ANS Mathematics and Computation Division

A Newsletter of the ANS Mathematics and Computation Division

Spring 2017
mcd.ans.org

MCD Leadership Team

We all thank you for joining MCD and look forward to working with you to build a great community on mathematics and computation. Please don't hesitate to reach out to anyone on the leadership team with suggestions or if you'd like to get involved.

Message from the Chair

Dear MCD Colleagues,

I am pleased to write to you as the Chair of the Mathematics and Computation Division. Modeling and simulation continue to play an important and even growing role in nuclear science and engineering. The research and development activities conducted by members of MCD strengthen the foundation and fidelity of nuclear engineering simulation software. I am motivated by the creative and technically excellent research that MCD members perform and present at our technical sessions and topical meetings.

National ANS President Andy Klein is engaging the entire society in the identification of ANS Nuclear Grand Challenges, technical challenges that need to be addressed by 2030 to enhance the economic, political, and public acceptability of nuclear technologies. MCD actively participated in this effort, receiving over two dozen suggestions for potential Grand Challenges through member participation in various opportunities. The MCD Executive Committee worked through a consolidation, selection, and refinement process to arrive at the three MCD Nuclear Grand Challenges that we submitted for further consideration as national ANS Nuclear Grand Challenges. Ultimately, one of the Grand Challenges submitted by MCD was consolidated with similar submissions to form the basis for one of the national ANS Nuclear Grand Challenges. If you are attending the ANS Annual Meeting in San Francisco, I encourage you to attend the ANS President's Special Session on Monday, June 12, 2017 from 4:30 to 6:30 pm to hear more about the ANS Nuclear Grand Challenges.

The M&C 2017 International Conference on Mathematics & Computational Methods Applied to Nuclear Science & Engineering, sponsored by the Korean Nuclear Society and co-sponsored by the American Nuclear Society under the auspices of the Mathematics and Computation Division, was very successful. I would like to express my appreciation on behalf of MCD to the organizers of this conference that was very well attended and held in a beautiful venue. In particular, thanks to Technical Program Committee Chair Han Joo for his efforts in organizing the diverse technical program for the conference.

MCD is in the process of endowing the Ely M. Gelbard Memorial Graduate Scholarship, and another successful fundraiser was held at the M&C 2017 conference. I would like to take this opportunity to thank Rachel Slaybaugh and Richard Martineau for their continued dedication to this effort.

The Mathematics and Computation Division is healthy, growing approximately fifteen percent in the last ten years. The MCD membership represents approximately ten percent of the total ANS membership. Students comprise approximately twenty percent of the MCD membership, a good sign for the future of MCD. As ANS strives to increase membership, we as a division should also endeavor to identify ways of gaining new members and engaging those just entering the nuclear profession. The MCD financial situation is strong, and we continue to use funds to support student participation at conferences and help endow the Gelbard scholarship. Finally, we have many volunteers who generously give of their time in support of MCD by reviewing

(Continued on page 2)

In this issue

Program Committee Report P.2

Benchmark Committee Report P.2

2017 Election Results P.3

Honors and Awards Committee Report P.4

Standards Committee Report P.5

Treasurer's Report P.6

(Continued from page 1)

papers, serving on committees and as committee chairs, serving in division leadership, etc.

As I conclude, I would like to express my appreciation to my predecessor, Tunc Aldemir, for his service to MCD. As they end their terms, I would also like to thank Steven Hamilton, Richard Martineau, and Jean Ragusa for their service on the MCD Executive Committee and Ryan McClarren for his service as MCD Technical Program Chair. Finally, I would like to thank my employer Lawrence Livermore National Laboratory for continuing to support my active involvement in the American Nuclear Society.

I look forward to seeing you at the ANS Annual Meeting in San Francisco!

Patrick Brantley

MCD Chair

MCD Program Committee

First, I would like to offer my sincere thanks to Ryan McClarren, who is completing his four-year term as the MCD Technical Program Chair (TPC)/Assistant TPC at the end of the 2017 ANS Annual Meeting in June. In addition, I am pleased to announce that Steven Hamilton (Oak Ridge National Laboratory) has agreed to take Ryan's place. The MCD TPC/Assistant TPC is a four-year commitment, years 1 and 4 as Assistant TPC and years 2 and 3 as TPC.

2017 ANS Annual Meeting

The 2017 ANS Annual Meeting will be held June 11-15 at the Hyatt Regency in San Francisco, CA. MCD is sponsoring the following sessions:

Current Issues in Computational Methods – Roundtable, Monday 1 PM

Monte Carlo Methods, Tuesday 1 PM

Computational Methods and Mathematical Modeling, Wednesday 8 AM

Uncertainty Quantity and Sensitivity Analysis – I, Wednesday 1 PM

Deterministic Transport Methods, Wednesday 4:30 PM

Uncertainty Quantification and Sensitivity Analysis – II, Thursday 8 AM

Also, MCD is co-sponsoring with THD the following special session organized by Tara Pandya (Oak Ridge National Laboratory) and Yassin Hassan (Texas A&M University):

Current Verification and Validation Efforts of Multiphysics Packages, Tuesday 8 AM

2017 ANS Winter Meeting

The 2017 ANS Winter Meeting will be held October 29-November 2 at the Marriott Wardman Park in Washington, DC. Along with the standard MCD sessions, Mark DeHart (Idaho National Laboratory) and Jean Ragusa (Texas A&M University) are organizing a special session entitled, "Advanced Methods for Reactor Transient Analysis". The deadline for submitting summaries is currently May 31.

(Continued on page 5)

Benchmark Committee

The M&C Division is now on GitHub under the organization name ANSMathCompDivision. We invite all our members to get a complimentary GitHub account and join the ANSMathCompDivision. To sign up, click here.

The M&C benchmark co-chairs are proud to announce the start of the computational-benchmark project under the M&C Division's GitHub organization. We are planning to conveniently host computational benchmarks including multi-physics and Monte-Carlo benchmarks for our members. The great work of the previous MCD benchmark chairs collected a large number of computational benchmarks and published them in the ANS-7416 Supplement 1-3 reports. However, we believe that it is not only important to create and document great benchmarks but to make them available to the community in the most convenient way possible.

GitHub is the perfect environment to host a benchmark repository because it provides a stable on-demand online access, automatically documented revisions, a peer-review process and, most importantly, it facilitates the collaboration of researchers around the world willing to contribute to our cause.

To make the ANSMathCompDivision and the computational-benchmark project a great resource for our community, we need YOUR contribution. If you have ideas or want to contribute, get yourself started on GitHub and sign up with the ANSMathCompDivision. If you have ideas or projects, you are invited to contact us via GitHub [opening an issue] or email us.

— Christopher Perfetti & Sebastian Schunert, MCD Benchmark Committee Co-Chairs

2017 Election Results

MCD OFFICERS

Rachel N. Slaybaugh

Chair

Assistant Professor at University of California, Berkeley

Dmitriy Y. Anistratov

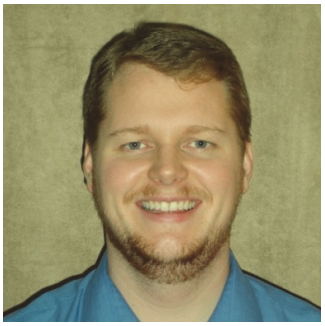
Vice Chair

Associate Professor, NC State University, Department of Nuclear Engineering

Wei Ji

Secretary

Associate Professor, Rensselaer Polytechnic Institute



Aaron M. Watson

Treasurer

Lynx Lead Developer and Integrated Design Lead, Knolls Atomic Power Laboratory

MCD EXECUTIVE COMMITTEE MEMBERS

Mathew A. Cleveland
Executive Committee

Computational Physicist, Los Alamos National Laboratory

Diego Mandelli

Executive Committee

R&D Scientist in the Risk Assessment and Management Services Department at the Idaho National Laboratory

Jonathan A. Walsh
Executive Committee

Computational Physicist, Lawrence Livermore National Laboratory

Han Gyu Joo

Executive Committee - Non-US

Professor, Department of Nuclear Engineering, Seoul National University (SNU), Korea

Honors & Awards Committee

The MCD administers three awards through its Honors and Awards Committee. These are the Gerald C. Pomraning Memorial Award that recognizes individuals who have made outstanding contributions to the fields of mathematics and/or computations related to topics of interest to the ANS; the Distinguished Service Award which recognizes individuals that have made outstanding contributions towards developing the division through various service activities such as leadership, governance, standards, benchmarking, program and/or other development activities; and the Ely Gelbard Memorial Young Member's Research Achievement Award that provides recognition to persons in the earlier stages of their career for meritorious contributions in the areas of mathematics and computations. Awards are made in odd years during the M&C Topical Meetings.

This year, the G. C. Pomraning Memorial Award was presented to Professor James Morel for his outstanding contributions to the field of mathematics and computation at the M&C 2017 Topical Meeting held in Jeju Korea, April 16-20, 2017. Dr. Morel was recognized for his "seminal contributions in the development of discretization and multi-level solution techniques for neutral and charged particle transport on unstructured and structured meshes with adaptive refinement; Monte Carlo methods and hybrid deterministic/ Monte Carlo methods; and discretization and solution techniques for the radiation-hydrodynamic equations." Dr. Morel is currently a Professor of Nuclear Engineering and the Director of the Center for Large Scale Scientific Simulations at Texas A&M University. He received his BS and MS degrees in mathematics and nuclear engineering from Louisiana State University in 1972 and 1974, respectively and his PhD degree in nuclear engineering from University of New Mexico in 1979.

The Gerald C. Pomraning Memorial Award was established in 2003. For more information on this award, including the instruction for nomination and previous recipients, the reader is referred to http://www.ans.org/honors/awards/award-pomraning/. All MCD members are highly encouraged to submit their nomination for any of the 3 MCD awards mentioned above by January 15 of odd years. Please send your nomination form and supporting material to Farzad Rahnema, farzad@gatech.edu.

— Farzad Rahnema, MCD Honors and Awards Committee Chair

2017 Mathematics and Computational Topical Meeting

The M&C 2017 meeting took place in Jeju, Korea, from April 16-20, 2017. The reactor physics and computational science division of the Korean Nuclear Society (KNS) was in charge to run it smoothly with a great number of papers and attendees. 333 papers were presented in 78 oral sessions and 79 papers in one poster session, totaling 412 presented papers in 12 subject areas. The three major subject areas were 1) Monte Carlo Methods and Applications with 98 papers, 2) Deterministic Transport Methods and Applications with 82 papers, and 3) General Reactor Physics Analysis Methods and Applications with 77 papers. Originally 500 extended summaries were received and 1180 reviews were performed by 170 reviewers yielding an average review of 6.9 per reviewer.

The number of registrants was 479 and 461 people actually attended. Six half day workshops were provided on Sunday with 189 people attending. Most attended workshops were the multiphysics workshop with 58 people and the MOOSE workshop with 48 people. 4 best posters were awarded at the banquet and 6 best student papers were awarded at the closing. About 25 papers were recommended for the NET (Nuclear Engineering and Technology, the KNS journal) archival journal publication which is scheduled for the September issue. The keynote speech presentation files and conference photos are available at the announcement bulletin of the M&C 2017 website: www.mc2017.org

Best Student Paper Awards

Jesse P. Jones (NCSU) for SA1. Discretization of Low-Order Quasidiffusion Equations on Arbitrary Quadrilaterals in 2D r-z Geometry.

Zhaoyuan Liu (MIT) for SA2. Progress of Cumulative Migration Method for Computing Diffusion Coefficients with OpenMC.

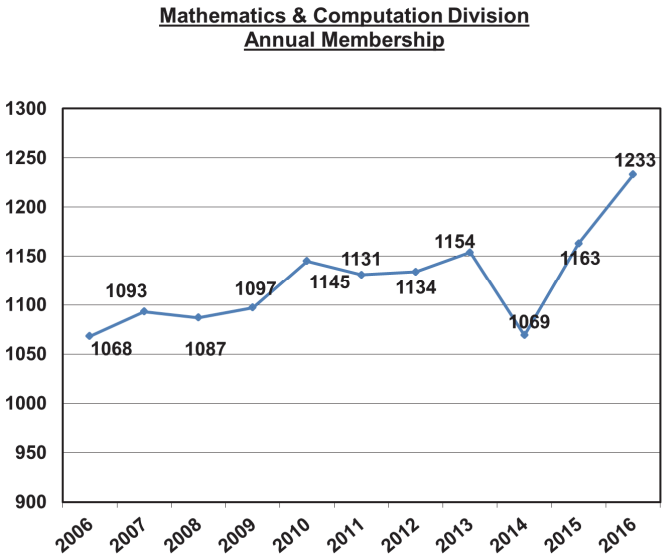
Sanggeol Jeong (UNIST) for SA3,4,5. Creation of a Database of Uncertainties for ICSBEP Handbook and Tool for Covariance Generation.

Hansol Park (SNU) for SA6,9. Practical Resolution of Angle Dependecy of Multigroup Resonance Cross Sections Using Parametrized Spectral SPH Factors.

Benjamin Megolan (MIT) for SA7,8. Multiphase Turbulence Mechanisms Identification from Consistent Analysis of Direct Numerical Simulation Data

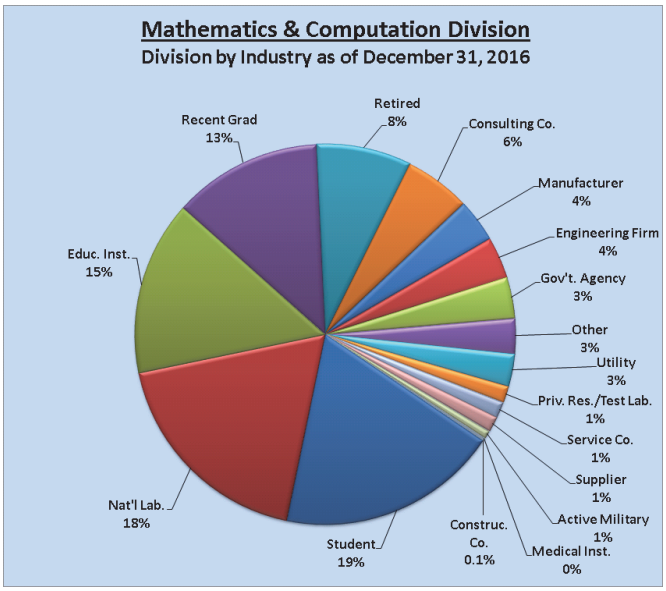
— Han Gyu Joo, M&C17 Technical Program Committee Chair

Membership Committee



Mathematics & Computation Division (MCD)
Total Membership as of December 31, 2016

Student	19%	232
Nat'l Lab.	18%	228
Educ. Inst.	15%	183
Recent Grad	13%	156
Retired	8%	100
Consulting Co.	6%	69
Manufacturer	4%	45
Engineering Firm	4%	44
Gov't. Agency	3%	43
Other	3%	37
Utility	3%	34
Priv. Res./Test Lab.	1%	17
Service Co.	1%	17
Supplier	1%	16
Active Military	1%	8
Medical Inst.	0%	3
Construc. Co.	0.1%	1
Total	100%	1,233



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Best Summary and Presentation Awards

Congratulations to the following recent winners of the MCD Best Summary+Presentation Award:

Aaron Olson, Anil Prinja, and Brian Franke for "Radiation Transport in Random Media," 2016 ANS Annual Meeting (New Orleans, LA).

Steven Hamilton, Thomas Evans, and Stuart Slattery for "GPU Acceleration of History-Based Multigroup Monte Carlo," 2016 ANS Winter Meeting (Las Vegas, NV)

Because Aaron was a student when he gave his presentation, he additionally received a $150 monetary award from MCD.

— Jeff Densmore, Technical Program Chair

Standards Committee Report

The Mathematics and Computation Subcommittee (ANS-10) of the Safety and Radiological Analyses Consensus Committee maintains a Mathematics and Computation standards on behalf of the ANS Standards Board. ANS Standards, as well as the standards of many other organizations and industries, are documents that set forth requirements for the design, manufacture, or operation of a piece of equipment. They can also address computer firmware and software. A standard can address the necessary physical and functional features of equipment, its safe application, or some combination of these. These standards are applied on a voluntary basis.

Since its start, ANS has written and approved nearly 150 different standards, and numerous versions of many of those. At present ANS has more than 70 standards that are current American National Standards and many others that are considered historical standards. These technical documents are written, reviewed, and approved by close to 1000 volunteers who provide their experience and expertise to the various levels of standards committees to see that these important documents are written for the industry's needs. The current Mathematics and Computation standards

(Continued on page 6)

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cover the design and development of both high integrity and non-safety related software, and the verification and validation of radiological data for waste management. In particular the following standards are current:

ANS-10.2, "Portability of Scientific and Engineering Software", which was reaffirmed in 2009. The working group chair is Robert Singleterry. The standard will need a major re-write to remain current and this is not currently possible given the changes that are occurring in software development at this time. Therefore the standard will be administratively withdrawn on its 10th anniversary (8/14/19).

ANS-10.4, "Verification and Validation of Non-Safety Related Scientific and Engineering Computer Programs for the Nuclear Industry", issued in 2008 with Andy Smetana as working group chair, and reaffirmed in 2016 for a further 5 years. It is recognised that it will need bringing up to date and a new working group is in the process of being formed, with Robin Jones as working group chair.

ANS-10.5, "Accommodating User Needs in Scientific and Engineering Computer Software Development". This was re-affirmed in 2016, the working group chair is Andy Smetana. There is currently no planned activity for this standard, but reaffirmation will be due in 2021.

ANS-10.7, "Non-Real Time, High-Integrity Software for the Nuclear Industry—Developer Requirements". This was a new standard in 2013 with Charles Martin as working group chair. There is currently no planned activity for this standard, but reaffirmation will be due in 2018.

ANS-10.8, "Non-Real Time, High-Integrity Software for the Nuclear Industry—User Requirements". This was a new standard in 2015 with Keith Morrell as working group chair. There is currently no planned activity for this standard, where reaffirmation will be due in 2020.

ANS-41.5, "Verification and Validation of Radiological Data for Use in Waste Management and Environmental Remediation". This standard was re-issued in 2012 with Saleem Salaymeh as working group chair. Reaffirmation of the standard is due this year.

Paul Hulse

ANS-10 standards sub-committee chair

To volunteer or learn more about MCD Newsletter publication, email Wei at jiw2@rpi.edu or join us at one of the national meetings.

Treasurer's Report

MCD Operating Funds (03/31/2017)

Balance (01/01/2017) = $35,389.10

Income: YTD = $612

Member Dues ($2/member):	$ 612

Expenses: YTD = $3,623.20

Awards and Plaques	$1,000
Pomraning Award—Jim Morel, Mar 2017	($1,000)
Student Support	$2,500
Pittsburgh Student Conference, Jan 2016	($2,500)
Other Expenses	$1,123.2
Fedex/USPS Allocation	($123.2)
Young Professionals Conference, Mar 2017	($1000)

Net Surplus/(Deficit): YTD = ($3,011.20)

Balance (03/31/2017) = $32,377.90

MCD Support of Gelbard Scholarship

In November 2014, the MCD Executive Committee voted to expend $20,000 from the MCD operating funds to partially fund the Eli Gelbard Scholarship for the year of 2015. In 2016, the MCD contributed $7,500 to the Eli Gelbard Scholarship account.

Fundraising Events for Gelbard Scholarship (led by Rachel Slaybaugh & Richard Martineau)

M&C SNA MC 2015: $5,650.

PHYSOR 2016: $7,745.

M&C 2017: $4,515.

— Aaron M. Watson, MCD Treasurer