> Senior Engineer Bettis Laboratory 814 Lilac Street Pittsburgh, PA 15217 412-476-6760 jmpounders@gmail.com	
<b>Dr. Cristian Rabiti</b> Idaho National Laboratory Group Leader Advanced Nuclear Method Development & Validation Phone: 1 208 526 6821 Fax: 1 208 526 2930 P.O. BOX 1625 MS 3870 Email: cristian.rabiti@inl.gov	<b>Dr. Baocheng Zang</b> Principal Engineer, Functional Lead Westinghouse Electric Co. 1000 Westinghouse Drive, CWHQ-4 Suite 452 +1 412-374-3858 ZhangB@westinghouse.com	
<b>Dr. A. C. (Skip) Kahler</b> Los Alamos National Laboratory T-2, Nuclear and Particle Physics, Building 200, Room 215 P.O.Box 1663, MS B214 Los Alamos, NM 87545 Phone 1-505-606-2042 (office) Email: akahler@lanl.gov	<b>Dr. Javier Ortensi</b> Scientist, Nuclear Science and Engineering Division Idaho National Laboratory Idaho Falls, ID 8341-3870 Phone: (208)526-4256 Javier.Ortensi@inl.gov	

(Continued on next page)

## ANS Reactor Physics Division Program Committee (continued)

2010/2013	2011/2014	2012/2015
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<p><b>Dr. Won Sik Yang</b> Nuclear System Analysis Department Reactor &amp; Fuel Cycle Analysis Section Argonne National Laboratory 9700 South Cass Ave. Argonne, IL 60439-4814, Phone:+1 630-252-9747 Fax: +1 630-252-4500 Email: wyang@anl.gov</p>		