



Radiation Protection and Shielding Division (RPSD)

Fall 2012 Newsletter

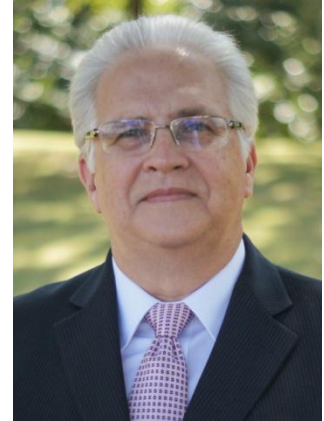
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Message from the Chair

RPSD Members:

As we approach the first ANS meeting of my term as Chair, I look forward to seeing you many of you in San Diego the week of November 11. We have sponsored several Technical Sessions that you may find interesting:



- Computational Resources in Radiation Protection and Shielding
- Ethics in Engineering – Panel Session
- The DOE Russian Health Studies Program: Status and Future – Panel Session
- Radiation Protection and Shielding Roundtable
- Radiation Protection and Shielding General Session
- RSICC: Celebrating 50 Years of Service to the Nuclear Research Community-Panel

I want to personally thank Rob Hayes for his continuing efforts in organizing Ethics in Engineering Panel sessions. I also want to underscore the Russian Health Studies Panel. That Panel will review the Mayak Production Association and the Techa River Population dose assessment and the results to date on the cancer incidence in those populations. These data will prove to be significant additions to the radiation dose-cancer incidence data currently available.

You will find in this newsletter a listing of the list of 2012 award recipients of the RPSD. I would particularly like for you to note that Dr. Dick Faw received the Rockwell Lifetime Achievement Award. Professor Faw has a long history of making significant contributions to radiation protection and shielding. As we enter 2013, I encourage you to nominate deserving members of the RPSD for awards to the Awards Committee.

I was able to attend the 12th International Conference on Radiation Shielding (ICRS12) which was also the 17th Topical Meeting of the RPSD. The meeting was excellent and many papers related to assessments of dose and releases from the Fukushima accident were presented. Our Japanese colleagues are to be congratulated for managing to put on such a high quality meeting given the current work load of many of the conference organizers. We are working on a Best of ICRS12/RPSD-17 session or sessions for 2013. So if you did not make ICRS12, you can catch a flavor of the meeting in the U.S. next year.

Nolan Hertel
Chair of RPSD, 2012-2013
Georgia Institute of Technology

Technical Program Chair Needed

The RPSD desperately needs a Technical Program Chair. Please contact Nolan before the RPSD Executive Meeting on November 11 at nolan.hertel@nre.gatech.edu if you would consider volunteering. From our Bylaws and Rules: the Program Committee must be composed of not fewer than five (5) members, including the Program Committee Chair. The Chair of the Program Committee shall be appointed by the Division Chair for a term of four (4) years. The Program Committee is responsible for organizing technical sessions of interest to Division members at National Meetings. The Program Committee Chair shall be responsible for representing the Division at meetings of the Society National Program Committee.”

Call for Nominations for 2013 Honors and Awards

We would like to encourage our members to nominate their peers to the following RPSD awards:

Rockwell Award

The Lifetime Achievement award, also referred to as the Rockwell Award, is based on long-term contributions in research, development of technology, or education in radiation measurement, protection, shielding, and dosimetry. It is expected that most recipients will have been long-time active members of the American Nuclear Society. Moreover, most recipients will be authors of publications that made significant contributions to the science of radiation protection and shielding.

Professional Excellence Award

The basis for this award would usually be a major contribution to the state of the art, an important publication, a major technical achievement, or a sustained record of significant accomplishment and technical excellence.

Service Recognition Award

This award is in recognition of outstanding past or current service to the Society and/or Division by a member of the Division. This award may be characterized as a distinguished service award or outstanding service award.

Newsletter Contributions

The next newsletter is published in the Spring of 2013. If you have news items of interest to RPSD members, please send such contributions to the Vice-Chair, Dr. George Xu (xug2@rpi.edu), by March 15, 2013.

12th International Conference on Radiation Shielding (ICRS-12) and 17th Topical Meeting of the RPSD-2012 September 2- 7, 2012 in Nara, Japan

By Bernie Kirk,
Oak Ridge National Laboratory

ICRS-12 and RPSD-12 were jointly organized by the Atomic Energy Society of Japan (AESJ), and American Nuclear Society (ANS). Co-sponsors included the Japan Atomic Energy Agency (JAEA), the Organization for Economic Cooperation and Development (OECD) Nuclear Energy Agency Data (NEA), and Oak Ridge National Laboratory's Radiation Safety Information Computational Center (RSICC).

The conference was a collaboration of the 12th International Conference on Radiation Shielding (ICRS-12) and the 17th Topical Meeting of the Radiation Protection and Shielding Division (RPSD-2012) of the ANS. The first ICRS conference was held in 1958 in Cambridge, United Kingdom. The ICRS series occurs every four or five years. Below is a summary of the ICRS series of conferences. Since 2004, ICRS and RPSD have held joint conferences.

| # | Year / Venue / Country | Chair | Presentations | Participants |
|-----|---------------------------------|------------------|---------------|--------------|
| 1. | 1958 Cambridge, UK | Terry Price | 28 | ~40 |
| 2. | 1961 Studsvik, Sweden | Josef Braun | 27 | 64 |
| 3. | 1967 Harwell, UK | Peter Mummery | 65 | 160 |
| 4. | 1972 Paris, France | Jean Rastoin | 80 | 200 |
| 5. | 1977 Knoxville, Tn, USA | Dave Trubey | 106 | 273 |
| 6. | 1983 Tokyo, Japan | Takumi Asaoka | 135 | 235 |
| 7. | 1988 Bournemouth, UK | John Butler | 142 | 179 |
| 8. | 1994 Arlington, Tx, USA | Richard Rubin | 184 | 261 |
| 9. | 1999 Tsukuba, Japan | Shinzo Saito | 175 | 250 |
| 10. | 2004 Funchal, Madeira, Portugal | Pedro Vaz | 350 | 330 |
| 11. | 2008 Pine Mountain, Ga, USA | Nolan Hertel | 240 | 300 |
| 12. | 2012 Nara, Japan | Takashi Nakamura | 313 | 385 |

The organizing committee included General Chair Takashi Nakamura (AESJ), General Co-Chairs Arzu Alpan (Westinghouse, USA), Timothy Valentine (RSICC, USA) and Honorary Chairs - Enrico Sartori and Shun-ichi Tanaka. The technical program chair was Hideo Hirayama (High Energy Accelerator Research, Japan), with co-chairs Pedro Vaz (Instituto Tecnológico Nuclear, Portugal) and Bernie Kirk. The total number of presented papers was 313 (187 oral and 122 posters) and 33 countries were represented. There were 3 plenary sessions.

Introductory remarks were made by representatives from respective co-sponsoring organizations and included Nolan Hertel (RPSD chair), Timothy Valentine (RSICC director), Jim Gulliford (NEA) and Takashi Nakamura. The conference opened with Plenary 1 summarizing the facts and circumstances surrounding the Fukushima Daiichi accident presented by Akio Yamamoto of Nagoya University, Japan. The second presentation in Plenary 1 described the consequent atmospheric dispersion of radioactive materials given by Hiromi Yamazawa, also from Nagoya University. Plenary 2 featured Kimiaki Sato from the Japan Atomic Energy Agency with a talk on the distribution and migration of radionuclides. Plenary 3 was on the issues of radiation shielding and protection surrounding the event at Fukushima and was presented by Hiroshi Nakashima for Shun-ichi Tanaka (the new head of Japan's Nuclear Regulatory Authority).

The conference also featured a workshop organized by ANS Computational Medical Physics Working Group (CMPWG). More information is available at <http://cmpwg.ans.org>. There were also computer codes tutorials on PHITS, GEANT4, MARS and CAD/MCNP GEOMIT. The conference proceedings will be published in *Progress in Nuclear Science and Technology (PNST)* of Atomic Energy Society of Japan.

For Japan & ICRS12 photos, please visit this website (by courtesy of Ken Van Riper) : <http://www.whiterockscience.com/Japan2012/Japan2012.html>



12th International Conference on Radiation Shielding (ICRS-12)
Topical Meeting of RPS Division of the American Nuclear Society (RPSD-2012)
Sept. 2nd - 7th, 2012 / Nara Prefectural New Public Hall, Nara, Japan / Organized by the Atomic Energy Society of Japan

Workshop of the Computational Medical Physics Working Group RPSD 2012 and ICRS-12

Wayne Newhauser
Department of Physics & Astronomy, Louisiana State University

Research and development activities have intensified in recent years in the field of computational medical physics. The scientific literature reveals that computational methods have become the third pillar of research in medical physics, as has occurred in many fields of study. Recent conferences in medical physics and related disciplines have included sessions on computational topics. Many new frontiers in medical physics research have opened up because of the proliferation of supercomputing, advances in radiation transport theory and algorithms. To promote trans-disciplinary exchange of ideas and to foster collaborations, a workshop was held at Nara, Japan, in conjunction with RPSD 2012 and ICRS-12, on 2 September, 2013. The meeting was organized by the Computational Medical Physics Working Group (CMPWG), which is jointly governed by the American Nuclear Society's Biology and Medicine Division and Math and Computation Divisions. Many RPSD members have been active in CMPWG activities because of many natural areas of mutual interest. The meeting was attended by 75 participants, including 13 speakers. This workshop was the fourth event sponsored by the Computation Medical Physics Work Group (visit <http://cmpwg.ans.org/> for slide presentations and information on symposia proceedings). Membership in the CMPWG is free.



Photo by Ken Von Riper
(More photos from this website by courtesy of Ken Van Riper :
<http://www.whiterockscience.com/Japan2012/Japan2012.html>)

2012 RPSD Honors and Awards

RPSD Rockwell Lifetime Achievement Award

Richard E. Faw, P.E., Ph.D. For numerous contributions over the last 50 years to the practice of shielding, shielding analyses, skyshine methodology, the education of students through teaching and research, the training of professionals through short courses, the publication of textbooks and technical articles, the creations of standards, and service to the profession.

2012 Professional Excellence Award

X. George Xu, Ph.D. In recognition of his work in pioneering efforts in computational dosimetry to quantify radiation levels in the human body from a wide variety of radiation sources and as co-editor of the “Handbook of Anatomical Models for Radiation Dosimetry.”

2012 Service Recognition Award

Robert B. Hayes, Ph.D., CHP, P.E. In recognition of service to the American Nuclear Society Radiation Protection and Shielding Division (RPSD) including his work as RPSD Chair, his very successful tenure as technical program chair, and his recent successes in organizing ethics panels at the national meetings.

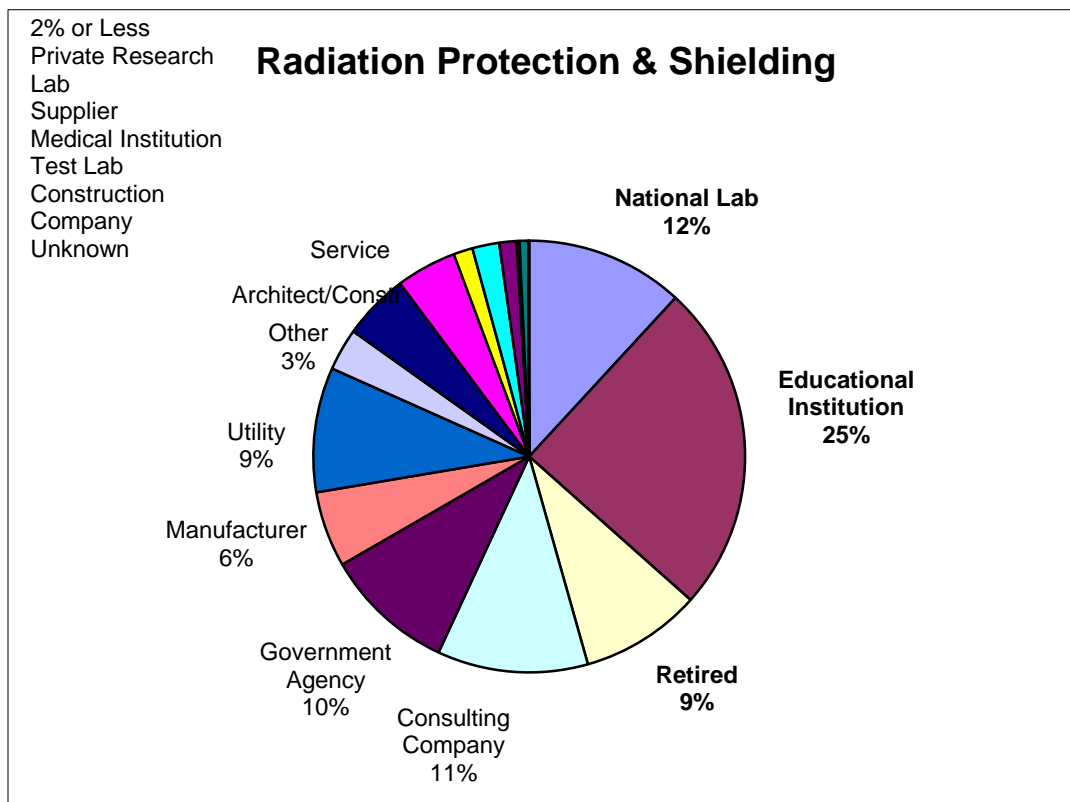
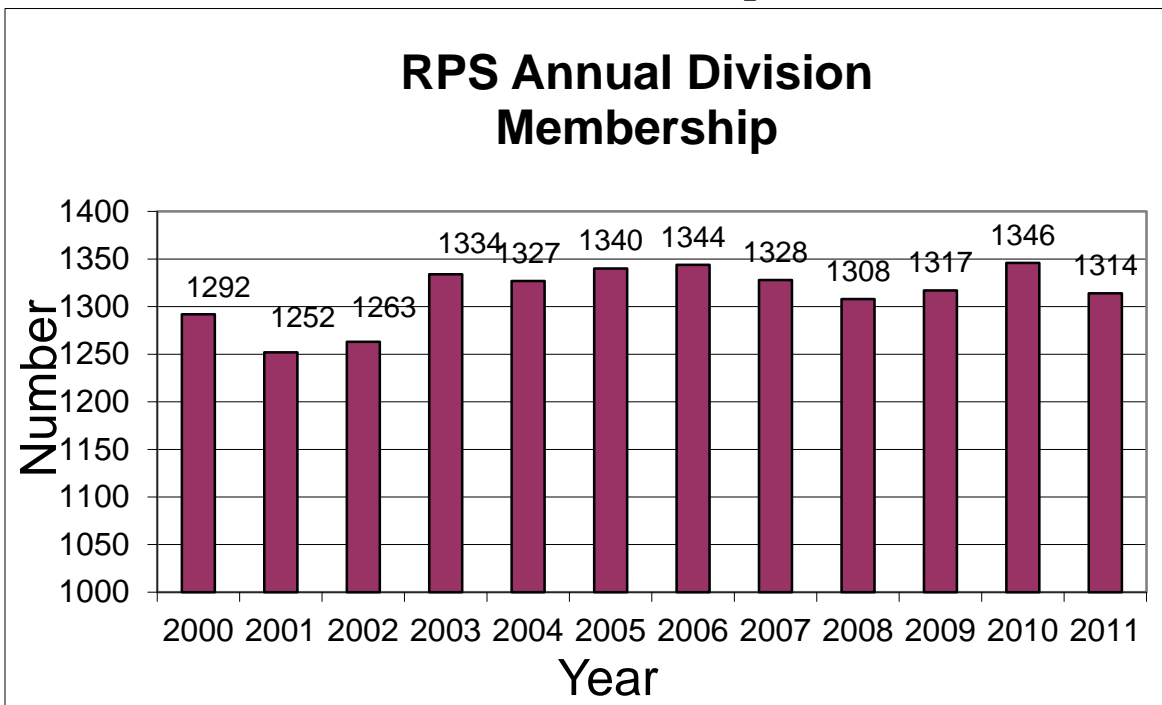
Nolan E. Hertel, Ph.D., P.E. In recognition of service to the American Nuclear Society Radiation Protection and Shielding Division (RPSD) including two terms of service as RPSD Chair, general chair of ICRS-11/RPSD-2008, and contributions to the RPSD program.

RPSD 2012 Blizzard Scholarship

The Blizzard Scholarship, endowed by individual and corporate contributions, supports Master's and Ph.D. students pursuing specialization in the field of radiation protection and shielding. This year's winner is **Timothy Patrick Burke** from the University of Michigan.

Congratulations!

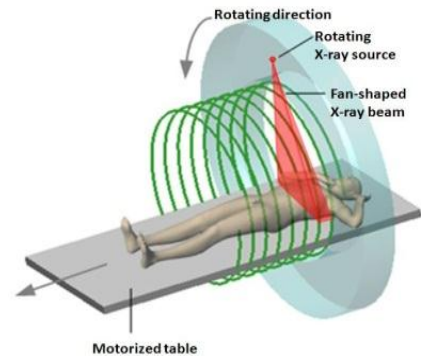
2012 RPSD Membership Data



CT imaging dose – what can nuclear engineers do?

By Aiping Ding, Rensselaer Polytechnic Institute

X-ray computed tomography (CT) has established itself as one of the most popular diagnostic imaging tools. Radiation exposure from CT scans has elevated to an alarming level in the United States and elsewhere in recent years. The radiation exposure from a single CT scan is still relatively small when compared with the clinical benefit of the procedure, but patients often receive multiple scans during the course of their diagnostic or therapeutic procedure. A recent report by the National Council on Radiation Protection and Measurements (NCRP) details how the U.S. population is now exposed to seven times more radiation every year from medical imaging exams than it was in 1980. While CT scans only account for 10 percent of diagnostic radiological exams, the procedure contributes disproportionately — about 67 percent — to the national collective medical radiation exposure. To help mitigate this risk, several national and international bodies have called for the establishment of a centralized, patient-specific “dose registry” system. Such a system would track over time the amount of CT scans a patient undergoes, and the radiation exposure resulting from those procedures. However, current software packages for tracking CT scan radiation exposure have fundamental limitations and are insufficient for such a critical task.



A new software, called “VirtualDose”, has been designed for radiologists, technologists, medical physicists, regulators, manufacturers and researchers who need to calculate and analyze patient radiation doses from exposures such as diagnostic CT examinations. “VirtualDose” takes into consideration a patient’s individual characteristics, including age, sex, pregnancy, height, and weight. By entering these data into the software, the program creates a virtual 3-D “phantom” closely matching with the patient. These anatomically realistic phantoms accurately model the patient’s internal organs, and detail how radiation interacts with each organ. The phantom, in turn, allows physicians and researchers to compare the levels of radiation exposure a patient gets from different CT scanning protocols or different scanner designs. Personalized virtual phantoms are particularly important for predicting radiation exposure from CT scans for the groups most sensitive to radiation — children and pregnant women. These groups are ignored by nearly all dose measurement software. “VirtualDose” is currently under testing (visit: <http://www.virtualphantoms.com/> for more information.)

ANS-6 Standards Subcommittee Update

Charlotta E. Sanders, Chair
University of Nevada

Standards are an integral part of our society and building blocks for competitiveness. John Quincy Adams told the Senate in 1821 that “weights and measures may be ranked among the necessities of life to every individual of human society. They enter into the economical arrangements and daily concerns of every family. They are necessary to every occupation of human industry; to the distribution and security of every species of property; to every transaction of trade and commerce; to the labors of the husbandman; to the ingenuity of the artificer; to the studies of the philosopher; to the researches of the antiquarian; to the navigation of the mariner, and the marches of the soldier; to all the exchanges of peace, and all the operations of war.”

The ANS-6 Standards Subcommittee supports RPSD related work/interest, such as specification for radiation shielding materials (ANSI/ANS-6.4.2), gamma-ray attenuation coefficients and buildup factors (ANSI/ANS-6.4.3), neutron and gamma-ray cross sections (ANSI/ANS-6.1.2), calculation and measurement of direct and scattered gamma radiation (ANSI/ANS-6.6.1), etc. This exciting work is on-going through updates and revisions/improvements to the existing standards. For more information on these standards and/or how to join a working group, please either contact myself, Charlotta Sanders [charlotta.sanders@unlv.edu], or Patricia Schroeder, ANS Standards Administrator [pschroeder@ans.org].

New Project Uses GPU-based Parallel Processors to Bring Effective, Inexpensive Supercomputing to Hospitals

The exa-scale high-performance computing era is expected to arrive before the end of this decade. However, many believe that such a system will be so power hungry that a nuclear power plant will have to be built to supply the needed electricity. To circumvent the foreseeable problem, a number of supercomputer centers worldwide are looking to the General Purpose Graphics Processing Units (GPGPUs) as an alternative and efficient power boost. One research area that will likely receive a lot of attention is to perform Monte Carlo calculations using the hybrid CPU/GPU supercomputers (such as that being developed for the Titan at Oak Ridge national Lab). Researchers at Rensselaer Polytechnic Institute in Troy, New York have been researching ways to harness the power of these computer graphics cards to accelerate Monte Carlo radiation transport and dose calculations. In particular, they are interested in the use of GPUs for computing doses from X-ray CT imaging procedures.

RPI's nuclear engineering professor, X. George Xu, is leading an interdisciplinary team of academic, medical, and industrial researchers on a 4-year project which is funded by a \$2.6 million grant since August 2012 from the National Institute of Biomedical Imaging and Bioengineering (NIBIB). The team aims to use video cards by NVIDIA and leading-edge parallel processing techniques to help reduce dose calculations from 10 hours to less than 60 seconds. The team also seeks to test this technology at Massachusetts General Hospital in Boston using General Electric's LightSpeed CT scanners. "With this new project, we hope to bring massively parallel computing power—currently available only to national laboratories and major research universities such as Rensselaer—to busy and resource-limited hospitals," said Xu, professor and head of RPI's Nuclear Engineering Program. "There is a strong interest at the national level to quantify and reduce the amount of ionizing radiation involved in medical imaging. Our parallel computing method has the potential to be used in everyday clinical procedures, which would dramatically decrease the amount of radiation we receive from CT scans.

Three RPI faculty members are partnering with Xu on this study. The team also involves radiologist and medical physicist at Massachusetts General Hospital in Boston and engineer from GE Global Research. Dr. Forrest Brown, an ANS member from Los Alamos National Lab, will serve as a consultant to the project.

Xu and the research team will design and test new Monte Carlo simulation software to be run on the GPUs found in computer graphics cards, instead of running solely on the central processing units (CPUs). They have to build the software from scratch, as no existing production Monte Carlo code system is compatible with the GPU hardware/software environment. GPUs are based on “stream processing” programming, which enables efficient and effective parallel processing. Connecting a small number of these video cards presents an inexpensive option for users in hospitals to tackle this “Big Data” challenge and perform massively parallel computation, Xu said. The research team has published preliminary results showing a single \$2,000 GPU card and a prototype Monte Carlo code developed at RPI can perform as fast as a 1,000-CPU cluster using an existing Monte Carlo code.

“The high-performance computing community is exploring the role of GPUs in massively parallel supercomputer systems,” RPI computer science professor, Chris Carothers, who is participating in the project, said. “From a computer science perspective, in this project we want to understand the fundamental interplay between the algorithms used in the CT dose software and the underlying hardware architecture of existing and forthcoming GPU processors from NVIDIA and ‘cluster on a chip’ designs from Intel and others. We plan to benchmark these architectures with the CT software application against our IBM Blue Gene/Q supercomputer system at CCNI.”

Nuclear engineers rely on Monte Carlo simulation as an essential research tool. Xu said this new unique hardware/software technology could open the door to applications in radiotherapy, nuclear reactor analysis, and health physics.

