

# Annual Report

# 2014

## Year in Review







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## *Charter*

The National Council on Radiation Protection and Measurements is a nonprofit corporation chartered by Congress in 1964 to:

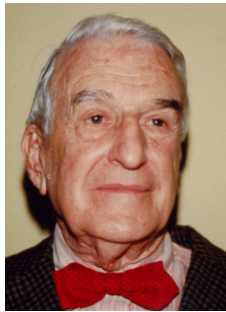
1. Collect, analyze, develop and disseminate in the public interest information and recommendations about (a) protection against radiation and (b) radiation measurements, quantities and units, particularly those concerned with radiation protection.
2. Provide a means by which organizations concerned with the scientific and related aspects of radiation protection and of radiation quantities, units and measurements may cooperate for effective utilization of their combined resources, and to stimulate the work of such organizations.
3. Develop basic concepts about radiation quantities, units and measurements, about the application of these concepts, and about radiation protection.
4. Cooperate with the International Commission on Radiological Protection, the International Commission on Radiation Units and Measurements, and other national and international organizations, governmental and private, concerned with radiation quantities, units and measurements and with radiation protection.

The Council is the successor to the unincorporated association of scientists known as the National Committee on Radiation Protection and Measurements and was formed to carry on the work begun by the Committee in 1929.

Participants in the Council's work are the Council members and members of scientific, advisory and administrative committees. Council members are selected on the basis of their scientific expertise and serve as individuals, not as representatives of any particular organization. The scientific committees, composed of experts having detailed knowledge and competence in the particular area of the committees' interests, draft reports, commentaries and statements. These are then submitted to the full membership of the Council for careful review and approval before being published.

## *Mission*

To support radiation protection by providing independent scientific analysis, information and recommendations that represent the consensus of leading scientists.



Lauriston S. Taylor  
1929–1977



Warren K. Sinclair  
1977–1991



Charles B. Meinhold  
1991–2002



Thomas S. Tenforde  
2002–2012



John D. Boice, Jr.  
2012–



## *President's Message*

The National Council on Radiation Protection and Measurements (NCRP) continues to expand our horizons in meeting the needs of the nation in radiation protection. It has been an exciting year with the resurgence of committees overflowing with new scientific activities. A few highlights:

- The first ever Council Committee (CC 1) was created to address radiation protection guidance for the United States. NCRP Report No. 116 (1993) is being updated with financial support from the U.S. Nuclear Regulatory Commission (NRC) (Co-Chairs: John D. Boice, Jr. and Kenneth R. Kase).
- CC 2 was approved by the Board of Directors to address the continuing needs of the nation for radiation protection. This is a continuation and expansion of our WARP (Where are the Radiation Professionals? A National Crisis) initiative for which a synopsis of the statement has been published and the statement will be forthcoming (Chair: Richard E. Toohey; Co-Chairs: John D. Boice, Jr. and Kathryn H. Pryor). The 2016 Annual Meeting is entitled the same as CC 2.
- Program Area Committee (PAC) 3 is under new leadership (Tammy P. Taylor and Brooke R. Buddemeier).
- PAC 5 has a new Co-Chair (Bruce A. Napier to assist S.Y. Chen) as does PAC 1 (Gayle E. Woloschak) to assist Kathryn D. Held.
- PAC 7 on Communications, Outreach and Policy has a new vice president (Steven M. Becker) assisted by Paul A. Locke.
- The final frontier has another commentary (No. 23) entitled *Radiation Protection for Space Activities: Supplement to Previous Recommendations* (Co-Chairs: Dudley T. Goodhead and R. Julian Preston).
- NCRP Report No. 175 was published on *Decision Making for Late-Phase Recovery from Major Nuclear or Radiological Incidents* (Chair: S.Y. Chen).
- The president wrote 12 columns on “all things radiation” for the *Health Physics News*, made 20 presentations to national and international protection and scientific groups, and had 17 publications in the scientific literature.
- Funds to support NCRP scientific committees (SC) have been provided by several agencies including the NRC (CC 1, SC 1-23), the National Aeronautics and Space Administration (NASA) (SC 1-24) and the U.S. Department of Homeland Security (DHS) (SC 3-1, SC 5-1).
- The Million Worker and Veterans Study is recognized around the world as the major investigation to provide information needed in radiation protection and science.
- SC 1-21 will publish a commentary in 2015 on integrating radiation epidemiology with radiation biology (Co-Chairs: Sally A. Amundson and Jonine L. Bernstein).

- A joint Radiation Research Society (RRS)/NCRP symposium was held at the RRS Annual Meeting featuring SC 1-21 work.
- SC 1-23 is providing a fresh look on the Radiation Protection Issues for Lens of the Eye (Co-Chairs: Eleanor A. Blakeley and Lawrence T. Dauer).
- SC 1-24 has continued to look at radiation exposures in space and the potential for effects on the central nervous system (Co-Chairs: Leslie A. Braby and Richard S. Nowakowski). Development for a full report, Phase 2, is in the works.
- SC 3-1 has been progressing at full speed in cooperation with the New York City Department of Health and Mental Hygiene and other state and federal agencies to address the complex issues of dosimetry for emergency responders in the event of an improvised nuclear device being detonated (Co-Chairs: Adela Salame-Alfie and Stephen Musolino).
- SC 4-6 completed NCRP Statement No 11 on *Outline of Administrative Policies for Quality Assurance and Peer Review of Tissue Reactions Associated with Fluoroscopically-Guided Interventions* (Chair: Stephen Balter).
- SC 6-8 has completed its peer-review of the radiation dose assessment approach taken by the U.S. Department of Defense (DOD) regarding the 70,000 military personnel and civilians in Japan in 2011 at the time of the Fukushima earthquake, tsunami, and nuclear reactor accident (Chair: John E. Till).
- SC 6-9 continues to provide comprehensive assessment of the complex radiation dosimetry issues for the Million Worker and Veterans Study (Chair: Andre Bouville; Co-Chair: Richard E. Toohey). A comprehensive overview was published in the *Health Physics* journal.
- The Million Worker and Veterans Study continues with support from NRC, the U.S. Environmental Protection Agency (EPA), the U.S. Department of Energy (DOE), and NASA, as well as in-kind support from DOD and the U.S. Department of Veterans Affairs. The study will address the level of risk when healthy individuals receive radiation gradually over a period of years.

Other important ongoing activities that are nearing completion include commentaries or reports on radiation and nanotechnology (SC 2-6, Chair: Mark D. Hoover; Co-Chair: David S. Myers), sealed radiation sources (SC 2-7, Chair: Kathryn H. Pryor), protection in dentistry associated with cone beam computed tomography (CT) (SC 4-5, Co-Chairs: Alan G. Lurie and Mel L. Kantor), communicating radiation risks and institution review board guidance (SC 4-7, Chair: Julie E. Timins), and patient dose and CT (SC 4-8, Chair: Munnudeep K. Kalra).

Another new initiative recently approved by the Board covers the radiation protection issues associated with naturally-occurring radioactive material and technologically-enhanced naturally-occurring radioactive material as linked in particular to hydraulic fracturing (Chair: William E. Kennedy, Jr.). Other possibilities for 2015 include updating the medical portion of Report No. 160 on the *Ionizing Radiation Exposure of the Population of the United States*, providing additional guidance for radiation emergency response, addressing issues surrounding cancer risk around nuclear installations, studies of nuclear submariners and shipyard workers, updating the American College of Radiology (ACR)/NCRP Radiation Primer, and possibly forging a partnership with the Harvard T.C. Chan School of Public

Health in conjunction with their John B. Little Center for Radiation Sciences. Jack Little is a Distinguished Emeritus Member of NCRP, a Taylor Lecturer, and a long-term friend and supporter of NCRP.

To continue supporting the needs of the nation in radiation protection, the President has met and discussed opportunities for partnership with personnel at NRC, NASA, U.S. Naval Reactors, Harvard University, Health Physics Society (HPS), RRS, ACR, and others. NCRP strives to be relevant and attuned to the needs of the nation across many disciplines.

Yet, despite the obvious need for radiation guidance in the United States, we are being overwhelmed by two tidal waves of societal change: there continues to be a dwindling number of radiation professionals available to meet the needs of the nation and the sources of funding for radiation protection activities continue in a downward spiral. Our WARP initiative addresses these tsunami trends of reality, but solutions must include increased governmental recognition and support.

The pulse of the nation's professionals in radiation science was reflected in the response to a recent *Health Physics News* column (The Boice Report #33, February 2015) that, figuratively speaking, went viral in its discussion of the needs for radiation science and professionals. One of the first Bills passed by the House of Representatives this year was on Low-Dose Radiation Research (H.R. 35): to develop a strategy for health research on low-dose radiation to meet national needs. If passed by the Senate and signed by the President, the Bill would require that:

1. scientific challenges to understanding low-dose effects be identified;
2. current status of research be assessed;
3. scientific goals for future research be formulated;
4. long-term strategy be recommended; and
5. research agenda be prioritized to overcome the challenges and meet the goals.

I applaud our legislative leaders for recognizing a serious gap in the nation's infrastructure necessary to deal with the burgeoning exposure of the population to medical radiation, the potential burden of regulatory actions if overly conservative, as well as the consequences of nuclear terrorism and major nuclear reactor accidents.

SC 1-21 was remarkably prescient and will soon publish a commentary on the health effects of low doses of radiation: integrating radiation biology and epidemiology. These goals are similar to those articulated in H.R. 35. Critical research needs for evaluating low-dose radiation health effects are the focus to bridging the gap between molecules and the entire human being. Biologically-based models coupled with high-quality, large-scale epidemiologic data such as those coming from the Million Worker and Veterans Study are one way forward. This public awareness about radiation needs further accentuates the need for developing and redeveloping major programs in the United States to train, engage and retain radiation protection professionals necessary to meet the needs of our nation.

The issues of radiation protection in the 21st century have been sculptured by recent events, by the increasing use of radiation in medicine, and by the horrific possibility of a nuclear terrorist act. The March 11, 2011 Fukushima nuclear reactor accident and meltdown was a major radiation disaster which brought into vivid focus the need for radiation guidance and improved ways to communicate with the press, members of the public, and equally important the medical community and scientists.



The 2007 International Commission on Radiological Protection (ICRP) made recommendations that have generated interest around the world and coincide with U.S. initiatives to update and revise our protection regulations. NCRP is addressing the needs for regulatory change and thoughtful guidance by creating CC 1 which deals directly with updating NCRP Report No.116 on *Limitation of Exposure to Ionizing Radiation*. Further, we are about to complete a commentary on the issues involving lens of the eye dose (SC 1-23), a topic which caused and continues to cause some controversy after the ICRP recommendations were made.

The remarkable increase in public exposure to medical radiological imaging (over 85 million CT exams per year!) heightens the need for continued protection guidance in this important medical advance and the beneficial uses of ionizing radiation. The unsettling nature of world affairs raises the possibility that a terrorist event with nuclear devices may occur on U.S. soil. The 2014 NCRP Annual Meeting entitled, “NCRP: Achievements of the Past 50 Years and Addressing the Needs of the Future” addressed many of these issues involving the future of radiation protection in the United States.

Our financial situation, in my view, has increased from a B– to a B: good and getting better but not great; stable in the short term but still uncertain in the long term. In addition to grants and contracts, we receive interagency support for research efforts for the Million Worker and Veterans Study, and we are reaching out to government agencies to support the initiatives outlined above as well as professional societies, universities, industry, donors and benefactors. We are grateful for our corporate sponsors and many professional contributors but we need more resources to increase our ability to serve the nation at this critical time. We will continue to develop innovative approaches for resource gathering in 2015 and have reestablished our resource committee (Chair: James A. Brink) under the auspices of our finance committee. Please send us your ideas for opportunities to support NCRP, and your interest in helping.

New and small endeavors to increase the financial stability of NCRP include the AmazonSmile<sup>®</sup> initiative where, at no cost to the individual, all purchases made on Amazon will provide a small percentage back to NCRP. Other opportunities suggested were to add NCRP as a small percentage beneficiary on IRAs, 401(k)s, and life insurance policies as already done by a number of Council members. Council members also make direct charitable contributions to NCRP and the donations in memory of Warren K. Sinclair this past year were very much appreciated.

Our 2014 Annual Meeting showcased NCRP and the past 50 y of accomplishments since being chartered by Congress in 1964 and our plans, goals and dreams for the future. The Annual Meeting enhanced many of the innovations from the 2013 meeting, including written questions and published answers and a “rapid” publication of the proceedings in *Health Physics*. A column of NCRP and other radiation professional activities (“The Boice Report”) has completed its third year of monthly publications in *Health Physics News*. Covered are recent events in radiation protection, measurements, science and health throughout the world. There have now been 32 columns published through December 2014. The President's travel schedule and presentation schedule continues to be substantial and includes presentations at the Conference of Radiation Control Program Directors (keynote address), the Society of Nuclear Medicine and Molecular Imaging, the Massachusetts Institute of Technology International Workshop on Radiation Damage to DNA (keynote address), North Atlantic Treaty Organization Human Factors in Medicine Panel on Ionizing Bioeffects and Countermeasures (keynote address),

MIRION Technologies, Society for Epidemiologic Research, American Nuclear Society (opening plenary session), U.S. Women in Nuclear, John B. Little Symposium (Harvard T.H. Chan School of Public Health), Northeastern Chapter of HPS, Baltimore and Washington Chapter of HPS, Rensselaer Polytechnic Institute, University of Maryland Medical School, Vanderbilt University, Harvard TC Chan School of Public Health, National Academy of Sciences, Memorial Sloan Kettering Cancer Center, Uniformed Services of the Health Sciences, and the 47th Annual Aubrey O. Hampton Lecture at the Massachusetts General Hospital.

The 2014 calendar year was productive with the initiation of many scientific committees outlined above and the publication of NCRP commentaries, reports, proceedings, statements, and scientific articles. These include:

- NCRP Report No. 175 on *Decision Making for Late-Phase Recovery from Major Nuclear or Radiological Incidents*. A summary was also published in the 2014 peer-reviewed proceedings [Health Phys. (2015) **108**(2)]. Publishing a summary of completed NCRP reports and commentaries in the broader scientific literature is enthusiastically encouraged as a way to reach broader audiences.
- The Proceedings of the 49th Annual Meeting in 2013 on “Radiation Dose and the Impacts on Exposed Populations” (admirably co-chaired by S.Y. Chen and Bruce A. Napier) was published [Health Phys. (2014) **106**(2)]. An informative summary appeared in the April 2013 issue of *Health Physics News* crafted by Bruce Napier.
- The Proceedings of the 49th Annual Meeting included the 37th Lauriston S. Taylor Lecture on Radiation Protection and Measurements by John E. Till on “When Does Risk Assessment Get Fuzzy?” and the 10th Annual Warren K. Sinclair Keynote Address by Shunichi Yamashita on “Fukushima Nuclear Power Plant Accident and Comprehensive Health Risk Management” [Health Phys. (2014) **106**(2)].
- The Proceedings of the 50th Annual Meeting in 2014 on “NCRP: Achievements of the Past 50 Years and Addressing the Needs of the Future” (Chair: Kenneth R. Kase; Co-Chairs: John D. Boice, Jr. and Jerrold T. Bushberg) was almost published in the same year (2014) as the meeting was held but fell short by only a few months and was published in February 2015. This attempt for a rapid publication is to make our publications more timely and accessible. A remarkable summary by Richard E. Toohey with accompanying photographs by Genevieve S. Roessler were published just a few weeks after the Annual Meeting in the April 2014 issue of *Health Physics News*!
- An important synopsis of our WARP statement was published in 2014. It succinctly summarizes on one page our initiatives to address the national crisis of the dwindling number of radiation professionals, judged to be insufficient to meet the needs of our nation. Unmet needs are not only in emergency response, but also in regulation, medicine, occupation, environment (*i.e.*, all aspects of radiation exposure to the population). CC 2 will continue this initiative. The WARP statement has been reviewed and approved and will soon be published.

Active committees are preparing the reports and commentaries highlighted at the beginning of the President's Message. In addition, NCRP has continued to move forward to address the evolving and challenging issues of radiation protection facing our nation. These include:

- Approaches to improve radiation risk communication, perception and outreach.
- Expanding our efforts in medicine, such as quality management of radiological medical imaging and electronic tracking patient exposures. Updating the medical component of NCRP Report No. 160 is being considered.
- Partnering with RRS to continue travel support for young scientists to attend the annual meeting. Two were able to attend in 2014 and four are planned for 2015.
- Partnering with HPS to improve the conduct of our missions to enhance radiation protection in the United States.
- Partnering with agencies that with substantial interests and programs involving radiation and protection. These includes the U.S. Navy, Centers for Disease Control and Prevention (CDC), DOE, NRC, NASA, National Nuclear Security Administration, DHS, EPA, DOD and others. We are the Council for the nation and strive to meet the needs of our country in all facets of radiation protection.
- We are improving the PAC structure in having, for the second time, full PAC meetings just before the annual meeting, and then a joint session of all PACs afterwards to present current activities and future plans and visions. This rewarding experience in 2014 will continue.
- Issues surrounding radiofrequencies could be considered in the future such as cell phone exposures and other uses of nonionizing radiation.
- We need to become more attuned to the modern age of social media with Twitter<sup>®</sup>, Facebook<sup>®</sup>, YouTube<sup>®</sup>, and other approaches to outreach.
- The annual meeting this year and last year were available as webcasts, increasing the reach of NCRP activities and providing real-time access to those unable to attend.
- NCRP is negotiating with the American Association of Physicists in Medicine (AAPM) to make PDF version of NCRP publications available to their members. It is anticipated that this will provide wider distribution of NCRP recommendations as well as secure funding for a portion of our publication revenue. The program will be funded by the AAPM for a period of 5 y with an option to renew.
- NCRP is working with a professional website developer to enhance our online presence. We anticipate having the new site up and running before the end of 2015.
- NCRP is developing a new logo, seeking a fresh and modern look for the future.
- In addition to the plaques, honorariums and keynote presentations for the W.K. Sinclair Keynote Speaker and the L.S. Taylor Lecturer, a new form of appreciation was established. Specially engraved medals will be presented to both honorees starting with the 2015 Annual Meeting. We will also present similar medals to those previously honored over the past 10 y.
- NCRP continues to participate in meetings or conferences of HPS, ICRP, the NRC Regulatory Information Conference, RRS, the United Nations Scientific Committee on the Effects of Atomic Radiation, and more. These venues increase NCRP visibility and impact.

NCRP reports, activities, members, programs and more can be found on the website <http://NCRP-online.org>. The NCRP program of activities made possible by the partnership and financial support from many government agencies including CDC, NASA, National Cancer Institute, DOD, DOE, DHS,

EPA, and NRC. Gifts from our corporate sponsors and many collaborating organizations remain critical to our continued success and are gratefully acknowledged.

Finally, NCRP remains a dynamic and influential organization only because of the generous contributions of time and knowledge contributed by Council members, the senior vice president, scientific vice presidents, committee members, Board of Directors, consultants, and the NCRP staff! These continue to be exciting times, challenging times, and opportunities abound. We are only limited by our imaginations (and shrinking budgets!). We balance two issues in management articulated by Admiral Rickover – the need to embrace innovation without losing sight or capitulating to the process (the routine hard work) that got NCRP where we are today and keeps us on an even keel. Our goal remains to be efficient, effective and productive, with a broad view for the future with ideas and visions to address the needs of the nation as we meet together the challenges of radiation protection for the 21st century!

A handwritten signature in blue ink that reads "John".

John D. Boice, Jr.  
*President*

## Membership

There are 100 Council Members serving six-year terms. There are normally 15 to 19 vacancies each year. Election of Council Members is based on nominations made by committee chairmen, current and Distinguished Emeritus Council members, and the Nominating Committee. New members are nominated and elected based primarily on the scientific contributions they have made to the work of the Council and/or recognized interest and scientific or professional competence in some aspect of radiation protection and measurements. In addition, the Board of Directors recommends that candidates with specific areas of expertise be sought based on the needs of the Council. The Council is comprised of specialists in biophysics, dentistry, dosimetry, environmental transport, epidemiology, genetics, health physics, medical physics, molecular and cellular biology, nuclear energy, nuclear medicine, pathology, physics, public health, public policy, radiation measurements, radiation therapy, radiobiology, radiology, risk analysis and communication, statistics, and waste management. In 2014 there were 16 vacancies; seven new members were elected, and nine members were re-elected. The seven new members were:

Judith L. Bader	Kathryn A. Higley
Michael Boyd	Michael D. Story
Joseph R. Dynlacht	Cary Zeitlin
Helen A. Grogan	

### 2014 Council Membership

Sally A. Amundson	Columbia University Medical Center	2010–2016
A. Iulian Apostoaei	SENES Oak Ridge, Inc.	2012–2018
Kimberly E. Applegate	Emory University School of Medicine	2013–2019
Edouard I. Azzam	New Jersey Medical School	2012–2018
Judith L. Bader	U.S. Department of Health & Human Services	2014–2020
Stephen Balter	Columbia-Presbyterian Medical Center	2013–2019
Steven M. Becker	University of Alabama at Birmingham	2011–2017
Joel S. Bedford	Colorado State University	2010–2016
Jonine L. Bernstein	Memorial Sloan-Kettering Cancer Center	2012–2018
Mythreyi Bhargavan	American College of Radiology	2009–2015

Eleanor A. Blakely	Lawrence Berkeley National Laboratory	2012–2018
William F. Blakely	Armed Forces Radiobiology Research Institute	2009–2015
John D. Boice, Jr.	National Council on Radiation Protection and Measurements	2012–2018
Wesley E. Bolch	University of Florida	2011–2017
Michael Boyd	U.S. Environmental Protection Agency	2014–2020
Richard R. Brey	Idaho State University	2013–2019
James A. Brink	Massachusetts General Hospital	2011–2017
Brooke R. Buddemeier	Lawrence Livermore National Laboratory	2009–2015
Jerrold T. Bushberg	University of California, Davis	2014–2020
Polly Y. Chang	SRI International	2011–2017
S.Y. Chen	Argonne National Laboratory	2011–2017
Lawrence L. Chi	General Electric Hitachi Nuclear Energy Americas	2010–2016
Mary E. Clark	U.S. Environmental Protection Agency	2014–2020
Donald A. Cool	U.S. Nuclear Regulatory Commission	2013–2019
Michael L. Corradini	University of Wisconsin, Madison	2010–2016
Allen G. Croff	Retired	2010–2016
Francis A. Cucinotta	University of Nevada, Las Vegas	2013–2019
Lawrence T. Dauer	Memorial Sloan-Kettering Cancer Center	2012–2018
Christine A. Donahue	CB&I	2009–2015
Joseph R. Dynlacht	Indiana University School of Medicine	2014–2020
Andrew J. Einstein	Columbia University	2012–2018
Alan J. Fischman	Massachusetts General Hospital	2009–2015
Patricia A. Fleming	Saint Mary's College, Notre Dame	2009–2015
Norman C. Fost	University of Wisconsin – Madison	2011–2017
Donald P. Frush	Duke University Medical Center	2010–2016
Ronald E. Goans	MJW Corporation	2013–2019
Helen A. Grogan	Cascade Scientific, Inc.	2014–2020
Milton J. Guiberteau	Greater Houston Radiology Associates	2010–2016
Raymond A. Guilmette	Lovelace Respiratory Research Institute	2009–2015
Martin Hauer-Jensen	University of Arkansas for Medical Sciences	2010–2016
Kathryn D. Held	Massachusetts General Hospital	2012–2018
Kathryn A. Higley	Oregon State University	2014–2020
Roger W. Howell	University of Medicine and Dentistry of New Jersey	2009–2015
Hank C. Jenkins-Smith	University of Oklahoma	2010–2016
Cynthia G. Jones	U.S. Nuclear Regulatory Commission	2011–2017
Timothy J. Jorgensen	Georgetown University Medical Center	2013–2019
William E. Kennedy, Jr.	Dade Moeller & Associates, Inc.	2010–2016
David C. Kocher	SENES Oak Ridge, Inc.	2011–2017
Amy Kronenberg	Lawrence Berkeley National Laboratory	2011–2017

Susan M. Langhorst	Washington University School of Medicine	2011–2017
John J. Lanza	Florida Department of Health	2010–2016
Edwin M. Leidholdt, Jr.	U.S. Department of Veterans Affairs	2012–2018
Martha S. Linet	National Cancer Institute	2010–2016
Jonathan M. Links	Johns Hopkins University Bloomberg School of Public Health	2011–2017
Jill A. Lipoti	Retired	2013–2019
Paul A. Locke	Johns Hopkins University	2010–2016
Ruth E. McBurney	Conference of Radiation Control Program Directors, Inc.	2013–2019
Charles W. Miller	Centers for Disease Control and Prevention	2012–2018
Donald L. Miller	Food and Drug Administration	2012–2018
William H. Miller	University of Missouri, Columbia	2011–2017
William F. Morgan	Pacific Northwest National Laboratory	2014–2020
Stephen V. Musolino	Brookhaven National Laboratory	2014–2020
Bruce A. Napier	Pacific Northwest National Laboratory	2014–2020
Gregory A. Nelson	Loma Linda University Medical Center	2012–2018
Wayne D. Newhauser	Louisiana State University	2013–2019
Andrea K. Ng	Harvard Medical School, Brigham & Women's Hospital	2009–2015
Harald Paganetti	Massachusetts General Hospital	2012–2018
David J. Pawel	U.S. Environmental Protection Agency	2011–2017
R. Julian Preston	U.S. Environmental Protection Agency	2009–2015
Kathryn H. Pryor	Pacific Northwest National Laboratory	2010–2016
Sara Rockwell	Yale School of Medicine	2011–2017
Adela Salame-Alfie	New York State Department of Health	2009–2015
Ehsan Samei	Duke University Medical Center	2013–2019
Beth A. Schueler	Mayo Clinic	2009–2015
Debra McBaugh Scroggs	Dade Moeller and Associates	2012–2018
J. Anthony Seibert	University of California Davis Medical Center	2014–2020
Stephen M. Seltzer	National Institute of Standards and Technology	2010–2016
George Sgouros	Johns Hopkins University School of Medicine	2013–2019
Steven L. Simon	National Cancer Institute	2010–2016
Christopher G. Soares	National Institute of Standards and Technology	2011–2017
Michael G. Stabin	Vanderbilt University	2010–2016
Michael D. Story	University of Texas, Southwestern Medical Center at Dallas	2014–2020
Daniel O. Stram	University of Southern California	2013–2019
Steven G. Sutlief	VA Puget Sound Health Care System	2012–2018
Tammy P. Taylor	Pacific Northwest National Laboratory	2010–2016
Julie K. Timins	Diagnostic Radiology	2010–2016
Richard E. Toohey	M.H. Chew	2012–2018

Elizabeth L. Travis	MD Anderson Cancer Center	2009–2015
Louis K. Wagner	University of Texas-Houston Medical School	2010–2016
Michael M. Weil	Colorado State University	2011–2017
Chris G. Whipple	Environ	2013–2019
Robert C. Whitcomb, Jr.	Centers for Disease Control and Prevention	2014–2020
Stuart C. White	University of California, Los Angeles	2010–2016
Jacqueline P. Williams	University of Rochester Medical College	2012–2018
Gayle E. Woloschak	Northwestern University	2009–2015
Shiao Y. Woo	University of Louisville	2011–2017
X. George Xu	Rensselaer Polytechnic Institute	2014–2020
R. Craig Yoder	Landauer, Inc.	2014–2020
Cary Zeitlin	Southwest Research Institute	2014–2020
Gary H. Zeman	Argonne National Laboratory	2011–2017

## Board of Directors

Jonine L. Bernstein*	Lawrence T. Dauer*	Bruce A. Napier
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James A. Brink	William E. Kennedy, Jr.*	Richard E. Toohey
Jerrold T. Bushberg	Ruth E. McBurney	Gayle E. Woloschak*
	William F. Morgan	

\*Newly elected to the Board of Directors on March 11, 2014.

## Officers

President	John D. Boice, Jr.
Senior Vice President	Jerrold T. Bushberg
Secretary and Treasurer	James R. Cassata (March 2014 – August 2014) David A. Smith (August 2014 – )



## Distinguished Emeritus Members

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 Joel E. Gray  
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 F. Owen Hoffman  
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 Roger O. McClellan  
 Barbara J. McNeil  
 Fred A. Mettler, Jr.  
 Kenneth L. Miller  
 A. Alan Moghissi

David S. Myers  
 Carl J. Paperiello\*  
 John W. Poston, Sr.  
 Andrew K. Poznanski  
 Jerome S. Puskin  
 Genevieve S. Roessler  
 Marvin Rosenstein  
 Lawrence N. Rothenberg  
 Henry D. Royal  
 Michael T. Ryan  
 William J. Schull  
 Roy E. Shore  
 Paul Slovic  
 Daniel J. Strom\*  
 John E. Till  
 Lawrence W. Townsend  
 Robert L. Ullrich  
 Arthur C. Upton  
 Richard J. Vetter  
 F. Ward Whicker  
 Susan D. Wiltshire  
 Marvin C. Ziskin

<sup>†</sup>Deceased during 2014.

\*Elected to Distinguished Emeritus Membership March 11, 2014.

## Consociate Members

Full members of the Council become Consociate Members at the end of their terms provided they are not re-elected to another term on the Council or are not appointed to Distinguished Emeritus membership.

Peter R. Almond	Everett G. Fuller	Eugene F. Oakberg
E. Stephen Amis, Jr.	Arthur H. Gladstein	Gilbert S. Omenn
Larry E. Anderson	Barry B. Goldberg	Frank L. Parker
Mary M. Austin-Seymour	Robert L. Goldberg	Terry C. Pellmar*
Charles M. Barnes	Marvin Goldman	Lester J. Peters
John W. Baum	Douglas Grahn	Ronald C. Petersen
Merrill A. Bender	Andrew J. Grosovsky	Adam Recht
B. Gordon Blaylock	Ellis M. Hall	William C. Reinig
Frederick J. Bonte	Robert J. Hasterlik	Allan C.B. Richardson
Harold S. Boyne	John M. Heslep	Robert Robbins
John W. Brand	John W. Hirshfeld, Jr.	Lester Rogers
David J. Brenner	David G. Hoel	Robert E. Rowland
A. Bertrand Brill	George B. Hutchison	Jonathan M. Samet
Thomas F. Budinger	Marylou Ingram	Keith J. Schiager
William W. Burr, Jr.	A. Everette James, Jr.	Robert A. Schlenker
John F. Cardella*	John R. Johnson	Thomas M. Seed
Stephanie K. Carlson	James G. Kereiakes	Raymond Seltser
Paul L. Carson	H. William Koch	Ferdinand J. Shore
Donald K. Chadwick	Harold L. Kundel	Edward A. Sickles
Charles E. Chambers	Richard W. Leggett	Kenneth W. Skrable
Chung-Kwang Chou	George R. Leopold	David H. Sliney
Kelly L. Classic	Howard L. Liber	James H. Sterner
Stephen F. Cleary	James C. Lin	Louise C. Strong
James E. Cleaver	Thomas A. Lincoln	Herman D. Suit
Fred T. Cross	David I. Livermore	Richard A. Tell
Stanley B. Curtis	Ray D. Lloyd	Joop W. Thiessen
Carter Denniston	Richard A. Luben	Ralph H. Thomas
John F. Dicello	Jay H. Lubin	Lois B. Travis
Richard L. Doan	Arthur C. Lucas	Fong Y. Tsai
Carl H. Durney	Harry R. Maxon	John C. Villforth
David A. Eastmond	C. Douglas Maynard	Niel Wald
Marc Edwards	Claire M. Mays	Daniel E. Wartenberg
Charles M. Eisenhauer	Cynthia H. McCollough	David A. Weber
Joe A. Elder	Mortimer L. Mendelsohn	J. Frank Wilson
Edward R. Epp	Jack Miller	H. Rodney Withers
Donald C. Fleckenstein	William A. Mills	Andrew J. Wyrobek
H. Keith Florig	John E. Moulder	Marco A. Zaider
Kenneth R. Foster	Peter C. Nowell	Pat B. Zanzonico

\*Elected to Consociate Membership March 11, 2014.

## *Administrative Committees*

### **Budget & Finance Committee** (appointed by the Board of Directors, March 11, 2014)

Richard E. Toohey, *Chairman*

Jerrold T. Bushberg  
William E. Kennedy, Jr.

Ruth E. McBurney  
R. Craig Yoder

### **Nominating Committee** (appointed by the Board of Directors, March 11, 2014)

Chris G. Whipple, *Chairman*

Christine A. Donahue  
Paul A. Locke

Donald L. Miller  
Kathryn H. Pryor

### **Program Committee for 2015 Annual Meeting**

(appointed by the Board of Directors, March 11, 2014)

Donald A. Cool, *Chairman*  
Ruth E. McBurney, *Co-Chairman*  
Kathryn H. Pryor, *Co-Chairman*

Isaf Al-Nabulsi  
Armin Ansari  
Renate Czarwinski  
Jonathan Edwards

John MacKinney  
Donald L. Miller  
Michael Noska  
Michael T. Ryan, *Consultant*

## *Scientific and Administrative Staff*

David A. Smith	Executive Director [August 2014 – ]
James R. Cassata	Executive Director [July 2012 – August 2014]
Laura J. Atwell	Office Manager ICRU Assistant Executive Secretary
Bruce B. Boecker	Technical Staff Consultant
Sarah S. Cohen	Technical Staff Consultant
Steven R. Frey	Technical Staff Consultant
Joel E. Gray	Technical Staff Consultant
Michael P. Grissom	Technical Staff Consultant
Kenneth L. Groves	Technical Staff Consultant
Cindy L. O'Brien	Managing Editor
R. Julian Preston	Technical Staff Consultant
Marvin Rosenstein	Technical Staff Consultant
David A. Schauer	Executive Director Emeritus ICRU Executive Secretary
Richard E. Toohey	Technical Staff Consultant
Myrna A. Young	Financial Records Manager

## *Program Area Committees and Advisory Panels*

The program area and advisory committees advise the NCRP President and Board of Directors on issues specific to their expertise. They have responsibility for evaluating the need for new NCRP activities related to the philosophy and the basic principles and requirements in their subject areas.

The work of the Council is supported by a Council committee, seven program area committees, and an advisory panel. They are:

### **Council Committee**

Radiation Protection Guidance for the United States

### **Program Area Committees**

Basic Criteria, Epidemiology, Radiobiology, and Risk

Kathryn D. Held

Operational Radiation Safety

Kathryn H. Pryor

Nuclear and Radiological Security and Safety

John W. Poston, Sr.

Debra McBaugh Scroggs

Radiation Protection in Medicine

James A. Brink

Donald L. Miller

Environmental Radiation and Radioactive Waste Issues

S.Y. Chen

Radiation Measurements and Dosimetry

Steven L. Simon

Radiation Education, Risk Communication, Outreach, and Policy

Paul A. Locke

Steven M. Becker

### **Advisory Panel**

Nonionizing Radiation

## **Vice Presidents**

Each scientific program area committee is chaired by an NCRP Vice President. The Vice Presidents:

- Chair their program area committee
- Provide recommendations for new work in their area
- Represent NCRP to federal agencies and other potential supporters
- Represent NCRP at scientific meetings
- Advise on membership of their program area committee

- Assist NCRP President and chairmen of new scientific committees with selection of potential committee or advisory members
- Assist in management of scientific committee efforts
- Provide the chairman of the nominating committee with potential candidates for Council membership
- Review all draft publications within their program area committee prior to Council review

# *Radiation Protection Guidance for the United States*

**Chair, John D. Boice, Jr.**

## **Key Functions of Council Committee (CC) 1**

- Update and expand NCRP Report No. 116 (1993), *Limitation of Exposure to Ionizing Radiation*, with regard to radiation protection as it pertains to the United States.
- Incorporate substantial advances in radiation effects knowledge as well as radiation protection understanding and culture.

## **Members of CC 1**

Status: Early discussion and drafting stage

John D. Boice, Jr., *Chair*

Kenneth R. Kase, *Co-Chair*

Armin Ansari

Jerrold T. Bushberg

Lawrence T. Dauer

Darrell R. Fisher

Patricia A. Fleming

Kathryn A. Higley

William E. Irwin

Fred A. Mettler, Jr.

Donald L. Miller

R. Julian Preston

Gayle E. Woloschak

S. James Adelstein, *Consultant*

Ralph Andersen, *Consultant*

Michael Boyd, *Consultant*

Donald A. Cool, *Consultant*

James A. Brink, *Advisor*

S.Y. Chen, *Advisor*

Kathryn D. Held, *Advisor*

Paul A. Locke, *Advisor*

John W. Poston, Sr., *Advisor*

Kathryn H. Pryor, *Advisor*

Steven L. Simon, *Advisor*

Marvin Rosenstein, *Technical Staff Consultant*

## *Basic Criteria, Epidemiology, Radiobiology, and Risk*

**Vice President, Kathryn D. Held**

### **Key Functions of Program Area Committee (PAC) 1**

- evaluate and approve all NCRP scientific committee draft recommendations on exposure limits; and
- evaluate new epidemiological and radiobiological data and determine their potential effect on human risk coefficients for radiation protection.

### **Members of PAC 1**

Kathryn D. Held, *Vice President*  
Sally A. Amundson  
Joel S. Bedford  
Jonine L. Bernstein  
Antone L. Brooks  
Ann R. Kennedy  
Amy Kronenberg  
William F. Morgan  
Gregory A. Nelson  
Roy E. Shore  
Daniel O. Stram  
Julie E.K. Timins  
Gayle E. Woloschak  
John D. Boice, Jr., *NCRP Contact*

### **Active Scientific Committees Under PAC 1**

#### **SC 1-20 Biological Effectiveness of Photons as a Function of Energy**

Status: Preparing for PAC review

Steven L. Simon, *Chair*

Leslie A. Braby

Polly Y. Chang

Dudley Goodhead

Stephen C. Hora

David C. Kocher

Kiyohiko Mabuchi

Jerome S. Puskin

David Richardson

James D. Tucker

Eliseo Vano

Marvin Rosenstein, *Technical Staff Consultant*



**SC 1-21 Multiplatform National Approach for Providing Guidance on Integrating Basic Science and Epidemiological Studies on Low-Dose Radiation Biological and Health Effects**

Status: Preparing for PAC review

Sally A. Amundson, *Co-Chair*

Jonine L. Bernstein, *Co-Chair*

Keith F. Eckerman

Raymond A. Guilmette

Amy Kronenberg

Mark P. Little

William F. Morgan

Jac A. Nickoloff

Simon N. Powell

Daniel O. Stram

R. Julian Preston, *Consultant*

Terry C. Pellmar, *Technical Staff Consultant*

Marvin Rosenstein, *Technical Staff Consultant*

**SC 1-23 Guidance on Radiation Dose Limits for the Lens of the Eye**

Status: Middle drafting stage

Eleanor A. Blakely, *Co-Chair*

Lawrence T. Dauer, *Co-Chair*

Joseph R. Dynlacht

David G. Hoel

Barbara Klein

Donald Mayer

Christina R. Prescott

Raymond Thornton

Eliseo Vano

Gayle E. Woloschak

Cindy Flannery, *Consultant*

Phung Tran, *Consultant*

Michael P. Grissom, *Technical Staff Consultant*

**SC 1-24 Radiation Exposures in Space and the Potential for Central Nervous System Effects**

Status: Middle drafting stage

Leslie A. Braby, *Co-Chair*

Richard S. Nowakowski, *Co-Chair*

Gregory Armstrong

Lee Goldstein

Kathryn D. Held

Gregory A. Nelson

James Root

Walter Schimmerling  
Rudy Tanzi  
Lawrence W. Townsend, *Consultant*  
Marvin Rosenstein, *Technical Staff Consultant*

## Authorized but Unfunded Activities

- lung cancer risks from inhaled radionuclides.

## Completed in 2014

NCRP Commentary No. 23, *Radiation Protection for Space Activities: Supplement to Previous Recommendations*, was issued in 2014. This Commentary was drafted by Scientific Committee 1-22 under the chairmanship of Dudley T. Goodhead and R. Julian Preston. Committee members included: Patricia A. Fleming, Kathryn D. Held, Amy Kronenberg, Gregory A. Nelson, Walter Schimmerling, Roger P. Shaw, Michael M. Weil; and Technical Staff Consultant, Marvin Rosenstein.

## *Operational Radiation Safety*

**Vice President, Kathryn H. Pryor**

### **Key Functions of Program Area Committee (PAC) 2**

- serve as a national resource for information on operational radiation safety; and
- formulate guidance regarding the application of operational radiation safety principles.

### **Members of PAC 2**

Kathryn H. Pryor, *Vice President*  
 Edgar D. Bailey  
 Carol D. Berger  
 John R. Frazier  
 Eric M. Goldin  
 Michael Littleton  
 David S. Myers  
 John W. Poston, Sr.  
 Kathleen Shingleton  
 Glenn M. Sturchio  
 Joshua Walkowicz  
 James G. Yusko  
 John D. Boice, Jr., *NCRP Contact*

### **Active Scientific Committees Under PAC 2**

#### **SC 2-6 Radiation Safety Aspects of Nanotechnology**

Status: Preparing for PAC review

Mark D. Hoover, *Chair*

David S. Myers, *Vice Chair*

Raymond A. Guilmette

Leigh J. Cash

Wolfgang G. Kreyling

Gunter Oberdoerster

Rachel Smith

Bruce B. Boecker, *Technical Staff Consultant*

Michael P. Grissom, *Technical Staff Consultant*

## SC 2-7 Radiation Safety of Sealed Radioactive Sources

Status: Middle drafting stage

Kathryn H. Pryor, *Chair*

Edgar D. Bailey

Carol D. Berger

John R. Frazier

Eric M. Goldin

Michael Littleton

David S. Myers

John W. Poston, Sr.

Kathleen Shingleton

Glen M. Sturchio

Joshua Walkowicz

James L. Thompson, *Consultant*

## Authorized but Unfunded Activities

- air monitoring;
- operational radiation safety in medical fusion imaging procedures;
- design of facilities and installed equipment for handling unsealed radioactive materials; and
- radiation protection guidelines for industrial accelerators and irradiators.

## *Nuclear and Radiological Security and Safety*

**Vice President, John W. Poston, Sr.**

### **Key Functions of Program Area Committee (PAC) 3**

- identify important steps to be taken in the interdiction of, preparedness for, and effective responses to possible acts of nuclear or radiological terrorism;
- define performance requirements, instrumentation, and testing criteria for security surveillance systems;
- develop operational strategies and optimization procedures for early, intermediate and late-phase responses to a nuclear or radiological terrorism incident;
- recommend effective methods for protecting against, mitigating, and treating traumatic injuries and long-term health and psychological effects of radiation exposure and other immediate stress effects such as thermal burns, shock, and contaminated shrapnel wounds resulting from a nuclear or radiological explosions to possible acts of nuclear or radiological terrorism;
- analyze methods for optimizing the cleanup, site restoration, and disposition of contaminated materials resulting from a nuclear or radiological terrorism incident; and
- develop operational strategies and optimization procedures for early, intermediate and late-phase responses to a nuclear or radiological terrorism incident.

### **Members of PAC 3**

John W. Poston, Jr., *Vice President*  
 Debra McBaugh Scroggs, *Vice Chair*  
 Steven M. Becker  
 Brooke R. Buddemeier  
 Stephen V. Musolino  
 Terry C. Pellmar  
 Tammy P. Taylor  
 Leslie A. Braby, *Liaison*  
 Jerrold T. Bushberg, *Liaison*  
 Jill A. Lipoti, *Liaison*  
 Julie E.K. Timins, *Liaison*  
 John D. Boice, Jr., *NCRP Contact*

## Active Scientific Committees Under PAC 3

### SC 3-1 Guidance for Emergency Responder Dosimetry

Status: Early drafting stage

Stephen V. Musolino, *Co-Chair*

Adela Salame-Alfie, *Co-Chair*

Judith L. Bader

Daniel Blumenthal

Brooke R. Buddemeier

Lawrence T. Dauer

Helen A. Grogan

William E. Irwin

Ruth E. McBurney

Jeanine Prudhomme

Richard Schlueck

Tammy P. Taylor

David A. Schauer, *Technical Staff Consultant*

## *Radiation Protection in Medicine*

### **Vice President, James A. Brink**

#### **Key Functions of Program Area Committee (PAC) 4**

- identify areas with which NCRP should be concerned in radiation protection of patients in medical, dental and chiropractic practice;
- examine and evaluate techniques and procedures to eliminate unnecessary radiation exposure to the patient; and
- examine and evaluate training of medical personnel in radiation protection.

#### **Members of PAC 4**

James A. Brink, *Vice President*  
 Donald L. Miller, *Co-Chair*  
 Kimberly E. Applegate  
 Stephen Balter  
 Jerrold T. Bushberg  
 Charles E. Chambers  
 Lawrence T. Dauer  
 Andrew J. Einstein  
 Donald P. Frush  
 Ronald E. Goans  
 Marilyn J. Goske  
 Joel E. Gray  
 Mannudeep K.S. Kalra  
 Linda A. Kroger  
 Edwin M. Leidholdt  
 Mahadevappa Mahesh  
 Fred A. Mettler, Jr.  
 Wayne D. Newhauser  
 Ehsan Samei  
 J. Anthony Seibert  
 Steven G. Sutlief  
 Julie E.K. Timins  
 Louis K. Wagner  
 Stuart C. White  
 Shiao Y. Woo  
 John D. Boice, Jr., *NCRP Contact*

## Active Scientific Committees Under PAC 4

### SC 4-5 **Radiation Protection in Dentistry Supplement: Cone Beam Computed Tomography, Digital Imaging and Handheld Dental Imaging**

Status: Preparing for PAC review

Alan G. Lurie, *Co-Chair*

Mel L. Kantor, *Co-Chair*

Mansur Ahmad

Veeratrishual Allareddy

John B. Ludlow

Edwin T. Parks

Eleonore D. Paunovich

Robert J. Pizzutiello

Robert A. Sauer

David C. Spelic

Edwin M. Leidholdt, *Consultant*

W. Doss McDavid, *Consultant*

Donald L. Miller, *Consultant*

Joel E. Gray, *Technical Staff Consultant*

### SC 4-7 **Evaluating and Communicating Radiation Risks for Studies Involving Human Subjects: Guidance for Researchers and Reviewing Bodies**

Status: Early drafting stage

Julie E.K. Timins, *Chair*

Jerrold T. Bushberg

Linda A. Kroger

Edwin M. Leidholdt, Jr.

Donald L. Miller

Robert E. Reiman

J. Anthony Seibert

Patricia A. Fleming, *Consultant*

Steven G. Sutlief, *Consultant*

Michael P. Grissom, *Technical Staff Consultant*

### SC 4-8 **Improving Patient Dose Utilization in Computed Tomography**

Status: Early drafting stage

Mannudeep K.S. Kalra, *Chair*

John M. Boone

Donald P. Frush





Ehsan Samei  
Edwin M. Leidholdt, Jr.  
Michael McNitt-Gray, *Consultant*

## Authorized but Unfunded Activities

- medical evaluation of workers; and
- revision of NCRP Report No. 102 on *Medical X-Rays, Electron Beam and Gamma-Ray Protection for Energies Up to 50 MeV* (1989).

## Completed in 2014

NCRP Statement No. 11, *Outline of Administrative Policies for Quality Assurance and Peer Review of Tissue Reactions Associated with Fluoroscopically-Guided Interventions*, was issued in 2014. This Statement was drafted by Scientific Committee 4-6 under the chairmanship of Stephen Balter. Committee members included: Jerrold T. Bushberg; Charles Chambers; Edwin M. Leidholdt; Donald L. Miller; John P. Winston; Consultant, Lynne Fairbent; and, Technical Staff Consultant, Joel E. Gray.

## *Environmental Radiation and Radioactive Waste Issues*

Vice President, S.Y. Chen

### Key Functions of Program Area Committee (PAC) 5

- serve as a national resource for environmental radiation and radioactive waste information and data;
- prepare scientific reports, commentaries and statements that can be used as fundamental scientific references dealing with radionuclides in the environment;
- help formulate NCRP recommendations on disposal of radioactive and mixed wastes;
- encourage scientific and technical discourse on the disposal of radioactive and mixed wastes including environmental and human risk from disposal; and
- encourage scientific and technical discourse on the cost-benefit of activities generating radioactive and mixed wastes.

### Members of PAC 5

S.Y. Chen, *Vice President*  
Mary E. Clark  
Thomas Hinton  
E. Vincent Holahan  
Katherine A. Kiel  
Jill A. Lipoti  
Ruth E. McBurney  
Bruce A. Napier  
Carl J. Paperiello  
Brian A. Powell  
Andrew Wallo, III  
Chris G. Whipple  
John D. Boice, Jr., *NCRP Contact*

### Authorized but Unfunded Activities

- assessment of measurement methodologies for environmental indicators of past releases (joint with PAC 6);

- case studies and lessons learned from remediation of sites and facilities with radioactive contamination;
- clearance as a radiation protection strategy for radioactive material management;
- development of a risk assessment and risk management parameter handbook;
- radiation protection criteria for plants and animals;
- risk-based corrective actions in remediation of contaminated ecosystems; and
- usage factors for environmental dose calculations.

## Completed in 2014

NCRP Report No. 175, *Decision Making for Late-Phase Recovery from Major Nuclear or Radiological Incidents*, was issued in 2014. This Report was drafted by Scientific Committee 5-1 under the chairmanship of S.Y. Chen. Committee members included: Daniel J. Barnett; Brooke R. Buddemeier; Vincent T. Covello; Katherine A. Kiel; Jill A. Lipoti; Debra M. Scroggs; Andrew Wallo, III; David J. Allard, *Advisor*; Jonathan D. Edwards, *Advisor*; Helen A. Grogan, *Advisor*; Anne F. Nisbet, *Advisor*; John J. Cardarelli, *Consultant*; John A. MacKinney, *Consultant*; Michael A. Noska, *Consultant*; and Steven R. Frey, *Technical Staff Consultant*.

## *Radiation Measurements and Dosimetry*

**Vice President, Steven L. Simon**

### **Key Functions of Program Area Committee (PAC) 6**

- evaluate the field of radiation measurements and dosimetry;
- serve as a source of information to scientific committees preparing reports that include radiation measurements and dosimetry; and
- maintain liaison with other organizations and professional societies that have similar interests.

### **Members of PAC 6**

Steven L. Simon, *Vice President*  
Luiz Bertelli  
William F. Blakely  
Wesley E. Bolch  
Leslie A. Braby  
John F. Dicello  
Raymond A. Guilmette  
Richard T. Kouzes  
Jeffrey J. Whicker  
Gary H. Zeman  
John D. Boice, Jr., *NCRP Contact*

### **Active Scientific Committees Under PAC 6**

#### **SC 6-8 Operation TOMODACHI Radiation Dose Assessment Peer Review**

Status: Preparing final report

John E. Till, *Chair*

A. Iulian Apostoaei

John D. Boice, Jr.

William E. Kennedy, Jr.

John R. Mercier, *Advisor*

Michael P. Grissom, *Technical Staff Consultant*

## SC 6-9 U.S. Radiation Workers and Nuclear Weapons Test Participants Radiation Dose Assessment

Status: Middle drafting stage

Andre Bouville, *Chair*

Richard E. Toohey, *Co-Chair*

Harold L. Beck

Lawrence T. Dauer

Keith F. Eckerman

Derek Hagemeyer

Bruce A. Napier

Kathryn H. Pryor

David A. Schauer

Daniel O. Stram

James L. Thompson

John E. Till

R. Craig Yoder

Cary Zeitlin

Terry Brock, *Consultant*

Richard W. Leggett, *Consultant*

Donald L. Miller, *Consultant*

Marvin Rosenstein, *Technical Staff Consultant*

## Authorized but Unfunded Activities

- Aerosol measurements
- Biological dosimetry
- Requirements and methods for recording information for accurate dose reconstruction in nuclear or radiological incidents
- Update of Report 58, A Handbook of Radioactivity Measurements
- Wound model dose coefficients

## *Radiation Education, Risk Communication, Outreach, and Policy*

Vice President, Paul A. Locke

### Key Functions of Program Area Committee (PAC) 7

- identify the policy implications of NCRP publications, meetings and other events, and seek to communicate those implications in a credible and comprehensible manner to policy makers and the public;
- suggest members or serve as members of new NCRP scientific committees whose topics relate to education, risk communication, policy, and outreach;
- provide advice, wording, and strategic outreach options to policy makers and the public for NCRP reports;
- ensure that NCRP communications and outreach emphasize NCRP's paramount role in providing scientific information and develop communications and outreach strategies so that recommendations are of maximum assistance to policy makers; and
- bolster educational efforts aimed at recruiting, training and retaining radiation health professionals.

### Members of PAC 7

Paul A. Locke, *Vice President*  
Steven M. Becker, *Co-Chair*  
John F. Ahearne  
Jerrold T. Bushberg  
Francis X. Cameron  
Hank C. Jenkins-Smith  
Jill A. Lipoti  
Charles W. Miller  
William F. Morgan  
Dennis O'Connor  
Debra McBaugh Scroggs  
John E. Till  
Julie E.K. Timins  
John D. Boice, Jr., *NCRP Contact*

## *Nonionizing Radiation*

### **Key Functions of Nonionizing Radiation Panel**

- Analyze mechanisms of interaction of nonionizing radiation with biological systems, including humans
- Identify biological responses and potential human health effects
- Evaluate theoretical and applied aspects of dosimetry and exposure assessment of humans to nonionizing radiation
- Provide recommendations on acceptable exposure levels for nonionizing radiation in occupational, medical and public environments
- Analyze procedures for mitigating exposure in public and occupational settings

### **Members of Advisory Panel**

Jerrold T. Bushberg  
James E. Cleaver  
David G. Hoel  
James C. Lin  
David H. Sliney  
Jan A.J. Stolwijk  
Richard A. Tell  
Marvin C. Ziskin  
John D. Boice, Jr., *NCRP Contact*

## *Collaborating Organizations*

Organizations or groups of organizations that are national in interest and are concerned with scientific problems involving radiation quantities, units, measurements and effects, or radiation protection may be granted collaborating status by NCRP. Collaborating Organizations provide a means by which NCRP can gain input into its activities from a wider segment of society. At the same time, the relationships with the Collaborating Organizations facilitate wider dissemination of information about the Council's activities, interests and concerns. Collaborating Organizations have the opportunity to comment on draft documents at the time that drafts are submitted to the members of the Council. This is intended to capitalize on the fact that Collaborating Organizations are in an excellent position to both contribute to the identification of what needs to be treated in NCRP documents and to identify problems that might result from proposed recommendations. The Collaborating Organizations for the year 2014 are:

### **Organization**

- American Academy for Dermatology
- American Academy of Environmental Engineers
- American Academy of Health Physics
- American Academy of Orthopaedic Surgeons
- American Association of Physicists in Medicine
- American Brachytherapy Society
- American College of Cardiology
- American College of Medical Physics
- American College of Nuclear Physicians
- American College of Occupational and Environmental Medicine
- American College of Radiology
- American Conference of Governmental Industrial Hygienists
- American Dental Association
- American Industrial Hygiene Association
- American Institute of Ultrasound in Medicine
- American Medical Association



American Nuclear Society  
American Pharmacists Association  
American Podiatric Medical Association  
American Public Health Association  
American Radium Society  
American Roentgen Ray Society  
American Society for Radiation Oncology  
American Society of Emergency Radiology  
American Society of Health-System Pharmacists  
American Society of Nuclear Cardiology  
American Society of Radiologic Technologists  
American Thyroid Association  
Association of Educators in Imaging and Radiological Sciences  
Association of University Radiologists  
Bioelectromagnetics Society  
Campus Radiation Safety Officers  
College of American Pathologists  
Conference of Radiation Control Program Directors, Inc.  
Council on Radionuclides and Radiopharmaceuticals  
Defense Threat Reduction Agency  
Electric Power Research Institute  
Federal Aviation Administration  
Federal Communications Commission  
Federal Emergency Management Agency  
Genetics Society of America  
Health Physics Society  
Institute of Electrical and Electronics Engineers, Inc.  
Institute of Nuclear Power Operations  
International Brotherhood of Electrical Workers  
International Society of Exposure Science  
National Aeronautics and Space Administration  
National Association of Environmental Professionals  
National Center for Environmental Health / Agency for Toxic Substances and Disease Registry

National Electrical Manufacturers Association  
National Institute for Occupational Safety and Health  
National Institute of Standards and Technology  
Nuclear Energy Institute  
Office of Science and Technology  
Paper, Allied-Industrial, Chemical and Energy Workers  
International Union  
Product Stewardship Institute  
Radiation Research Society  
Radiological Society of North America  
Society for Cardiovascular Angiography and Interventions  
Society for Pediatric Radiology  
Society for Risk Analysis  
Society of Cardiovascular Computed Tomography  
Society of Chairmen of Academic Radiology Departments  
Society of Interventional Radiology  
Society of Nuclear Medicine and Molecular Imaging  
Society of Radiologists in Ultrasound  
Society of Skeletal Radiology  
U.S. Air Force  
U.S. Army  
U.S. Coast Guard  
U.S. Department of Energy  
U.S. Department of Housing and Urban Development  
U.S. Department of Labor  
U.S. Department of Transportation  
U.S. Environmental Protection Agency  
U.S. Navy  
U.S. Nuclear Regulatory Commission  
U.S. Public Health Service  
Utility Workers Union of America

## *Special Liaison Organizations*

Special Liaison relationships are established with various organizations outside of the United States that have an interest in radiation protection and measurements. This relationship provides: (1) an opportunity for participating organizations to designate an individual to provide liaison between the organization and NCRP; (2) that the individual designated will receive copies of draft NCRP publications (at the time that these are submitted to the members of the Council) with an invitation to comment but not vote; and (3) that new NCRP efforts might be discussed with liaison individuals as appropriate, so that they might have an opportunity to make suggestions on new studies and related matters. The Special Liaison Organizations for 2014 are:

### **Organization**

Australian Radiation Protection and Nuclear Safety Agency  
 Bundesamt für Strahlenschutz (Germany)  
 (Federal Office for Radiation Protection)  
 Canadian Association of Medical Radiation Technologists  
 Canadian Nuclear Safety Commission  
 Central Laboratory for Radiological Protection (Poland)  
 China Institute for Radiation Protection  
 Commissariat à l'Énergie Atomique (France)  
 Commonwealth Scientific Instrumentation Research  
 Organization (Australia)  
 European Commission  
 Heads of the European Radiological Protection Competent  
 Authorities  
 Health Council of the Netherlands  
 Health Protection Agency  
 International Commission on Non-Ionizing Radiation  
 Protection  
 International Commission on Radiation Units and  
 Measurements  
 International Commission on Radiological Protection  
 International Radiation Protection Association  
 Japan Radiation Council

Korea Institute of Nuclear Safety  
Nuclear Safety Commission of Japan  
Russian Scientific Commission on Radiation Protection  
South African Forum for Radiation Protection  
World Association for Nuclear Operators  
World Health Organization, Unit of Radiation and  
Environmental Health

## *Corporate Sponsors*

The Corporate Sponsor's Program facilitates the interchange of information and ideas, and corporate sponsors provide valuable fiscal support for the NCRP program. The Corporate Sponsors for 2014 are:

### **Organization**

3M

Landauer, Inc.

Nuclear Energy Institute

## *Review Process*

The review process for draft publications is elaborate and comprehensive. It begins with a review by a group of critical reviewers designated by the appropriate Program Area Committee Vice President and the NCRP Secretariat. Second, following modification of the draft on the basis of the comments of the critical reviewers, the publication is submitted for review to the full Council membership (100), Distinguished Emeritus Members (73), Collaborating Organizations (79), and Special Liaison Organizations (23). At the time a draft is submitted for Council review it is also placed on NCRP's website for public comment (<http://NCRPonline.org>). Further modification of draft reports on the basis of the comments received follows, with the goal of reaching a scientific consensus on the material included in the report. An NCRP report can be released for publication by the President only if there are no more than two remaining disapprovals by members of the Council after resolution of review comments.

In addition to full reports, NCRP also produces statements, commentaries, and presidential reports. Statements are brief documents that succinctly address topics of contemporary interest and importance for radiation protection. The review and approval process for statements is the same as for reports. NCRP commentaries are documents that provide preliminary evaluations, critiques, reviews and results of exploratory studies, or extensions of previously published NCRP reports on an accelerated schedule when time for the normal review process is not available. Approval is by the Board of Directors with involvement by other Council members to an extent dependent on the time available. Presidential reports are documents on specific issues in radiation health protection that are developed by a scientific committee, reviewed by members of Council and other subject-area experts as needed, and approved for publication by the Board of Directors and the President.

*Lauriston S. Taylor Lectures*

<b>Year</b>	<b>Title</b>	<b>Lecturer</b>
2014	On the Shoulders of Giants: Radiation Protection Over 50 Years	Fred A. Mettler, Jr.
2013	When Does Risk Assessment Get Fuzzy?	John E. Till
2012	From the Field to the Laboratory and Back: The <i>What Ifs</i> , <i>Wows</i> , and <i>Who Cares</i> of Radiation Biology	Antone L. Brooks
2011	What Makes Particle Radiation so Effective?	Eleanor A. Blakely
2010	Radiation Protection and Public Policy in an Uncertain World	Charles E. Land
2009	Radiation Epidemiology: The Golden Age and Remaining Challenges	John D. Boice, Jr.
2008	Radiation Standards, Dose/Risk Assessments, Public Interactions, and Yucca Mountain: Thinking Outside the Box	Dade W. Moeller
2007	The Quest for Therapeutic Actinide Chelators	Patricia W. Durbin
2006	Fifty Years of Scientific Investigation: The Importance of Scholarship and the Influence of Politics and Controversy	Robert L. Brent
2005	Nontargeted Effects of Radiation: Implications for Low-Dose Exposures	John B. Little
2004	Radiation Protection in the Aftermath of a Terrorist Attack Involving Exposure to Ionizing Radiation	Abel J. Gonzalez
2003	The Evolution of Radiation Protection: From Erythema to Genetic Risks to Risks of Cancer to ?	Charles B. Meinhold
2002	Developing Mechanistic Data for Incorporation into Cancer Risk Assessment: Old Problems and New Approaches	R. Julian Preston
2001	Assuring the Safety of Medical Diagnostic Ultrasound	Wesley L. Nyborg
2000	Administered Radioactivity: <i>Unde Venimus Quoque Imus</i>	S. James Adelstein
1999	Back to Background	Naomi H. Harley

1998	From Chimney Sweeps to Astronauts: Cancer Risks in the Work Place	Eric J. Hall
1997	Radionuclides in the Body: Meeting the Challenge	William J. Bair
1996	70 Years of Radiation Genetics: Fruit Flies, Mice and Humans	Seymour Abrahamson
1995	Certainty and Uncertainty in Radiation Research	Albrecht M. Kellerer
1994	Mice, Myths, and Men	R.J. Michael Fry
1993	Science, Radiation Protection and the NCRP	Warren K. Sinclair
1992	Dose and Risk in Diagnostic Radiology: How Big? How Little?	Edward W. Webster
1991	When is a Dose Not a Dose?	Victor P. Bond
1990	Radiation Protection and the Internal Emitter Saga	J. Newell Stannard
1989	Radiobiology and Radiation Protection: The Past Century and Prospects for the Future	Arthur C. Upton
1988	How Safe is Safe Enough?	Bo Lindell
1987	How to be Quantitative about Radiation Risk Estimates	Seymour Jablon
1986	Biological Effects on Non-Ionizing Radiations: Cellular Properties and Interactions	Herman P. Schwan
1985	Truth (and Beauty) in Radiation Measurements	John H. Harley
1984	Limitation and Assessment in Radiation Protection	Harald H. Rossi
1983	The Human Environment—Past, Present and Future	Merril Eisenbud
1982	Ethics, Trade-Offs and Medical Radiation	Eugene L. Saenger
1981	How Well Can We Assess Genetic Risk? Not Very	James F. Crow
1980	From “Quantity of Radiation” and “Dose” to “Exposure” and “Absorbed Dose”—An Historical Review	Harold O. Wyckoff
1979	Radiation Protection—Concepts and Trade Offs	Hymer L. Friedell
1978	Why be Quantitative About Radiation Risk Estimates?	Sir Edward Pochin
1977	The Squares of the Natural Numbers in Radiation Protection	Herbert M. Parker



## *Warren K. Sinclair Keynote Addresses*

<b>Year</b>	<b>Title</b>	<b>Lecturer</b>
2014	Science, Radiation Protection, and the NCRP: Building on the Past, Looking to the Future	Jerrold T. Bushberg
2013	Fukushima Nuclear Power Plant Accident and Comprehensive Health Risk Management	Shunichi Yamashita
2012	Childhood Exposure: An Issue from Computed Tomography Scans to Fukushima	Fred A. Mettler, Jr.
2011	Heavy Ions in Therapy and Space: Benefits and Risks	Marco Durante
2010	Effective Risk Communication Before, During and After a Radiological Emergency: Challenges, Guidelines, Strategies and Tools	Vincent T. Covello
2009	The Role of a Strong Regulator in Safe and Secure Nuclear Energy	Peter B. Lyons
2008	Issues in Quantifying the Effects of Low-Level Radiation	Dudley T. Goodhead
2007	Use and Misuse of Radiation in Medicine	James A. Brink
2006	Retrospective Analysis of Impacts of the Chernobyl Accident	Mikhail Balonov
2005	Contemporary Issues in Risk-Informed Decision Making on Waste Disposition	B. John Garrick
2004	Current Challenges in Countering Radiological Terrorism	John W. Poston, Sr.

## *Annual Meetings*

<b>Year</b>	<b>Topic</b>
2014	NCRP: Achievements of the Past 50 Years and Addressing the Needs of the Future
2013	Radiation Dose and the Impacts on Exposed Populations
2012	Emerging Issues in Radiation Protection in Medicine, Emergency Response, and the Nuclear Fuel Cycle
2011	Scientific and Policy Challenges of Particle Radiations in Medical Therapy and Space Missions
2010	Communication of Radiation Benefits and Risks in Decision Making
2009	Future of Nuclear Power Worldwide: Safety, Health and Environment
2008	Low Dose and Low Dose-Rate Radiation Effects and Models
2007	Advances in Radiation Protection in Medicine
2006	Chernobyl at Twenty
2005	Managing the Disposition of Low-Activity Radioactive Materials
2004	Advances in Consequence Management for Radiological Terrorism Events
2003	Radiation Protection at the Beginning of the 21st Century—A Look Forward
2002	Where the New Biology Meets Epidemiology: Impact on Radiation Risk Estimates
2001	Fallout from Atmospheric Nuclear Tests—Impact on Science and Society
2000	Ionizing Radiation Science and Protection in the 21st Century
1999	Radiation Protection in Medicine: Contemporary Issues
1998	Cosmic Radiation Exposure of Airline Crews, Passengers and Astronauts
1997	The Effects of Pre- and Postconception Exposure to Radiation
1996	Implications of New Data on Radiation Cancer Risk
1995	Environmental Dose Reconstruction and Risk Implications
1994	Extremely-Low-Frequency Electromagnetic Fields: Issues in Biological Effects and Public Health
1993	Radiation Science and Societal Decision Making
1992	Radiation Protection in Medicine
1991	Genes, Cancer and Radiation Protection

1990	Health and Ecological Implications of Radioactively Contaminated Environments
1989	Radiation Protection Today—The NCRP at Sixty Years
1988	Radon
1987	New Dosimetry at Hiroshima and Nagasaki and Its Implications for Risk Estimates
1986	Nonionizing Electromagnetic Radiations and Ultrasound
1985	Radioactive Waste
1984	Some Issues Important in Developing Basic Radiation Protection Recommendations
1983	Environmental Radioactivity
1982	Radiation Protection and New Medical Diagnostic Approaches
1981	Critical Issues in Setting Radiation Dose Limits
1980	Quantitative Risk in Standards Setting
1979	Perceptions of Risk

## 2014 Annual Meeting

The Fiftieth Annual Meeting of NCRP was held March 10–11, 2014 at the Hyatt Regency Bethesda in Bethesda, Maryland. The topic of the meeting was *NCRP: Achievements of the Past 50 Years and Addressing the Needs of the Future*. The sessions and presentations were as follows:

### **Eleventh Annual Warren K. Sinclair Keynote Address**

Science, Radiation Protection, and the NCRP: Building on the Past, Looking to the Future,  
Jerrold T. Bushberg

### **Basic Criteria, Epidemiology, Radiobiology, and Risk (PAC 1)**

Integrating Basic Radiobiological Science and Epidemiological Studies (Why and How?),  
R. Julian Preston

Radiation Safety and Human Spaceflight: Importance of the NCRP Advisory Role in Protecting  
Against Large Uncertainties, Francis A. Cucinotta

Biological Effectiveness of Photons and Electrons as a Function of Energy, Steven L. Simon

### **Nuclear and Radiological Security and Safety (PAC 3 & 5)**

Response to an Improvised Nuclear Device or a Radiological Dispersal Device: Models,  
Measurements, and Medical Care, C. Norman Coleman

Decision Making for Late-Phase Recovery from Nuclear or Radiological Incidents (What's Next  
After the First Responders Have Left?), S.Y. Chen

### **Operational and Environmental Radiation Protection (PAC 2 & 5)**

Radiation Safety of Sealed Radioactive Sources, Kathryn H. Pryor

Pennsylvania's Technologically-Enhanced Naturally-Occurring Radioactive Material Experiences and Studies of the Oil and Gas Industry, David J. Allard

Radiation Safety in Nanotechnology (Does Size Matter?), Mark D. Hoover

### **Radiation Measurement and Dosimetry (PAC 6)**

Framework and Need for Dosimetry and Measurements: Quantitation Matters, Raymond A. Guilmette

Dose Reconstruction for the Million Worker Epidemiological Study, Andre Bouville

### **Thirty-Eighth Lauriston S. Taylor Lecture on Radiation Protection and Measurements**

On the Shoulders of Giants: Radiation Protection Over 50 Years, Fred A. Mettler, Jr.

### **Radiation Protection in Medicine (PAC 4)**

Protection of Patients in Diagnostic and Interventional Medical Imaging, Kimberly E. Applegate

Protection and Measurement in Radiation Therapy, Steven G. Sutlief

Protection of the Developing Embryo and Fetus from Ionizing Radiation Exposure, Robert L. Brent

### **Radiation Education, Risk Communication, Outreach, and Policy (PAC 7)**

Historical Trends in Radiation Protection, Policy and Communications: 1964 to the Present, Paul A. Locke

U.S. Radiation Protection: Role of National and International Advisory Organizations and Opportunities for Collaboration (Harmony not Dissonance), Michael A. Boyd

### **Summary: NCRP for the Future**

Capturing Opportunities and Meeting Challenges in Radiation Protection, Kenneth R. Kase

Serving on the Program Committee for the 2014 Annual Meeting were: Kenneth R. Kase, *Chair*; John D. Boice, Jr., *Co-Chair*; Jerrold T. Bushberg, *Co-Chair*; James A. Brink, S.Y. Chen, Raymond A. Guilmette, Kathryn D. Held, Paul A. Locke, Donald L. Miller, John W. Poston, Sr., Kathryn H. Pryor, and Richard E. Toohey. The proceedings of the 2014 Annual Meeting will be published in *Health Physics*.

**N | C | R | P**

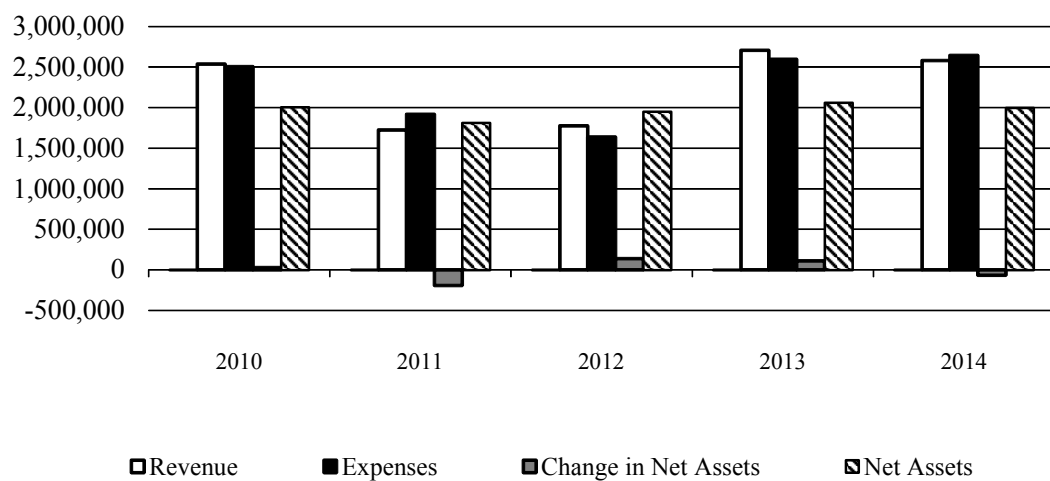
**A | P | P | E | N | D | I | C | E | S**



## Financial Summary

The table and bar graph presented below exhibit NCRP’s year-end financial data for 2014 and the four preceding years in the categories: (1) total revenue from grants, contracts, contributions, corporate sponsorships, contributed professional services, administrative services, sales of publications, and investments; (2) total operating and investment expenses; (3) change in net assets of the corporation; and (4) net assets.

Year	Revenue	Expenses	Change in Net Assets	Net Assets
2010	2,535,213	2,505,323	29,890	2,005,164
2011	1,725,326	1,916,162	(190,836)	1,814,328
2012	1,776,001	1,638,754	137,247	1,951,574
2013	2,706,268	2,595,346	110,922	2,062,496
2014	2,578,042	2,642,904	(64,862)	1,997,634



## Appendix 1. Finances

### Exhibit A Statement of Financial Position For the year ended December 31, 2014 (unaudited)

#### Current Assets

Cash and cash equivalents	\$ 148,751
Investments [at market]	1,832,403
Accounts receivable:	
Publications [net of allowance of \$38]	4,294
Grants and contracts	217,041
International Commission on Radiation Units and Measurements	4,549
Inventory—publications	305,247
Prepaid expenses and other assets	16,448
Total current assets	<u>2,528,733</u>

#### Property and Equipment [at cost]

Furniture and equipment	173,372
Less accumulated depreciation	150,525
Total property and equipment	<u>22,847</u>

**TOTAL ASSETS** \$ 2,551,580

#### Liabilities

Line of credit	\$ 90,000
Accounts payable and accrued expenses	264,534
Total current liabilities	<u>354,534</u>

#### Other Liabilities

Deferred rent liability	5,703
Accrued post-retirement benefits	193,709
Total other liabilities	<u>199,412</u>

**TOTAL LIABILITIES** 553,946





<b>Net Assets</b>	
Unrestricted:	
Undesignated	174,134
Board designated	1,596,417
Temporarily restricted	192,083
Permanently restricted	35,000
<b>TOTAL NET ASSETS</b>	<u>1,997,634</u>
<b>TOTAL LIABILITIES AND NET ASSETS</b>	<u><u>\$ 2,551,580</u></u>

## Exhibit B Statement of Activities For the year ended December 31, 2014 (unaudited)

	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
<b>Revenue and Other Increases</b>				
Contracts and grants	\$ 1,938,149	\$ —	\$ —	\$ 1,938,149
Contributions	151,976	—	—	151,976
Corporate sponsorship	25,000	—	—	25,000
Contributed professional services	223,550	—	—	223,550
Sales of publications	132,088	—	—	132,088
Dividends and interest	68,288	8,850	—	77,138
Net realized and unrealized gain on investments	4,824	244	—	5,068
Professional and administrative services	25,073	—	—	25,073
Total revenue and other increases	2,568,948	9,094	—	2,578,042
<b>Expenses and other decreases</b>				
Program costs:				
Contracts and grants	1,353,650	—	—	1,353,650
Publications	88,916	—	—	88,916
Contributed professional services	223,550	—	—	223,550
Total program costs	1,666,116	—	—	1,666,116
Management and general expenses	920,828	—	—	920,828
Total expenses	2,586,944	—	—	2,586,944
Investment fees	17,128	2,221	—	19,349
Post-retirement benefit change	36,611	—	—	36,611
	2,640,683	2,221	—	2,642,904
<b>Change in Net Assets</b>	(71,735)	6,873	—	(64,862)
<b>Net Assets at Beginning of Year</b>	1,842,286	185,210	35,000	2,062,496
<b>Net Assets at End of Year</b>	\$ 1,770,551	\$ 192,083	\$ 35,000	\$ 1,997,634

**Exhibit C**  
**Statement of Cash Flow**  
**For the year ended December 31, 2014**  
*(unaudited)*

Cash flows from operating activities:	
Change in net assets	\$ (64,862)
Adjustments to reconcile change in net assets to cash provided by operating activities	
Depreciation	11,610
Net realized and unrealized gain on investments	(5,068)
(Increase) decrease in assets:	
Accounts receivable	(139,965)
Inventory—publications	4,268
Prepaid expenses and other assets	5,431
Increase (decrease) in liabilities:	
Accounts payable and accrued expenses	120,382
Deferred rent liability	(10,060)
Accrued post-retirement benefits	38,926
<b>Net cash used by operating activities</b>	<u>(39,338)</u>
Cash flows from investing activities:	
Purchase of equipment	(16,361)
Purchase of investments	(78,644)
Sale of investments	145,394
<b>Net cash used by investing activities</b>	<u>50,389</u>
Cash flows from financing activities:	
Net borrowings on line of credit	58,000
<b>Net decrease in cash and cash equivalents</b>	69,051
<b>Cash and cash equivalents at beginning of year</b>	<u>79,700</u>
<b>Cash and cash equivalents at end of year</b>	<u><u>\$ 148,751</u></u>

## Schedule 1 Schedule of Contracts and Grants Revenue For the year ended December 31, 2014

*(unaudited)*

### Contracts

U.S. Food and Drug Administration	\$ 10,000
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<b>Total contracts</b>	<b>10,000</b>
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### Grants

Centers for Disease Control and Prevention	476,692
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National Aeronautics and Space Administration	159,745
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National Institutes of Health / National Cancer Institute	24,500
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U.S. Department of Energy	1,154,683
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U.S. Nuclear Regulatory Commission	112,529
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<b>Total grants</b>	<b>1,928,149</b>
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<b>Total contracts and grants revenue</b>	<b>\$ 1,938,149</b>
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## Schedule 2

### Schedule of Contributions & Corporate Sponsorship Revenue

#### For the year ended December 31, 2014

(unaudited)

#### Contributions

American Academy of Health Physics	\$ 1,000
American Academy of Oral and Maxillofacial Radiology	5,000
American Association of Physicists in Medicine	15,400
American College of Radiology Foundation	25,000
American Osteopathic College of Radiology	275
American Registry of Radiologic Technologists	6,000
American Roentgen Ray Society*	7,500
American Society for Radiation Oncology	3,000
American Society of Radiologic Technologists	6,000
Council on Radionuclides and Radiopharmaceuticals	2,000
Health Physics Society	12,430
Individuals	5,871
Landauer, Inc.	3,000
Lillian and Robert Brent Fund	1,500
National Electrical Manufacturers Association	5,000
Radiological Society of North America	25,000
Society for Cardiovascular Angiography and Interventions Foundation	5,000
Society of Interventional Radiology	5,000
Society of Nuclear Medicine and Molecular Imaging*	2,500
Society of Pediatric Radiology	500
<b>Total contributions</b>	<b>\$ 136,976</b>

#### Corporate Sponsors

3M	\$ 5,000
Landauer, Inc.	10,000
Nuclear Energy Institute*	10,000
<b>Total Corporate Sponsors</b>	<b>\$ 25,000</b>

## Appendix 2. Publications

### Distribution of NCRP Publications

(during the period May 16, 1931 through December 31, 2014)

No.	Title and Year of Publication	Number of Copies Distributed				
		Government Printing Office <sup>a</sup>	NCRP Publications <sup>b</sup>		Total NCRP Publications	All Sources Combined
			2014			
		Hardcopy	E-Pub			
<b>NCRP Reports</b>						
175	Decision Making for Late-Phase Recovery from Major Nuclear or Radiological Incidents (2014)	__d	0	0	0	0
174	Preconception and Prenatal Radiation Exposure: Health Effects and Protective Guidance (2013)	__d	68	59	324	324
173	Investigation of Radiological Incidents (2012)	__d	21	17	256	256
172	Reference Levels and Achievable Doses in Medical and Dental Imaging: Recommendations for the United States (2012)	__d	61	72	543	543
171	Uncertainties in the Estimation of Radiation Risks and Probability of Disease Causation (2012)	__d	24	24	286	286
170	Second Primary Cancers and Cardiovascular Disease After Radiation Therapy (2011)	__d	15	11	244	244
169	Design of Effective Radiological Effluent Monitoring and Environmental Surveillance Programs (2010)	__d	16	9	220	220
168	Radiation Dose Management for Fluoroscopically-Guided Interventional Medical Procedures (2010)	__d	25	31	777	777
167	Potential Impact of Genetic Susceptibility and Previous Radiation Exposure on Radiation Risk for Astronauts (2010)	__d	4	1	166	166
166	Population Monitoring and Radionuclide Decorporation Following a Radiological or Nuclear Incident (2010)	__d	8	6	331	331
165	Responding to a Radiological or Nuclear Terrorism Incident: A Guide for Decision Makers (2010)	__d	22	161	918	918
164	Uncertainties in Internal Radiation Dosimetry (2009)	__d	0	14	184	184
163	Radiation Dose Reconstruction: Principles and Practices (2009)	__d	14	8	363	363
162	Self Assessment of Radiation-Safety Programs (2009)	__d	9	15	550	550

No.	Title and Year of Publication	Number of Copies Distributed				
		Government Printing Office <sup>a</sup>	NCRP Publications <sup>b</sup>		Total NCRP Publications	All Sources Combined
			2014			
			Hardcopy	E-Pub		
161	Management of Persons Contaminated with Radionuclides (2009)	__d	18	39	1,282	1,282
160	Ionizing Radiation Exposure of the Population of the United States (2009)	__d	65	24	1,635	1,635
159	Risk to the Thyroid from Ionizing Radiation (2008)	__d	2	9	293	293
158	Uncertainties in the Measurement and Dosimetry of External Radiation (2007)	__d	2	7	718	718
157	Radiation Protection in Educational Institutions (2007)	__d	2	2	866	866
156	Development of a Biokinetic Model for Radionuclide-Contaminated Wounds and Procedures for Their Assessment, Dosimetry and Treatment (2006)	__d	3	8	790	790
155	Management of Radionuclide Therapy Patients (2006)	__d	8	12	1,163	1,163
154	Cesium-137 in the Environment: Radioecology and Approaches to Assessment and Management (2006)	__d	0	5	595	595
153	Information Needed to Make Radiation Protection Recommendations for Space Missions Beyond Low-Earth Orbit (2006)	__d	1	6	722	722
152	Performance Assessment of Near-Surface Facilities for Disposal of Low-Level Radioactive Waste (2005)	__d	0	0	585	585
151	Structural Shielding Design and Evaluation for Megavoltage X- and Gamma-Ray Radiotherapy Facilities (2005)	__d	45	48	3,569	3,569
150	Extrapolation of Radiation-Induced Cancer Risks from Nonhuman Experimental Systems to Humans (2005)	__d	1	2	722	722
149	A Guide to Mammography and Other Breast Imaging Procedures (2004)	__d	3	3	1,172	1,172
148	Radiation Protection in Veterinary Medicine (2004)	__d	10	15	1,241	1,241
147	Structural Shielding Design for Medical X-Ray Imaging Facilities (2004)	__d	60	55	4,478	4,478
	Compact disk version of Report No. 147	__d	0	0	143	143
146	Approaches to Risk Management in Remediation of Radioactively Contaminated Sites (2004)	__d	3	2	1,112	1,112
145	Radiation Protection in Dentistry (2003)	__d	16	47	2,365	2,365
144	Radiation Protection for Particle Accelerator Facilities (2003)	__d	14	22	2,240	2,240
143	Management Techniques for Laboratories and Other Small Institutional Generators to Minimize Off-Site Disposal of Low-Level Radioactive Waste (2003)	__d	0	0	734	734

No.	Title and Year of Publication	Number of Copies Distributed				
		Government Printing Office <sup>a</sup>	NCRP Publications <sup>b</sup>		Total NCRP Publications	All Sources Combined
			2014			
			Hardcopy	E-Pub		
142	Operational Radiation Safety Program for Astronauts in Low-Earth Orbit: A Basic Framework (2002)	__d	0	2	1,158	1,158
141	Managing Potentially Radioactive Scrap Metal (2002)	__d	0	4	1,245	1,245
140	Exposure Criteria for Medical Diagnostic Ultrasound: II. Criteria Based on All Known Mechanisms (2002)	__d	3	2	822	822
139	Risk-Based Classification of Radioactive and Hazardous Chemical Wastes (2002)	__d	0	1	995	995
138	Management of Terrorist Events Involving Radioactive Material (2001)	__d	13	5	7,606	7,606
137	Fluence-Based and Microdosimetric Event-Based Methods for Radiation Protection in Space (2001)	__d	1	0	781	781
136	Evaluation of the Linear-Nonthreshold Dose-Response Model for Ionizing Radiation (2001)	__d	1	10	1,393	1,393
135	Liver Cancer Risk from Internally-Deposited Radionuclides (2001)	__d	0	0	1,120	1,120
134	Operational Radiation Safety Training (2000)	__d	1	4	1,357	1,357
133	Radiation Protection for Procedures Performed Outside the Radiology Department (2000)	__d	3	9	1,715	1,715
132	Radiation Protection Guidance for Activities in Low-Earth Orbit (2000)	__d	0	5	1,043	1,043
131	Scientific Basis for Evaluating the Risks to Populations from Space Applications of Plutonium (2001)	__d	0	0	803	803
130	Biological Effects and Exposure Limits for “Hot Particles” (1999)	__d	1	2	1,143	1,143
129	Recommended Screening Limits for Contaminated Surface Soil and Review of Factors Relevant to Site-Specific Studies (1999)	__d	1	6	1,690	1,690
128	Radionuclide Exposure of the Embryo/Fetus (1998)	__d	3	2	1,609	1,609
127	Operational Radiation Safety Program (1998)	__d	53	12	2,431	2,431
126	Uncertainties in Fatal Cancer Risk Estimates Used in Radiation Protection (1997)	__d	0	1	1,896	1,896
125	Deposition, Retention and Dosimetry of Inhaled Radioactive Substances (1997)	__d	0	2	2,566	2,566
124	Sources and Magnitude of Occupational and Public Exposures from Nuclear Medicine Procedures (1996)	__d	2	7	3,203	3,203
123	Screening Models for Releases of Radionuclides to Atmosphere, Surface Water, and Ground (1996)	__d	0	15	3,204	3,204



No.	Title and Year of Publication	Number of Copies Distributed				
		Government Printing Office <sup>a</sup>	NCRP Publications <sup>b</sup>		Total NCRP Publications	All Sources Combined
			2014			
			Hardcopy	E-Pub		
122	Use of Personal Monitors to Estimate Effective Dose Equivalent and Effective Dose to Workers for External Exposure to Low-LET Radiation (1995)	__d	5	12	3,358	3,358
121	Principles and Application of Collective Dose in Radiation Protection (1995)	__d	2	5	2,469	2,469
120	Dose Control at Nuclear Power Plants (1994)	__d	1	1	3,007	3,007
119	A Practical Guide to the Determination of Human Exposure to Radiofrequency Fields (1993)	__d	2	6	3,516	3,516
118	Radiation Protection in the Mineral Extraction Industry (1993)	__d	1	1	2,645	2,645
117	Research Needs for Radiation Protection (1993)	__d	1	0	1,956	1,956
116	Limitation of Exposure to Ionizing Radiation (1993)	__d	13	18	7,294	7,294
115	Risk Estimates for Radiation Protection (1993)	__d	7	4	3,187	3,187
114	Maintaining Radiation Protection Records (1992)	__d	2	1	2,469	2,469
113	Exposure Criteria for Medical Diagnostic Ultrasound: I. Criteria Based on Thermal Mechanisms (1992)	__d	0	0	3,287	3,287
112	Calibration of Survey Instruments Used in Radiation Protection for the Assessment of Ionizing Radiation Fields and Radioactive Surface Contamination (1991)	__d	3	10	3,852	3,852
111	Developing Radiation Emergency Plans for Academic, Medical and Industrial Facilities (1991)	__d	1	0	4,082	4,082
110	Some Aspects of Strontium Radiobiology (1991)	__d	0	1	2,568	2,568
109	Effects of Ionizing Radiation on Aquatic Organisms (1991)	__d	0	3	2,209	2,209
108	Conceptual Basis for Calculations of Absorbed-Dose Distributions (1991)	__d	1	2	3,139	3,139
107	Implementation of the Principle of As Low As Reasonably Achievable (ALARA) for Medical and Dental Personnel (1990)	__d	2	10	3,396	3,396
106	Limit for Exposure to "Hot Particles" on the Skin (1990)	__d	1	2	2,886	2,886
105	Radiation Protection for Medical and Allied Health Personnel (1989)	__d	0	12	6,832	6,832
104	The Relative Biological Effectiveness of Radiations of Different Quality (1990)	__d	0	1	2,417	2,417
103	Control of Radon in Houses (1989)	__d	1	1	3,767	3,767
102	Medical X-Ray, Electron Beam and Gamma-Ray Protection for Energies up to 50 MeV (Equipment Design, Performance and Use) (1989)	__d	10	16	7,818	7,818
101	Exposure of the U.S. Population from Occupational Radiation (1989)	__d	0	0	4,163	4,163

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		Government Printing Office <sup>a</sup>	NCRP Publications <sup>b</sup>		Total NCRP Publications	All Sources Combined
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100	Exposure of the U.S. Population from Diagnostic Medical Radiation (1989)	__d	1	1	4,983	4,983
99	Quality Assurance for Diagnostic Imaging (1988)	__d	2	14	4,858	4,858
98	Guidance on Radiation Received in Space Activities (1989)	__d	0	0	3,405	3,405
97	Measurement of Radon and Radon Daughters in Air (1988)	__d	0	8	4,248	4,248
96	Comparative Carcinogenicity of Ionizing Radiation and Chemicals (1989)	__d	0	0	4,096	4,096
95	Radiation Exposure of the U.S. Population from Consumer Products and Miscellaneous Sources (1987)	__d	2	6	4,279	4,279
94	Exposure of the Population in the United States and Canada from Natural Background Radiation (1987)	__d	0	4	4,429	4,429
93	Ionizing Radiation Exposure of the Population of the United States (1987)	__d	1	2	7,389	7,389
92	Public Radiation Exposure from Nuclear Power Generation in the United States (1987)	__d	0	1	3,690	3,690
91	Recommendations on Limits for Exposure to Ionizing Radiation (1987)	__d	0	0	8,486	8,486
90	Neptunium: Radiation Protection Guidelines (1988)	__d	0	1	2,907	2,907
89	Genetic Effects from Internally Deposited Radionuclides (1987)	__d	0	2	3,967	3,967
88	Radiation Alarms and Access Control Systems (1986)	__d	0	3	4,813	4,813
87	Use of Bioassay Procedures for Assessment of Internal Radionuclide Deposition (1987)	__d	1	6	4,257	4,257
86	Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields (1986)	__d	2	5	5,304	5,304
85	Mammography—A User's Guide (1986)	__d	0	0	32,655	32,655
84	General Concepts for the Dosimetry of Internally Deposited Radionuclides (1985)	__d	0	2	4,258	4,258
83	The Experimental Basis for Absorbed-Dose Calculations in Medical Uses of Radionuclides (1985)	__d	0	1	3,551	3,551
82	SI Units in Radiation Protection and Measurements (1985)	__d	1	1	4,587	4,587
81	Carbon-14 in the Environment (1985)	__d	0	2	4,000	4,000
80	Induction of Thyroid Cancer by Ionizing Radiation (1985)	__d	0	0	4,271	4,271
79	Neutron Contamination from Medical Electron Accelerators (1984)	__d	1	11	4,839	4,839
78	Evaluation of Occupational and Environmental Exposures to Radon and Radon Daughters in the United States (1984)	__d	0	2	6,479	6,479

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		Government Printing Office <sup>a</sup>	NCRP Publications <sup>b</sup>		Total NCRP Publications	All Sources Combined
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77	Exposures from the Uranium Series with Emphasis on Radon and Its Daughters (1984)	__d	0	3	6,655	6,655
76	Radiological Assessment: Predicting the Transport, Bioaccumulation, and Uptake by Man of Radionuclides Released to the Environment (1984)	__d	0	2	6,688	6,688
75	Iodine-129: Evaluation of Release from Nuclear Power Generation (1983)	__d	0	1	5,948	5,948
74	Biological Effects of Ultrasound: Mechanisms and Clinical Implications (1983)	__d	0	1	11,227	11,227
73	Protection in Nuclear Medicine and Ultrasound Diagnostic Procedures in Children (1983)	__d	0	0	5,502	5,502
72	Radiation Protection and Measurement for Low-Voltage Neutron Generators (1983)	__d	0	0	4,448	4,448
71	Operational Radiation Safety—Training (1983)	__d	1	6	5,074	5,074
70	Nuclear Medicine—Factors Influencing the Choice and Use of Radionuclides in Diagnosis and Therapy (1982)	__d	1	2	5,416	5,416
69	Dosimetry of X-Ray and Gamma-Ray Beams for Radiation Therapy in the Energy Range 10 keV to 50 MeV (1981)	__d	0	6	5,026	5,026
68	Radiation Protection in Pediatric Radiology (1981)	__d	0	1	4,505	4,505
67	Radiofrequency Electromagnetic Fields—Properties, Quantities and Units, Biophysical Interaction and Measurements (1981)	__d	0	2	5,454	5,454
66	Mammography (1980)	__d	0	0	4,598	4,598
65	Management of Persons Accidentally Contaminated with Radionuclides (1980)	__d	0	3	18,441	18,441
64	Influence of Dose and Its Distribution in Time on Dose-Response Relationships for Low-LET Radiations (1980)	__d	0	1	5,250	5,250
63	Tritium and Other Radionuclide Labeled Organic Compounds Incorporated in Genetic Material (1979)	__d	0	1	4,329	4,329
62	Tritium in the Environment (1979)	__d	0	2	3,963	3,963
61	Radiation Safety Training Criteria for Industrial Radiography (1978)	__d	0	4	6,175	6,175
60	Physical, Chemical and Biological Properties of Radium Relevant to Radiation Protection Guidelines (1979)	__d	0	1	4,035	4,035
59	Operational Radiation Safety Program (1979)	__d	0	0	8,046	8,046
58	A Handbook of Radioactivity Measurements Procedures (1978)	__d	2	5	13,639	13,639

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57	Instrumentation and Monitoring Methods for Radiation Protection (1978)	__d	0	2	10,979	10,979
56	Radiation Exposure from Consumer Products and Miscellaneous Sources (1977)	__d	__e	0	5,905	5,905
55	Protection of the Thyroid Gland in the Event of Releases of Radioiodine (1977)	__d	0	1	6,843	6,843
54	Medical Radiation Exposure of Pregnant and Potentially Pregnant Women (1977)	__d	4	4	10,604	10,604
53	Review of NCRP Radiation Dose Limit for Embryo and Fetus in Occupationally Exposed Women (1977)	__d	__e	0	9,289	9,289
52	Cesium-137 from the Environment to Man: Metabolism and Dose (1977)	__d	0	0	4,706	4,706
51	Radiation Protection Design Guidelines for 0.1-100 MeV Particle Accelerator Facilities (1977)	__d	1	0	8,513	8,513
50	Environmental Radiation Measurements (1976)	__d	1	0	7,925	7,925
49	Structural Shielding Design and Evaluation for Medical Use of X Rays and Gamma Rays of Energies up to 10 MeV (1976)	__d	7	35	17,682	17,682
	Adjunct to NCRP Report 49 (1976)	__d	0	0	2,797	2,797
48	Radiation Protection for Medical and Allied Health Personnel (1976)	__d	__e	0	14,359	14,359
47	Tritium Measurement Techniques (1976)	__d	1	4	6,386	6,386
46	Alpha-Emitting Particles in Lungs (1975)	__d	0	0	6,088	6,088
45	Natural Background Radiation in the United States (1975)	__d	__e	0	7,296	7,296
44	Krypton-85 in the Atmosphere—Accumulation, Biological Significance, and Control Technology (1975)	__d	0	1	6,572	6,572
43	Review of the Current State of Radiation Protection Philosophy (1975)	__d	__e	0	9,722	9,722
42	Radiological Factors Affecting Decision-Making in a Nuclear Attack (1974)	__d	6	0	47,244	47,244
41	Specification of Gamma-Ray Brachytherapy Sources (1974)	__d	1	1	5,475	5,475
40	Protection Against Radiation from Brachytherapy Sources (1972)	__d	0	3	9,802	9,802
39	Basic Radiation Protection Criteria (1971)	__d	__e	0	40,393	40,393
38	Protection Against Neutron Radiation (1971)	__d	6	3	8,986	8,986
37	Precautions in the Management of Patients who have Received Therapeutic Amounts of Radionuclides (1970)	__d	0	0	17,402	17,402

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36	Radiation Protection in Veterinary Medicine (1970)	__d	0	0	7,620	7,620
35	Dental X-Ray Protection (1970)	__d	0	0	28,559	28,559
34	Medical X-Ray and Gamma-Ray Protection for Energies up to 10 MeV—Structural Shielding Design and Evaluation (1970)	__d	__e	0	17,622	17,622
33	Medical X-Ray and Gamma-Ray Protection for Energies up to 10 MeV—Equipment Design and Use (1968)	__d	__e	0	98,134	98,134
32	Radiation Protection in Educational Institutions (1966)	__d	0	0	22,362	22,362
31	Shielding for High Energy Electron Accelerator Installations (1964)	3,700	__e	0	2,697	6,397
30	Safe Handling of Radioactive Materials (1964)	24,450	7	0	9,948	34,398
29	Exposure to Radiation in an Emergency	55,705	__e	0	3,678	59,383
28	A Manual of Radioactivity Procedures (1961)	22,892	__e	0	3,665	26,557
27	Stopping Powers for Use with Cavity Chambers (1961)	4,144	0	0	3,831	7,975
26	Medical X-Ray Protection up to Three Million Volts (1961)	75,894	__e	0	27,154	103,048
25	Measurement of Absorbed Dose of Neutrons and Mixtures of Neutrons and Gamma Rays (1961)	10,790	0	0	4,083	14,873
24	Protection Against Radiations from Sealed Gamma Sources (1960)	35,710	__e	0	953	36,663
23	Measurement of Neutron Flux and Spectra for Physical and Biological Applications (1960)	11,849	0	0	3,073	14,922
22	Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure (1959)	52,526	0	0	7,446	59,972
21	Safe Handling of Bodies Containing Radioactive Isotopes (1958)	29,304	__e	0	2,352	31,656
20	Protection Against Neutron Radiation up to 30 Million Electron Volts (1957)	16,989	__e	0	353	17,342
19	Regulation of Radiation Exposure by Legislative Means (1955)	15,140	__e	0	0	15,140
18	X-Ray Protection (1955)	98,713	__e	0	0	98,713
17	Permissible Dose from External Sources of Ionizing Radiation (1954)	60,530	__e	0	2,038	62,568
16	Radioactive Waste Disposal in the Ocean (1954)	16,203	__e	0	2,664	18,867
15	Safe Handling of Cadavers Containing Radioactive Isotopes (1953)	14,486	__e	0	0	14,486
14	Protection Against Betatron-Synchrotron Radiations up to 100 Million Electron Volts (1954)	27,190	__e	0	1,710	28,900

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		Government Printing Office <sup>a</sup>	NCRP Publications <sup>b</sup>		Total NCRP Publications	All Sources Combined
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13	Protection Against Radiation from Radium, Cobalt-60 and Cesium-137 (1954)	22,785	__e	0	0	22,785
12	Recommendations for the Disposal of Carbon-14 Wastes (1953)	23,506	__e	0	2,571	26,077
11	Maximum Permissible Amounts of Radioisotopes in the Human Body and Maximum Permissible Concentrations in Air and Water (1953)	32,494	__e	0	0	32,494
10	Radiological Monitoring Methods and Instruments (1952)	59,651	__e	0	3,894	63,545
9	Recommendations for Waste Disposal of Phosphorus-32 and Iodine-131 for Medical Users (1951)	28,810	__e	0	5,682	34,492
8	Control and Removal of Radioactive Contamination in Laboratories (1951)	50,500	0	0	7,653	58,153
7	Safe Handling of Radioactive Isotopes (1949)	60,867	__e	0	0	60,867
6	Medical X-Ray Protection up to Two Million Volts (1949)	70,261	__e	0	0	70,261
5	Safe Handling of Radioactive Luminous Compounds (1941)	6,187	__e	0	0	6,187
4	Radium Protection (1938)	10,086	__e	0	0	10,086
3	X-Ray Protection (1936)	16,490	__e	0	0	16,490
2	Radium Protection (1934)	__g	__e	0	0	0
1	X-Ray Protection (1931)	1,596	__e	0	0	1,596
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### Lauriston S. Taylor Lectures

37	When Does Risk Assessment Get Fuzzy?, John E. Till (2013)	__i	__i	__i	__i
36	From the Field to the Laboratory and Back: The <i>What Ifs</i> , <i>Wows</i> , and <i>Who Cares</i> of Radiation Biology, Antone L. Brooks (2012), <i>Health Phys.</i> <b>105</b> (5), 407–421	__i	__i	__i	__i
35	What Makes Particle Radiation So Effective?, Eleanor A. Blakely (2011), <i>Health Phys.</i> <b>103</b> (5), 508–528	__i	__i	__i	__i
34	Radiation Protection and Public Policy in an Uncertain World, Charles E. Land (2010), <i>Health Phys.</i> <b>101</b> (5), 497–629 (2011)	__i	__i	__i	__i
33	Radiation Epidemiology: The Golden Age and Remaining Challenges, John D. Boice, Jr. (2009), <i>Health Phys.</i> <b>100</b> (1) 59–76 (2011)	__i	__i	__i	__i

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31	The Quest for Therapeutic Actinide Chelators, Patricia W. Durbin (2007), Health Phys. <b>95</b> , 465–492 (2008)	__i	__i	__i	__i	
30	Fifty Years of Scientific Investigation: The Importance of Scholarship and the Influence of Politics and Controversy, Robert L. Brent (2006), Health Phys. <b>93</b> , 348–379 (2007)	__i	__i	__i	__i	
29	Nontargeted Effects of Radiation: Implications for Low-Dose Exposures, John B. Little (2005), Health Phys. <b>91</b> , 416–426 (2006)	__i	__i	__i	__i	
28	Radiation Protection in the Aftermath of a Terrorist Attack Involving Exposure to Ionizing Radiation, Abel J. Gonzalez (2004), Health Phys. <b>89</b> , 418–446 (2005)	__i	__i	__i	__i	
27	The Evolution of Radiation Protection—From Erythema to Genetic Risks of Cancer ? Charles B. Meinhold (2003), Health Phys. <b>87</b> , 240–248 (2004)	__i	__i	__i	__i	
26	Developing Mechanistic Data for Incorporation into Cancer and Genetic Risk Assessments: Old Problems and New Approaches, R. Julian Preston (2002), Health Phys. <b>85</b> , 4–12 (2003)	__i	__i	__i	__i	
25	Assuring the Safety of Medical Diagnostic Ultrasound, Wesley L. Nyborg (2001), Health Phys. <b>82</b> , 578–587 (2002)	__i	__i	__i	__i	
24	Administered Radioactivity: <i>Unde Venimus Quoque Imus</i> , S. James Adelstein (2000), Health Phys. <b>80</b> , 317–324 (2001)	__i	__i	__i	__i	
23	Back to Background: Natural Radiation and Radioactivity Exposed, by Naomi H. Harley (1999), Health Phys. <b>79</b> , 121–128 (2000)	__i	__i	__i	__i	
22	From Chimney Sweeps to Astronauts: Cancer Risks in the Work Place, by Eric J. Hall (1998), Health Phys. <b>75</b> , 357–366 (1999)	__i	__i	__i	__i	
21	Radionuclides in the Body: Meeting the Challenge, by William J. Bair (1997), Health Phys. <b>73</b> , 423–432 (1998)	__i	__i	__i	__i	
20	70 Years of Radiation Genetics: Fruit Flies, Mice and Humans, by Seymour Abrahamson (1996), Health Phys. <b>71</b> , 624–633 (1997)	__i	__i	__i	__i	
19	Certainty and Uncertainty in Radiation Research, by Albrecht M. Kellerer (1995), Health Phys. <b>69</b> , 446–453 (1976)	__i	__i	__i	__i	
18	Mice, Myths and Men, by R.J. Michael Fry (1995)	__d	0	__j	512 512	

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17	Science, Radiation Protection and the NCRP, by Warren K. Sinclair (1993)	__d	0	__j	544	544
16	Dose and Risk in Diagnostic Radiology: How Big? How Little?, by Edward W. Webster (1992)	__d	0	0	1,434	1,434
15	When is a Dose Not a Dose?, by Victor P. Bond (1992)	__d	0	0	752	752
14	Radiation Protection and the Internal Emitter Saga, by J. Newell Stannard (1990)	__d	0	0	354	354
13	Radiobiology and Radiation Protection: The Past Century and Prospects for the Future, by Arthur C. Upton (1989)	__d	1	0	580	580
12	How Safe is Safe Enough?, by Bo Lindell (1988)	__d	1	0	1,010	1,010
11	How to Be Quantitative about Radiation Risk Estimates, by Seymour Jablon (1988)	__d	0	0	1,023	1,023
10	Biological Effects of Non-Ionizing Radiations: Cellular Properties and Interactions, by Herman P. Schwan (1987)	__d	1	0	1,692	1,692
9	Truth (and Beauty) in Radiation Measurement, by John H. Harley (1985)	__d	0	0	765	765
8	Limitation and Assessment in Radiation Protection, by Harald H. Rossi (1984)	__d	1	0	1,530	1,530
7	The Human Environment—Past, Present and Future, by Merrill Eisenbud (1983)	__d	0	0	1,034	1,034
6	Ethics, Trade-Offs and Medical Radiation, by Eugene L. Saenger (1982)	__d	1	0	1,250	1,250
5	How Well Can We Assess Genetic Risk? Not Very, by James F. Crow (1981)	__d	0	0	1,404	1,404
4	From “Quantity of Radiation” and “Dose” to “Exposure” and “Absorbed Dose”—An Historical Review, by Harold O. Wyckoff (1980)	__d	1	0	1,852	1,852
3	Radiation Protection—Concepts and Trade Offs, by Hymer L. Friedell (1979)	__d	1	0	2,085	2,085
2	Why be Quantitative about Radiation Risk Estimates? by Sir Edward E. Pochin	__d	0	__j	2,338	2,338
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Total Lectures Distributed		0	8	0	21,672	21,672



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<b>NCRP Annual Meeting Proceedings</b>						
35	Radiation Dose and the Impacts on Exposed Populations, Proceedings of the Forty-Ninth Annual Meeting held March 11–12, 2013. Health Phys. <b>106</b> (2), 145–329 (2014)	__i	__i	__i	__i	
34	Emerging Issues in Radiation Protection in Medicine, Emergency Response, and the Nuclear Fuel Cycle, Proceedings of the Forty-Eighth Annual Meeting held March 12–13, 2012. Health Phys. <b>105</b> (5), 401–468 (2013)	__i	__i	__i	__i	
33	Scientific and Policy Challenges of Particle Radiations in Medical Therapy and Space Missions, Proceedings of the Forty-Seventh Annual Meeting held March 78, 2011. Health Phys. <b>103</b> (5), 529–684 (2012)	__i	__i	__i	__i	
32	Communication of Radiation Benefits and Risks in Decision Making, Proceedings of the Forty-Sixth Annual Meeting held March 8–9, 2010. Health Phys. <b>101</b> (5), 497–629 (2011)	__i	__i	__i	__i	
31	Future of Nuclear Power Worldwide: Safety, Health and Environment, Proceedings of the Forty-Fifth Annual Meeting held March 2–3, 2009. Health Phys. <b>100</b> (1), 2–112 (2011)	__i	__i	__i	__i	
30	Low Dose and Low Dose-Rate Radiation Effects and Models, Proceedings of the Forty-Fourth Annual Meeting held April 14–15, 2008. Health Phys. <b>97</b> (5), 373–541 (2009)	__i	__i	__i	__i	
29	Advances in Radiation Protection in Medicine, Proceedings of the Forty-Third Annual Meeting held April 16–17, 2007. Health Phys. <b>95</b> (5), 461–686 (2008)	__i	__i	__i	__i	
28	Chernobyl at Twenty, Proceedings of the Forty-Second Annual Meeting held April 3–4, 2006. Health Phys. <b>93</b> (5), 345–595 (2007)	__i	__i	__i	__i	
27	Managing the Disposition of Low-Activity Radioactive Materials, Proceedings of the Forty-First Annual Meeting held March 30–31, 2005. Health Phys. <b>91</b> , 413–536 (2006)	__i	__i	__i	3 3	
26	Advances in Consequence Management for Radiological Terrorism Events, Proceedings of the Fortieth Annual Meeting held April 14–15, 2004. Health Phys. <b>89</b> (5), 415–588 (2005)	__i	__i	__i	1 1	
	Compact disk version of Proceedings No. 26	__i	0	0	102 102	
25	Radiation Protection at the Beginning of the 21st Century—A Look Forward, Proceedings of the Thirty-Ninth Annual Meeting held April 9–10, 2004. Health Phys. <b>87</b> (3), 249–318 (2004)	__i	__i	__i	__i	

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23	Fallout from Atmospheric Nuclear Tests—Impact on Science and Society, Proceedings of the Thirty-seventh Annual Meeting held April 4–5, 2001. Health Phys. <b>82</b> , 573–748 (2002)	__i	__i	__i	__i	
22	Ionizing Radiation Science and Protection in the 21st Century, Proceedings of the Thirty-sixth Annual Meeting held April 5–6, 2000. Health Phys. <b>80</b> , 317–402 (2001)	__i	__i	__i	__i	
21	Radiation Protection in Medicine: Contemporary Issues, Proceedings of the Thirty-fifth Annual Meeting held April 7–8, 1999 (1999)	__d	1	0	205	205
	Compact disk version of Proceedings No. 21	__d	0	0	82	82
20	Cosmic Radiation Exposure of Airline Crews, Passengers and Astronauts, Proceedings of the Thirty-fourth Annual Meeting held on April 1–2, 1998, Health Phys. <b>79</b> , 466–613 (2000)	__i	__i	__i	0	__i
19	The Effects of Pre- and Postconception Exposure to Radiation, Proceedings of the Thirty-third Annual Meeting held on April 2–3, 1997, Teratology <b>59</b> , 181–317 (1999)	__i	__i	__i	0	__i
18	Implications of New Data on Radiation Cancer Risk, Proceedings of the Thirty-second Annual Meeting held April 3–4, 1996 (1997)	__d	1	__j	384	384
17	Environmental Dose Reconstruction and Risk Implications, Proceedings of the Thirty-first Annual Meeting held April 12–13, 1995 (1996)	__d	0	__j	428	428
16	Extremely-Low-Frequency Electromagnetic Fields: Issues in Biological Effects and Public Health, Proceedings of the Thirtieth Annual Meeting held on April 6–7, 1994 [not published]	__d	0	__j	0	0
15	Radiation Science and Societal Decision Making, Proceedings of the Twenty-Ninth Annual Meeting held April 7–8, 1993 (1994)	__d	0	__j	565	565
14	Radiation Protection in Medicine, Proceedings of the Twenty-Eighth Annual Meeting held April 1–2, 1992 (1993)	__d	0	__j	847	847
13	Genes, Cancer and Radiation Protection, Proceedings of the Twenty-Seventh Annual Meeting held April 3–4, 1991 (1992)	__d	0	__j	690	690
12	Health and Ecological Implications of Radioactively Contaminated Environments, Proceedings of the Twenty-Sixth Annual Meeting held April 4–5, 1990 (1991)	__d	0	__j	917	917

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11	Radiation Protection Today—The NCRP at Sixty Years, Proceedings of the Twenty-Fifth Annual Meeting held April 4–5, 1990 (1990)	__d	0	7	661	661
10	Radon, Proceedings of the Twenty-Fourth Annual Meeting held March 30–31, 1988 (1989)	__d	0	__j	1,454	1,454
9	New Dosimetry at Hiroshima and Nagasaki and Its Implications for Risk Estimates, Proceedings of the Twenty-Third Annual Meeting held April 8–9, 1987 (1989)	__d	0	__j	748	748
8	Nonionizing Electromagnetic Radiations and Ultrasound, Proceedings of the Twenty-Second Annual Meeting held April 2–3, 1986 (1988)	__d	0	__j	1,025	1,025
7	Radioactive Waste, Proceedings of the Twenty-First Annual Meeting held April 3–4, 1985 (1986)	__d	0	__j	1,421	1,421
6	Some Issues Important in Developing Basic Radiation Protection Recommendations, Proceedings of the Twentieth Annual Meeting held April 4–5, 1984 (1985)	__d	0	__j	1,537	1,537
5	Environmental Radioactivity, Proceedings of the Nineteenth Annual Meeting held April 6–7, 1983 (1984)	__d	0	__j	3,976	3,976
4	Radiation Protection and New Medical Diagnostic Approaches, Proceedings of the Eighteenth Annual Meeting held April 6–7, 1982 (1983)	__d	0	__j	1,210	1,210
3	Critical Issues in Setting Radiation Dose Limits, Proceedings of the Seventeenth Annual Meeting held April 8–9, 1981 (1982)	__d	0	__j	1,667	1,667
2	Quantitative Risk in Standards Setting, Proceedings of the Sixteenth Annual Meeting held April 2–3, 1980 (1981)	__d	__e	__j	2,158	2,158
1	Perceptions of Risk, Proceedings of the Fifteenth Annual Meeting held March 14–15, 1979 (1980)	__d	0	__j	1,944	1,944
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### NCRP Commentaries

23	Radiation Protection for Space Activities: Supplement to Previous Recommendations (2014)	__d	20	4	24	24
22	Radiological Health Protection Issues Associated With Use of Active Detection Technology Systems for Detection of Radioactive Threat Materials (2011)	__d	3	2	67	67
21	Radiation Protection in the Application of Active Detection Technologies (2011)	__d	2	2	81	81
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18	Biological Effects of Modulated Radiofrequency Fields (2003)	__d	1	2	454	454
17	Pulsed Fast Neutron Analysis System Used in Security Surveillance (2003)	__d	0	0	486	486
16	Screening of Humans for Security Purposes Using Ionizing Radiation Scanning Systems (2003)	__d	0	4	634	634
15	Evaluating the Reliability of Biokinetic and Dosimetric Models and Parameters Used to Assess Individual Doses for Risk Assessment Purposes (1998)	__d	0	2	659	659
14	A Guide for Uncertainty Analysis in Dose and Risk Assessments Related to Environmental Contamination (1996)	__d	0	1	1,662	1,662
13	An Introduction to Efficacy in Diagnostic Radiology and Nuclear Medicine (Justification of Medical Radiation Exposure) (1995)	__d	0	1	1,398	1,398
12	Radiation Exposure and High-Altitude Flight (1995)	__d	0	1	559	559
11	Dose Limits for Individuals Who Receive Exposure from Radionuclide Therapy Patients (1995)	__d	0	5	1,321	1,321
10	Advising the Public about Radiation Emergencies: A Document for Public Comment (1994)	__d	0	1	1,173	1,173
9	Considerations Regarding the Unintended Radiation Exposure of the Embryo, Fetus or Nursing Child (1994)	__d	0	0	1,390	1,390
8	Uncertainty in NCRP Screening Models Relating to Atmospheric Transport, Deposition and Uptake by Humans (1993)	__d	1	1	912	912
7	Misadministration of Radioactive Material in Medicine—Scientific Background (1991)	__d	0	0	1,084	1,084
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5	Review of the Publication, “Living Without Landfills” (1989)	__d	0	0	3,104	3,104
4	Guidelines for the Release of Waste Water from Nuclear Facilities with Special Reference to the Public Health Significance of the Proposed Release of Treated Waste Waters at Three Mile Island (1987)	__d	0	0	859	859
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2	Radioactive and Mixed Waste—Risk as a Basis for Waste Classification, Proceedings of a Symposium held November 9, 1994 (1995)	__d	0	0	463	463
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