



# NEWSLETTER

## BMD Fall 2011

*We hope to see you in Chicago (June 2012)*



*Sheraton Keauhou Bay Resort, Kona, HI, home of the MARC IX conference*

### Executive Committee

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Sam Glover

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Bryan Bednarz, 2014

Welcome to the Fall Newsletter of the Biology and Medicine Division! The following pages provide an overview of the Biology and Medicine Division's upcoming activities and other areas of potential interest to our members. We also are working to update the website. Your feedback is greatly appreciated. Contents include:

1. Chairman's Message
2. Program Committee Report
3. Upcoming and Recent Conferences
4. Fluka training

We hope you find the following information useful and we encourage you to get involved. There are many opportunities for involvement including the executive committee, developing ANS position papers, review of papers for the national meetings, and participation at national meetings by giving papers or helping to organize technical sessions.

Sincerely,

Biology and Medicine Executive Committee

<http://bmd.ans.org>



## CHAIRMAN'S MESSAGE

The members of the Biology and Medicine Division are engaged in a broad spectrum of activities of relevance to human health and biological sciences. In recent years, our division has increased its activities in medical physics, including co-sponsorship of the Computational Medical Physics Working Group (CMPWG), organization of scientific session at various meetings of the ANS, and recruitment of medical physicists as division members and leaders. Please visit our website for more information on the BMD and its activities (<http://bmd.ans.org/>).

The field of medical physics traditionally circumscribes radiation therapy, diagnostic radiology, and nuclear medicine. As one might expect, there are common interests and strong synergies with many members of BMD and other divisions that focus on non-medical aspects of nuclear science, nuclear engineering, and health physics. A few examples include the development of radiation transport theory and code, radiogenic risk assessment, anthropomorphic phantom development, and high performance computing. For these reasons, the ANS, principally through BMD, Mathematics and Computation Division, and CMPWG, actively work to promote transdisciplinary interactions. The key to these interactions in bringing together experts from diverse fields and creating opportunities to discover unexploited opportunities to collaborate. As evidenced by the many successful scientific meetings and publications of our members, the multidisciplinary research has been very popular and productive.

Despite encouraging progress in health care outcomes, there remain major challenges to curing many diseases, e.g., cancer. The challenges include a lack of understanding of disease causation, prevention, diagnosis, treatment, and survivorship. Many of these challenges cry out for solutions that involve radiation-related research; examples currently in the popular press include low-dose computed tomography scans, proton therapy, and positron emission tomography. Hence, there are urgent and vital societal needs that will require the combined skills of clinical medical physicists, nuclear and radiation scientists, and other specialists. The scientific program of BMD will explore these and other important areas that are ripe for collaboration in 2012 and beyond (see the update on upcoming meetings elsewhere in this newsletter).

In June, 2012, Michelle Sutton-Ferenci succeeded one of us (WN) as the chair of the CMPWG. Under the leadership of Michelle and the CMPWG executive committee, we are confident that this group will continue to serve BMD members as a focal point for nucleating transdisciplinary communication and collaboration with others in the nuclear science community. Please visit the CMPWG web site (<http://cmpwg.ans.org/>) for more information.

In closing, on behalf of the entire BMD leadership team, we would like to thank all of the BMD members who have participated in BMD activities in 2011. It is worth underscoring that the role of BMD is simply to serve its members. For members contemplating more active participa-



tion in 2012, please know that BMD a very welcoming, collegial, and supportive organization. On behalf of the entire BMD leadership team, we look forward to hearing from you in 2012!

Wayne Newhauser, Chair  
Sam Glover, Vice Chair

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## Program Committee Report

Members of BMD are invited to follow our strategy of setting up new opportunities for engaging in the ANS Annual and Winter Meetings and the sponsored topical meetings. The Accelerator Applications (AAD) and/or the Isotope & Radiation (IRD) Divisions and the Computational Medical Physics Working Group (CMPWG) cosponsor these new topics, as well as some of our “classical” topics. We rely on our BMD membership to take a lead in these topics; you can contribute to these in many ways, be it session organizer, session chair, reviewer, or presenter: step up and join the program.

Please consider submitting a summary to one of the listed topics in the ANS Annual Meeting in Chicago (Deadline Jan. 11, 2012) or plan a contribution for the ANS Winter Meeting.

The sessions in Chicago are:

Session #1: MODELING AND SIMULATION OF BRACHYTHERAPY SEEDS

Organizer: Firas Mourtada ([fmourtad@gmail.com](mailto:fmourtad@gmail.com)), Sponsors: BMD/CMPWG

Session #2: ACCELERATORS AND DETECTORS USED IN MEDICAL THERAPY

Organizer: Philip Cole ([colephil@isu.edu](mailto:colephil@isu.edu)) Sponsors: AAD/BMD

Session #3: PROTON IMAGING TECHNOLOGY FOR PROTON THERAPY

Organizers: George Coutrakon ([gcoutrakon@niu.edu](mailto:gcoutrakon@niu.edu)), Reinhard Schulte ([rschulte@dominion.llumc.edu](mailto:rschulte@dominion.llumc.edu)) Sponsors: BMD/CMPWG

Of course there is always room for contributions in addition to these topics in the BMD General Sessions.

For the ANS Winter Meeting a Symposium on ADVANCES IN NON-HEU  $^{99}\text{MO}$  /  $^{99\text{m}}\text{TC}$  PRODUCTION TECHNOLOGIES with 4 or more sessions is planned by Dave Robertson ([robertsonjo@missouri.edu](mailto:robertsonjo@missouri.edu)) and Phil Cole, AAD. This highly relevant topic should draw a broad participation. The ANS Call for Papers will be issued Spring 2012.

Looking back at the past year of our program in the ANS meetings we can highlight two events that exceeded expectations. The second edition of our Tutorial on NEUTRON ACTIVATION ANALYSIS—FRONTIERS AND SUSTAINED PERFORMANCE resulted in a packed lecture room at the Washington, DC meeting in November. Numerous inquiries after the lectures demonstrate that this topic continues to be of high interest to BMD and IRD members and the ANS audience in general.

The embedded topical meeting ISOTOPES FOR MEDICINE AND INDUSTRY at the ANS 2010 Winter Meeting in Las Vegas drew an audience of well above 100 throughout the four days of sessions. One Keynote lecture from IAEA (W. Burkart and N. Ramamoorthy), 6 Panel contributions, and 69 invited and contributed papers were presented in 13 Sessions. The authors demonstrated the continuing rapid growth of radioisotopes for both medical and industrial applications as a matter of national and international interest. The expanding applications, new research opportunities, and associated production issues surrounding the supply of



research, diagnostic, therapeutic, environmental, and industrial radioisotopes were discussed. Details of this topical meeting were highlighted in Nuclear News (January 2011, p. 79-82) and Science (Vol. 331, p. 277-279).

BMD, IRD, and AAD will continue supporting these highly relevant topics. A third edition of this embedded topical meeting was postponed in favor of our participation in the 8<sup>th</sup> INTERNATIONAL CONFERENCE ON ISOTOPES (ICI-8) to be held by ANS in Chicago, IL, Sep. 2-6, 2012.

BMD sponsors and participates in other topical meetings, MARC-IX, NAMSL-9, NRC-8; for these please refer to other sections in this newsletter. The 12th International Conference on Radiation Shielding (ICRS-12) and 17th Topical Meeting of the Radiation Protection and Shielding Division of the American Nuclear Society (RPSD-2012) September 2nd - 7th, 2012, Nara, Japan, and the 5th Joint Symposium on Computational Cancer Research, (Tentatively April, 2012), Conference Organizer: Wayne Newhauser ([Newhauser@lsu.org](mailto:Newhauser@lsu.org)) are of interest to many of our members.



## FLUKA TUTORIAL

At the ANS Winter Meeting BMD sponsored a 3-hour tutorial on FLUKA. The multi-purpose Monte Carlo radiation transport code simulates electromagnetic and hadronic cascades as well as heavy ions. Applications include therapy and imaging, dosimetry and radiation protection, high-energy physics, accelerator facility and detector design, cosmic-ray studies and material damage, activation and shielding. Analog transport is available in addition to non-analog transport. Various variance reduction techniques and built-in scoring options are accessible. Since its first inception in the sixties, active development of FLUKA continues.

Users of all nationalities and institutions are welcome. The package is downloadable from [www.fluka.org](http://www.fluka.org). Full-scale calculations may be accomplished via a text file, a graphical user interface (FLAIR), or a combination of both. FLAIR includes a geometry editor and 3D viewer, automatic error detection and reference libraries. No programming is required, although if so inclined the user is given access to Fortran routines for more customized setups.

BMD technical group contact: Mary Pik-Wai Chin ([Mary.Chin@cern.ch](mailto:Mary.Chin@cern.ch))

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**UPCOMING CONFERENCES AND EMBEDDED TOPICAL MEETINGS****MARC IX-METHODS AND APPLICATIONS OF RADIOANALYTICAL CHEMISTRY**  
MARCH 25-30, 2012

The Biology and Medicine Division along with the Isotopes and Radiation Division and Northern California section of the ANS will host the 9th International Conference on Methods and Applications of Radioanalytical Chemistry. The conference will be held March 25-30, 2012 in Kona, HI. Over 250 scientists typically attend the meeting. Additional details of the conference and proceedings may be found at the conference website: <http://www.marconference.org>

The Sheraton Keauhou Bay Resort in Kona, HI will be the venue and serve as the conference hotel. Please contact Sam Glover ([sam.glover@uc.edu](mailto:sam.glover@uc.edu)) or Steve LaMont ([lamont@lanl.gov](mailto:lamont@lanl.gov)) with any questions regarding the MARC conference.

Abstracts were due December 1, 2011.

Mahalo,

MARC IX Organizing Committee

**NRC-8 - EUCHEMS INTERNATIONAL CONFERENCE ON NUCLEAR AND RADIOCHEMISTRY 8, COMO, ITALY, SEPTEMBER 16-21, 2012**

BMD is sponsoring the EuCheMS International Conference on Nuclear and Radiochemistry (NRC-8) to be held in Como, Italy, 16-21 September 2012, with our member Mauro Bonardi leading this conference as General Chair. The series of International Conferences on Nuclear and Radiochemistry (NRC) aims to promote worldwide scientific exchange among scientists involved in various aspects of nuclear

chemistry, radiochemistry and related disciplines. The aim of EuCheMS NRC-8 is to cover all aspects of nuclear science and technology with particular attention to Nuclear and Radiochemistry and related disciplines. The sessions will be devoted to various fields with a multidisciplinary approach for sustaining the interest of scientists and industrial communities, see

<http://nrc8.mi.infn.it/>

THE 10<sup>TH</sup> INTERNATIONAL CONFERENCE ON NUCLEAR ANALYTICAL METHODS IN THE LIFE SCIENCES (NAMLS-10)

NAMLS is a series of international conferences organized to promote the development and application of nuclear and related analytical methods in the life sciences.

Previous conferences were held in Lisbon, Portugal (2008); Rio de Janeiro, Brazil (2005); Antalya, Turkey (2002); Beijing, China (1998); Prague, Czech Republic (1993); Gaithersburg, USA (1989); Vienna, Austria (1978); Bled, Slovenia (1972); and Amsterdam, Netherlands (1967).

The first three conferences were convened and organized by the International Atomic Energy Agency (IAEA). All subsequent conferences have been convened by the NAMLS International Committee in cooperation with the IAEA. The next conference, NAMLS-10, will be hosted by Thailand Institute of Nuclear Technology (TINT) and held in Bangkok, Thailand from January 15-20, 2012. It is the first time the conference is held in Southeast Asia, and only the second time in Asia. Conference topics cover, but are not limited to, the following methods and application fields: Methods and their developments, Neutron, charged particle and photon activation analysis, Ion beam techniques (PIXE, PIGE, RBS, Synchrotron techniques, etc.), Tracer methods (using both radio- and stable tracers), Nuclear imaging methods, Alpha- and gamma-spectrometry, X-ray fluorescence analysis, Radioisotopic dating, Radioimmunoassay, Mass spectrometry, PET / CT for diagnostic and Hyperfine interactions (Mössbauer spectrometry, positron annihilation, perturbed angular correlation spectrometry).

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## Food Irradiation

The American Nuclear Society endorses the expanded use of food irradiation technology as part of a comprehensive program to improve the safety of the food supply. This ANS position has been supported in the past by BMD through an active technical committee comprised of researchers in the food preservation area and other BMD members. Recent reviews of the ANS position made it clear that research and support of technology in food irradiation must become again a major focus in BMD's program.

To initiate a status review, BMD organized 1-day symposium on Food Irradiation under the leadership of Joseph Butterweck, AEMGroup as Session Organizer. At the 2010 ANS Annual Meeting, San Diego, CA, BMD hosted an Invited Paper Session and a Panel Session. Session (see box). These sessions were well attended with up to 30 "outsiders" in the audience. We have been following up on this successful start-up with a blog section in the ANS Café, continuing discussion among the presenters and participants in the San Diego session, and development of a strategy for further steps to bring together the food safety and preservation community with the professionals in ANS. Joe Butterweck is chairing the BMD Technical Group on Food Irradiation.

Next to the ANS position statement on Food Irradiation, Joe's summary of some of the basics on this topic that should help BMD and ANS members to recognize the importance of this topic:

### Food Irradiation: What you should know

Food irradiation starts with basic physics. Ionizing radiation converts an [atom](#) or [molecule](#) into an [ion](#) by adding or removing charged particles such as [electrons](#) or other ions. In food irradiation, this ionization process results in the breakdown of the DNA of targeted food pathogens, like E coli bacteria.

This DNA breakdown kills the unwanted pathogens and sterilizes the food product.

### Food irradiation is 'cold pasteurization'

The food irradiation process uses energy from the wavelength of  $10^{-10}$  to  $10^{-12}$  meters on the electromagnetic spectrum, a frequency of  $10^{18}$  to  $10^{20}$  and energy levels up to 10 mega-electronvolts, or MEV. This amount of energy is so low that it has been called cold pasteurization. When we think of sterilization processes, we commonly think of milk pasteurization, which is a heat process. In heat pasteurization, the product is brought up to a temperature of over 161 F (72 C).

Don't confuse ultra violet radiation and irradiated milk with food irradiation! They use different processes. All food products treated with ionizing radiation are clearly labelled with the radura, the international symbol indicating a food product has been irradiated. The symbol's graphical details and colours vary between countries.

### Food irradiation kills microbes, but does not affect food products

The food product does not change when treated with food irradiation. Heat sterilization processes damage both the food and the microbe. Cold sterilization selectively targets the microbe, or pathogen. This is a big advantage to the food industry and consumer. Eliminating the offending microbe while preventing any changes to the food composition is a huge benefit to the food industry and to the consumer.

There are three sources of the energy used in food irradiation: beta particles, gamma waves and x-rays. All three sources have the same effect on the pathogens. In the commercial setting, each has its advantages and disadvantages.

### Common uses of food irradiation in the U.S.

In the USA, food irradiation is used as follows:

1. **Disinfesting tropical fruit from Hawaii and other tropical agriculture areas** (Low dose 0.1 to 1 KGy). Hawaii, like most tropical climates has vast amounts of agriculture pests. Agricultural interests in the Continental USA do not want to risk introducing a pest that would damage U.S. agriculture production and export market. The only way to get tree-ripened papayas into the Continental USA is to treat the product with ionizing radiation. Consumers want tasty, tree-ripened fruit from tropical climates, and the average U.S. citizen needs to consume more fresh fruits and vegetable.
2. **Pasteurizing meats and fish** (Moderate dose 1 to 10 KGy). Cooking meat kills pathogens. However, when consumers bring uncooked meat into the home, the pathogens are hitchhikers. Various E coli outbreaks in beef hamburger and Salmonella from poultry products make news headlines. Using food irradiation to pasteurize meats and fish can help to eliminate these types of outbreaks.

The poultry and beef industry have been very frustrated trying to control some bacteria pathogens. Some strains of E coli bacteria are very pathogenic and very low doses (number of bacteria) can result in kidney damage, especially in



young children. This pathogen is especially troublesome in Canada and Argentina, where treating beef with ionizing radiation has not been approved. Both these countries rely upon aggressive Hazardous Analysis and Critical Control Point (HACCP) like inspection instead of other intervention technology, like food irradiation.

3. **Eliminating food spoilage to increase shelf life** (Higher dose over 10 KGy). Spices and other ingredients are contaminated with many kinds of microbes. Most do not cause a problem unless the right one gets into the processed food. Spoilage may result in a shortened shelf life. When ingredients are mixed with the commercial prepared food product, the microbes may grow and result in off flavours. The food becomes unacceptable.

#### **Why should nuclear professionals be interested in food irradiation?**

1. Healthy eating habits include eating fresh food, including tree-ripened fruit. In the U.S., over half of the beef consumed is in the form of hamburger, which can be easily treated with irradiation to kill pathogens.
2. ANS members should learn about their cousins! Food irradiation is one of those other nuclear technologies.
3. As nuclear professionals, we promote nuclear technologies that help save lives to a public that is not always comfortable with the technology. Let's share information on how to better communicate the benefits of nuclear science.

For more information, please visit the Food Irradiators Processor Alliance (FIPA) website at [www.fipa.us](http://www.fipa.us). FIPA is the commercial arm of the food irradiation industry. You can follow their links to a vast amount of scientific and technical information (S&T).

Food irradiation S&T has been studied extensively since the 1930's. The U.S. Army led the investigation through the 1960's. Wikipedia also has an excellent overview of food irradiation available [here](#).

#### **Bottom Line**

Why are food irradiation and nuclear energy technologies not more embraced in the U.S.?

#### **BMD Roadmap to Solutions**

Are ANS members and specifically BMD members ready to climb onto the wagon?

- Simply as consumers for whom we can pass on information in form of advertisement
- As active participants in the BMD Technical Group
- Support/be active in research in radiation biology and radiation chemistry
- As active promoters and facilitators of nuclear technology

Follow our next initiative at MARC-9

Contact Joseph Butterweck ([food-irradiation@aemgroup.net](mailto:food-irradiation@aemgroup.net)) or Rolf Zeisler