AMERICAN NUCLEAR SOCIETY
MATHEMATICS AND COMPUTATION DIVISION

Message from the Chair

Dear MCD Members,

I hope this newsletter finds you in good spirits, both personally and professionally. **I am happy to report that the Mathematics and Computation Division (MCD) is strong.** I expect that MCD will experience some rather uncommon growth in the next few years. This growth will be driven by the exploding state of computing in the world and by the American Nuclear Society's changes in its direction over the coming year. MCD will remain strong in its core areas, such as transport methods. But, new members from other areas of the world's ubiquitous computing/analytics will join our division, affecting our core, benefitting from our core, and extending our core. (Along those lines, I can only assume that some nuclear engineer has since fixed the absurd instability in my 2006 SUV's "Miles Remaining" algorithm.) Sometimes that growth won't be aligned with our well-established policies and traditions, and it may not be easy, but, in the end, our core will grow and improve.

The MC2013 Topical Meeting (mc2013.org) was a resounding success with attendees from all over the world. Huge kudos to Bill Martin, Rich Martineau, Teri Ehresman, Hans Gougar, Ron Ellis, and the Idaho Local Section. The methods research presented was just as exciting as ever, but now it is impressively realistic. Large-scale software efforts are growing rapidly, balancing capability and accuracy; and single physics is yielding to multi-physics. Each plenary speaker was captivating. Uncertainty quantification, which MCD intentionally decided to "own" a few years ago, is integrating with existing methods and efforts. Prof. Kord Smith wanted to show nuclear engineers that their careers aren't limited to nuclear reactors, so he invited banquet speaker Rick Lawrence from IBM, who started in neutron transport theory at Argonne before moving to machine learning. Dr. Lawrence talked about the *Jeopardy!* computer, Watson, and myriad mind-blowing projects based on "big data" and "human sensors."

Administratively, this year we have submitted to ANS our final version of the MCD Bylaws and Rules, we have a first cut at a public-relations poster requested by past ANS President Eric Loewen (the "Loewen Initiative"), we have stood up our new website on the ANS servers, and you're receiving this newsletter before the national meeting. "Thank you" to Prof. Todd Palmer and Oregon State University for hosting our website for so many years. With the MCD Secretary taking over responsibility for the website, Sec. Jim Donnelly (AMEC) and RPI student Christopher Morrison stood up the new website. Many thanks to Jim and Chris and to Prof. Wei Ji for offering Chris' services.

ANS is asking all Divisions what they are doing for the ANS and the public. I noticed that Wikipedia seems light on certain MCD-related topics, so **I would urge you to find your area of expertise on Wikipedia and, if it's not satisfactory, please consider editing the content.** I expect that you soon will be able to contribute to the ANS online center of nuclear technology.

The best service that ANS provides its members is a forum for collaboration and for sharing and publishing technical research and development. In the spirit of furthering practical service to members, **I offer, at the ANS 2013 Summer Meeting in Atlanta, to provide constructive feedback to anyone who wishes to practice their presentation.** I will solicit other senior MCD members as necessary. Just send me an email or find me at the conference. Of course, anyone at any point in their career should feel welcome to solicit advice and guidance from fellow MCD members. This is what "society" is about. If you have ideas for codifying or exploring other member services, please let me or incoming Chair Tom Evans know. Is navigating the legalities of software distribution something that ANS could help with?

I look forward to seeing you in Atlanta, and I hope you're getting ready to celebrate the 75th anniversary of the discovery of fission at the Winter Meeting. It's been a pleasure serving as MCD Chair during this 75th year of knowing fission. Thank you, members, for your enthusiasm and great technical work; retiring Executive Committee members Sandra Dulla, Richard Sanchez, and Avneet Sood, retiring TPC Patrick Brantley, and continuing Executive Committee members, officers, TPCs, and committee chairs for your diligence and creativity; and immediate past Chair Prof. Anil Prinja for wise counsel.

Sincerely,
Todd Urbatsch, MCD Chair
XTD-5, Air Force Systems, Los Alamos National Laboratory

ANS Student Travel Support

MCD gives $1000 each year to ANS to support student travel to national meetings. We have received thank-you notes from the following students and student sections:

- Bethany Smith, PhD Student, Vanderbilt University
- Elise Pusateri, RPI
- Several students from the University of Florida Student ANS Section
- Trey Gebhart, PhD Student, Virginia Tech, President VT-ANS
- Natalie Smadi, Texas A&M University

We offer our sincere thanks to Patrick Brantley, who is completing four years of excellent service to the division as the Technical Program Chair (TPC) and Assistant. MCD's TPC and Assistant TPC positions are four-year overlapping, ramp-up/ramp-down terms. Of someone's four-year term, the first year is as Asst. TPC; the second year, they switch roles with the TPC; the third year, a new Asst. TPC starts; the fourth year, they switch. With Patrick's departure from the position, we are pleased to introduce the next Assistant TPC, Prof. Ryan McClarren, Texas A&M University, who is beginning his four-year term.

2013 ANS Annual Meeting

The upcoming 2013 ANS Annual Meeting will be held at the Hyatt Regency in Atlanta, Georgia the week of June 16-20, 2013. MCD will feature a technical program encompassing the three sessions below, so you are encouraged to register for and attend the meeting!

MONDAY, 17 June 2013 p.m. - Current Issues in Computational Methods – Roundtable: "Managing Modeling and Simulation Research and Innovation in an Applications-Driven Environment"

TUESDAY, 18 June 2013 p.m. - Transport and Computational Methods

WEDNESDAY, 19 June 2013 p.m. - Mathematical Modeling, Uncertainty Quantification, and Sensitivity Analysis Methods

2013 ANS Winter Meeting

The 2013 ANS Winter Meeting will be held at the Omni Shoreham in Washington, D.C. the week of November 10-14, 2013. The deadline for the submission of summaries is June 14, 2013. In addition to the standard MCD sessions on Transport Methods, Computational Methods, Mathematical Modeling, and Uncertainty Quantification and Sensitivity Analysis Methods, two special sessions are being organized. We encourage you to contribute your summaries to these sessions.

Jim Warsa, Anil Prinja, and Piero Ravetto are organizing the session "Deterministic and Stochastic Methods for Eigenvalue Computations: A Retrospective and Prospective Look." Computing the eigenvalues of a fissioning system is an important and computationally intensive problem. A variety of numerical solution techniques for the transport and diffusion equations, including both deterministic and stochastic methods, have been developed and implemented since the discovery of the fission process and its subsequent use in civilian and military applications. To commemorate the 75th anniversary of the discovery of fission and to acknowledge its significance to the Mathematics and Computation Division, this special session will consist of presentations that review the success of traditional methods in computing the critical eigenvalues, including inverse iteration and nonlinear fixed-point iteration. Solution techniques will also be presented that have been more recently applied to the calculation of the critical eigenvalues, including Newton-Krylov methods, the nonlinear-Krylov acceleration of fixed-point iteration, and residual-based Monte Carlo methods. Finally, newly developed methods that are gaining popularity or that are on the horizon will be highlighted, such as hybrid-stochastic-deterministic approaches.

Paul Hulse and Keith Searson are organizing the session "Use of CAD in Nuclear Shielding and Criticality Codes". This session is for researchers to submit papers on advances in the automated importing of CAD models into new and existing radiation transport codes, in particular those which have traditionally not been able to work directly with CAD models. The session will cover: (i) methods of enabling the transport codes to work with CAD models, (ii) method validation, (iii) model validation, and (iv) comparisons with existing codes, both for accuracy and performance. The ability to directly work with CAD models is currently being added to many codes which have historically been unable to accept CAD. The intent of this session is to showcase these developments, and promote the acceptance of CAD integration within general-purpose transport codes.

Recent ANS Meetings

The MCD Technical Program at recent ANS Meetings has included a significant number of quality papers presented at each meeting, with 28 papers at the Annual 2012 meeting (Chicago, Illinois) and 32 papers at the Winter 2012 meeting (San Diego, California).

Recent Best Summary+Presentation Awards

We extend our congratulations to the following authors for winning MCD Best Summary+Presentation Awards for their excellent work presented at recent ANS meetings:

- 2012 Annual Meeting (Chicago, IL): Andrea Barbarino, Sandra Dulla, and Piero Ravetto for "On the Evaluation of Ray Effects in Multidimensional and Time-Dependent Transport Problems"
- 2012 Winter Meeting (San Diego, CA): Ryan McClarren and Todd Urbatsch for "An Implicit Monte Carlo Method Based on BDF-2 Time Integration for Simulating Nonlinear Radiative Transfer"

SNA + MC 2013

The Joint International Conference on Supercomputing in Nuclear Applications + Monte Carlo will be held October 27-31, 2013 in Paris, France. Early registration is available through August. Please see the conference website for more information (https://www.sfen.fr/SNA-and-MC-2013).

PHYSOR 2014

The 2014 International Conference on the Physics of Reactors will be held September 28 – October 3, 2014 in Kyoto, Japan. Full papers are due December 20, 2013. Additional information is available on the conference website (http://physor2014.org/).

ANS Student Conference 2013

MCD provided financial support to MIT's Student Conference, held April 4-6, 2013, with over 600 attendees. MCD member, Tim Goorley, from Los Alamos National Laboratory, gave a professional development presentation, "Observations of a Ph.D. Nuclear Engineering First Line Manager."

--- Submitted by Brian Franke, MCD Technical Program Chair

Mathematics & Computation Division – 2013 Election Results

Thomas M. Evans, Chair
Distinguished R&D Staff, Oak Ridge National
Laboratory, Oak Ridge, TN
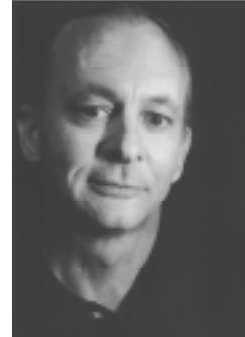
Forrest B. Brown, Vice Chair
Senior R&D Scientist, Monte Carlo Codes Group,
LANL, Los Alamos, NM

James V. Donnelly, Secretary
Principal Consultant – Reactor Physics, AMEC NSS,
Toronto, Ontario, Canada

Dmitriy Y. Anistratov, Treasurer
Associate Professor, North Carolina State University,
Department of Nuclear Engineering, Raleigh, NC

Cassiano R. de Oliveira
Executive Committee
Professor, Chemical and Nuclear
Engineering, University of New
Mexico

Rachel N. Slaybaugh
Executive Committee
Senior Engineer at Bettis Atomic
Power Laboratory, Pittsburgh, PA

Piero Ravetto
Executive Committee
Non-US
Professor of Nuclear Reactor
Physics, Chair of Energy and
Nuclear Engineering Program
(until 2012), Politecnico di Torino,
Dipartimento Energia, Torino,
Italy

Physics Books on the Internet

We are pleased to share that several notable textbooks in the field have recently been made available electronically.

- James Duderstadt and William Martin have made their book "Transport Theory" available through the University of Michigan at: http://hdl.handle.net/2027/mdp.39015040316401
- James Duderstadt and Gregory Moses have made their book "Inertial Confinement Fusion" available through HathiTrust at: http://hdl.handle.net/2027/mdp.39015003993980
- Through the efforts of Paul Romano, Bell and Glasstone's book "Nuclear Reactor Theory" is now available from OSTI at: http://www.osti.gov/bridge/servlets/purl/4074688/NUCLEARREACTORTHEORY.pdf
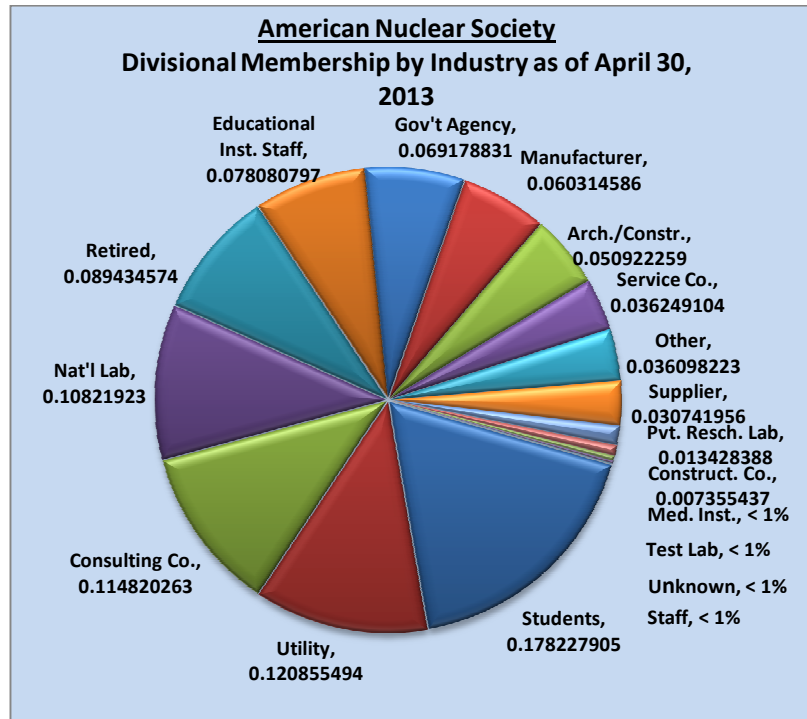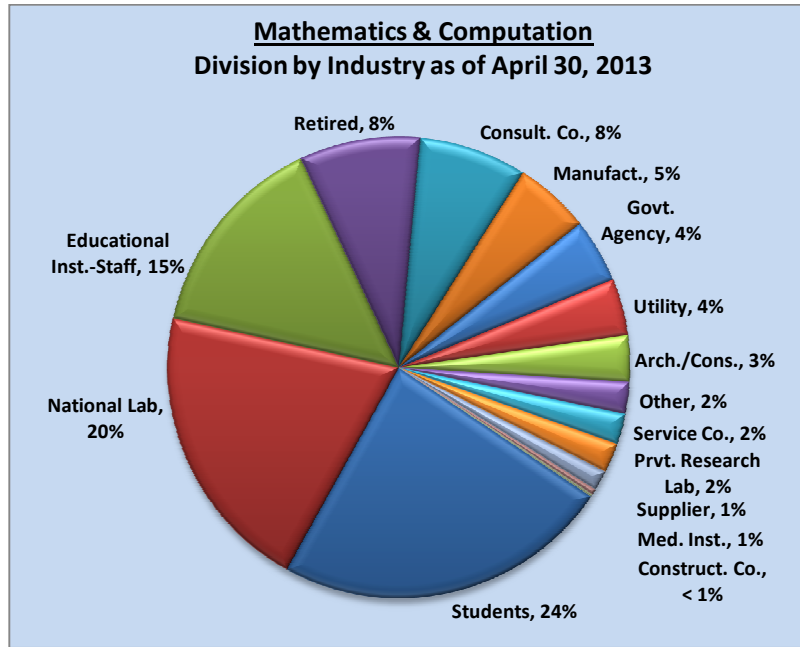
Honors and Awards

The M&C Division established the Gerald C. Pomraning Award 12 years ago in memory of Dr. Pomraning to recognize individuals who have made outstanding contributions toward the advancement of the fields of mathematics and/or computation. Dr. Jack Dorning was selected as the 6th winner of this award in 2013. The award was presented to him at the M&C 2013 conference held in Sun Valley in May 2013 in recognition of his "seminal use of mathematics and computation to advance the understanding of solutions of problems in the areas of reactor core homogenization theory, reactor kinetics, bifurcation theory, nonlinear dynamics, nonlinear plasma waves, and his outstanding technical leadership inspiring high standards of excellence in nuclear science and engineering." As part of the award ceremony, Dr. Dorning was of the luncheon speakers giving a talk on "How Does One Do Large-Scale Numerical Bifurcation Calculations?" at the M&C2013 conference.

Dr. Dorning received his BS in Marine Engineering from the US Merchant Marine Academy and MS and PhD in nuclear engineering from Columbia University. Subsequently, he worked at BNL for 3 years and then joined the University of Illinois serving as an Associate Professor and Professor of nuclear engineering for 14 years. He is currently the Whitney Stone Professor of nuclear science and engineering, Professor of Engineering Physics and Professor of Applied Math at the University of Virginia. Dr. Dorning is the recipient of the DOE's Lawrence Award and is a member of the Academy of Engineering.

--- Submitted by Farzad Rahnema, MCD Awards Chair

Mathematics & Computation
Division by Industry as of April 30, 2013

Retired, 8%
Consult. Co., 8%
Manufact., 5%
Govt. Agency, 4%
Educational Inst.-Staff, 15%
Utility, 4%
Arch./Cons., 3%
Other, 2%
Service Co., 2%
Prvt. Research Lab, 2%
National Lab, 20%
Supplier, 1%
Med. Inst., 1%
Construct. Co., < 1%
Students, 24%

American Nuclear Society
Divisional Membership by Industry as of April 30, 2013

Educational Inst. Staff, 0.078080797
Gov't Agency, 0.069178831
Manufacturer, 0.060314586
Arch./Constr., 0.050922259
Service Co., 0.036249104
Retired, 0.089434574
Other, 0.036098223
Supplier, 0.030741956
Nat'l Lab, 0.10821923
Pvt. Resch. Lab, 0.013428388
Construct. Co., 0.007355437
Med. Inst., < 1%
Consulting Co., 0.114820263
Test Lab, < 1%
Unknown, < 1%
Students, 0.178227905
Staff, < 1%
Utility, 0.120855494

Prepared by Toni Bishop, ANS

2012-2013 ANS MATHEMATICS AND COMPUTATION DIVISION OFFICERS

Chair: Todd Urbatsch (LANL, (505) 667-3513, tmonster@lanl.gov)
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Treasurer   Dimitriy Anistratov (NCSU, (919) 513-4353, anistratov@ncsu.edu)

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2014	Jim Donnelly (AMEC NSS, (416) 592-2398, jim.donnelly@amec.com)
2014	Dimitriy Anistratov (North Carolina State University, (919) 513-4353 anistratov@ncsu.edu)
2013	Todd Urbatsch (Los Alamos National Laboratory, (505) 667-3513 tmonster@lanl.gov)
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2014	Massimiliano Rosa (Los Alamos National Laboratory (505) 667-0869 massimilianorosa@gmail.com)
2015	John Wagner (Oak Ridge National Laboratory, (865) 241-3570 wagnerjc@ornl.gov)
2015	Glenn Sjoden (Georgia Institute of Technology, (404) 894-5733 glenn.sjoden@me.gatech.edu)
2015	Mark Williams (Oak Ridge National Laboratory, (865) 576-5565 williamsml@ornl.gov)

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HONORS & AWARDS:	Farzad Rahnema (Georgia Instit. Of Tech.., farzad.rahnema@nre.gatech.edu)
MEMBERSHIP:	Madeline A. Feltus (USDOE, 301/903-2308, madeline.feltus@hq.doe.gov)
NOMINATING:	Anil K. Prinja (University of New Mexico, (505) 277-4600 prinja@unm.edu)
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STANDARDS:	Andy Smetana (Westinghouse SRC, 803/725-4192, andrew.smetana@srs.gov)
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