Annual Report

2017

Year in Review

NCRP

Contents

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.

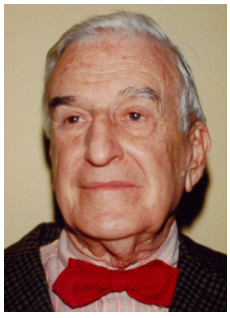
Participants in the Council's work are the Council members and members of scientific, advisory and administrative committees. Council members are selected on the basis of their scientific expertise and serve as individuals, not as representatives of any particular organization. The scientific committees, 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.

NCRP

Mission

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

Presidents



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) strives to address national needs in radiation protection. It continues to be exciting and visionary times! The remarkable productivity of NCRP is a credit to the brilliance of Council members and those serving on scientific committees (SCs). New scientific ideas are overflowing: our imagination remains unbounded and the constraints are only financial. This will be my last of six President's Messages (2012 to 2017). It's been a great ride, but we'll start with a few highlights for 2017:

- Council Committee 1 (CC 1), **Radiation Protection Guidance for the United States**, completed its important charge of providing a new look at radiation protection recommendations for the United States. The final report will be available soon as NCRP Report No. 180, *Management of Exposure to Ionizing Radiation: Radiation Protection Guidance for the United States (2018)*. This sentinel document replaces NCRP Report No. 116 (1993) and was made possible by financial support from the U.S. Nuclear Regulatory Commission (NRC) (Chair: Kenneth R. Kase; Co-Chair: Donald A. Cool).
- CC 2, **Meeting the Needs of the Nation for Radiation Protection**, continues and expands upon our "Where Are the Radiation Professionals?" (WARP) initiative [NCRP Statement No. 12 (2015)]. The Committee conducting this critical activity for our future has undergone reorganization, and the writing teams have made substantial progress, with a final draft of a commentary expected by the end of this year (Chair: Wayne D. Newhauser; Co-Chair: Jacqueline P. Williams).
- **NCRP Report No. 176, *Radiation Safety Aspects of Nanotechnology*** (2017), was published (Chair: Mark D. Hoover; Vice Chair: David S. Myers).
- **NCRP Report No. 179, *Guidance for Emergency Response Dosimetry*** (2017), was published (Co-Chairs: Steven V. Musolino and Adela Salame-Alfie).
- The president wrote 11 "**Boice Report**" columns on "all things radiation" for the *Health Physics News*, made 13 invited presentations to international, national, scientific and university audiences and had 10 publications in the scientific literature. Publications included articles on Fukushima, the Million Person Study (MPS), research needs in going to Mars, the linear-nonthreshold model for radiation protection, classifying radiation-related heart diseases, chromosomal abnormalities among children of cancer survivors, and mitochondrial DNA modeling from cancer survivors and their children.
- **Funds to support SCs** have been provided during 2017 by agencies and organizations including:
  - Centers for Disease Control and Prevention (CDC) (SC 1-20, SC 1-26, SC 2-6, SC 4-9, SC 5-2, SC 6-9, and SC 6-10);
  - Health Physics Society (HPS) (SC 2-7)
  - National Aeronautics and Space Administration (NASA) (SC 1-24P2 and MPS);
  - NRC (CC 1, SC 1-25, and MPS).
  - U.S. Department of Energy (DOE) (SC 2-6, SC 2-7, and MPS);
  - U.S. Department of Homeland Security (DHS) (SC 3-1P1 and SC 3-1P2); and
  - U.S. Navy (MPS).

- The **MPS** is recognized around the world as the major investigation to fill gaps in understanding the health effects of exposures received gradually over time. Over the years, support has been received from many agencies [Defense Threat Reduction Agency (DTRA), NASA, National Cancer Institute (NCI), NRC, U.S. Department of Defense (DOD), DOE, U.S. Environmental Protection Agency (EPA), U.S. Navy, and in-kind support from the U.S. Department of Veterans Affairs (VA) and military services]. Unfortunately, funding has been reduced substantially or eliminated. Accordingly, there remains a serious need to secure adequate funding for completing the MPS before this window of opportunity closes.
- Dr. Boice presented a **plenary talk on** "**NCRP: Current and Future Activities**" at the 2017 midyear meeting of HPS in Bethesda, Maryland. This was followed by an NCRP-organized two-part **special session on** "**Nuclear Power and Radiation Protection.**" A summary of the Special Session, written by Dr. Donald Cool, was published in the March 2017 issue of *Health Physics News*.
- **The Proceedings of the 2016 NCRP Annual Meeting on "Meeting the Needs of the Nation for Radiation Protection"** were published in the February 2017 issue of *Health Physics* [112(2), 111–234, 2017].
- **The Proceedings of the 2017 NCRP Annual Meeting on "Assessment of National Efforts in Emergency Preparedness for Nuclear Terrorism: Is There a Need for Realignment to Close Remaining Gaps?"** were published in the February 2018 issue of *Health Physics* [114(2), 109–260, 2018].
- At the HPS 2017 Annual Meeting in Raleigh, North Carolina, a **special session on** "**Low Dose Occupational Epidemiology: The Importance of Dosimetry and Statistics in the Million Person Study and the Mallinckrodt Chemical Works (MCWL) Cohort"** focused on NCRP/MPS work. In addition, a "**Special Session: NCRP/Nanotechnology**" highlighted the work of NCRP SC 2-6 on Radiation Safety Aspects of Nanotechnology, with presentations by members of that Committee and Dr. Held. Papers on the MPS session were published in the April 2018 issue of *Health Physics*.
- Papers from the **Bill Morgan Memorial Symposia**, two joint Radiation Research Society (RRS)/ NCRP symposia at the 2016 RRS Annual Meeting, including presentations about the work of SC 1-25, were published in the October 2017 issue of the *International Journal of Radiation Biology*, with guest editors including Drs. Boice and Held, as well as a paper and summaries of the sessions by Drs. Boice and Held, respectively.
- **Dr. Held presented a talk on "Guidance on Radiation Dose Limits for the Lens of the Eye"** at the 2017 NRC Regulatory Information Conference (RIC) in March 2017, filling in for Dr. Larry Dauer who was prevented from attending by a spring snowstorm.
- One change in Program Area Committee (PAC) leadership occurred in 2017. **Dr. Bruce Napier became Scientific Vice President (SVP) of PAC 5**, replacing Dr. S.Y. Chen who had been SVP for several years.
- **SC 1-20** completed responses to Council comments and revised and finalized their report on **Evaluation of the Relative Effectiveness of Low-Energy Photons and Electrons in Inducing Cancer in Humans** (Chair: Steven L. Simon). The report has gone to press and should be available soon.
- **SC 1-24 (Phase II)** is preparing a report on **Radiation Exposures in Space and the Potential for Central Nervous System Effects**. The Committee has met several times and the draft report has been sent for PAC review (Co-Chairs: Leslie A. Braby and Jacob Raber).
- **SC 1-25** on **Recent Epidemiologic Studies and Implications for the Linear-Nonthreshold Model for Radiation Protection** (Chair: Roy E. Shore; Co-Chair: Lawrence T. Dauer) was formed in 2015 to provide guidance to CC 1. The commentary prepared by this Committee was published

in 2018 as Commentary No. 27. Further, papers were submitted to the *Health Physics* Journal as part of the 2018 proceedings and to the *Journal of Radiological Protection* as a memorandum from members of an NCRP committee.

- **SC 1-26** on **Approaches for Integrating Radiation Biology and Epidemiology for Enhancing Low-Dose Risk Assessment** is developing a report expanding NCRP Commentary No. 24 (2015) (Chair: R. Julian Preston; Co-Chair: Werner Rühm). The report should be completed by the end of 2018.
- **SC 2-7** has completed a draft report on **Radiation Safety of Sealed Radiation Sources** (Chair: Kathryn H. Pryor); the report has undergone Council review and has been revised appropriately. It is in the publication process and will be out in 2018.
- **SC 3-1** published **NCRP Report No. 179, *Guidance for Emergency Response Dosimetry***, in 2017 addressing the complex **issues of dosimetry for emergency responders** in the event of an improvised nuclear device being detonated (Co-Chairs: Stephen V. Musolino and Adela Salame-Alfie). SC 3-1Phase II (with the same Co-Chairs) has begun work on the follow-on commentary to provide implementation guidance. It should be completed by early 2019.
- **SC 4-5** completed **NCRP Report No. 177 entitled *Radiation Protection in Dentistry and Oral & Maxillofacial Imaging***. The report is being edited for publication (Co-Chairs: Mel L. Kantor and Alan G. Lurie).
- **SC 4-7** is preparing a report on **Evaluating and Communicating Radiation Risks for Studies Involving Human Subjects: Guidance for Researchers and Reviewing Boards** (Chair: Julie E.K. Timins). The report has undergone Council review, has been revised, and is in final revision stage.
- **SC 4-8** continues its work on **Improving Patient Dose Utilization in Computed Tomography** (Co-Chairs: Mannudeep K.S. Kalra and Edwin M. Leidholdt, Jr.). Several drafts have been completed and closure should be within the year.
- **SC 4-9** on **Medical Exposure of Patients in the United States** has made substantial progress this year on preparing a report to evaluate changes in medical x-ray exposure to patients since NCRP Report No. 160 (2009) (Chair: Fred A. Mettler, Jr.; Co-Chair: Mahadevappa Mahesh). The target date for completion is the end of 2018, early 2019.
- **SC 5-2** is addressing **Radiation Protection for Naturally Occurring Radioactive Materials (NORM) and Technologically Enhanced NORM (TENORM) from Oil and Gas Recovery** (Chair: William E. Kennedy, Jr.). Funding from CDC has accelerated progress and a commentary is planned in early 2019.
- **SC 6-9** has completed a comprehensive report on the complex radiation dosimetry issues for U.S. radiation workers and nuclear test participants, entitled ***Deriving Organ Doses and Their Uncertainty for Epidemiologic Studies (with a focus on the One Million U.S. Workers and Veterans Study of Low-Dose Radiation Health Effects)*** (Chair: André Bouville; Co-Chair: Richard E. Toohey). The report (**Report No. 178**) is about to go to press.
- **SC 6-11** on **Dosimetry Guidance for Medical Radiation Workers with a Focus on Lung Dose Reconstruction** (Chair: R. Craig Yoder and Co-Chair: Lawrence T. Dauer) will prepare a commentary that describes the optimum approaches for estimating lung dose (as well as brain and other organ doses) for an epidemiologic study of medical radiation workers, 1960 to 1994, in cooperation with NASA. SC 6-11 has met several times.
- **SC 6-12** in preparing a commentary on **Development of Models for Brain Dosimetry for Internally Deposited Radionuclides** (Chair: Richard Leggett). The commentary will describe new approaches to obtain dose to the brain following intakes of radionuclides. This will be in conjunction

with DOE and NASA grants to provide new knowledge on brain (and lung) dosimetry. Several abstracts have been submitted to the 2018 "International Conference on the Health Effects of Incorporated Radiation."

- **SC 6-10** will be formed and begin in 2018. It is entitled **Radiation Doses to Airline Crews.** A commentary will be prepared.
- **SC 1-27** entitled **Evaluation of Sex-Specific Differences in Lung Cancer Radiation Risks and Recommendations for Use in Transfer Models** will be initiated shortly (Chair: Michael Weil). Because of NASA's interest in the sex-specific differences in radiation-induced lung cancer, NCRP was asked to conduct an epidemiologic study to address this issue and to evaluate optimum ways of incorporating the sex-specific lung cancer risks into lifetime risk projection models. All organs, however, will be evaluated but the emphasis will be on the lung.

The President has met and discussed **opportunities for partnership** with personnel at the American College of Radiology, CDC, the Conference on Radiation Control Program Directors (CRCPD), DOD, Harvard University, HPS, NASA, RRS, U.S. Navy, NRC, 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 continue to be overwhelmed by two tidal waves of societal change:** the 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.

NCRP continues to support the passing of legislation, such as **H.R. 4675**, the Low-Dose Radiation Research Act of 2017, which seeks to develop a strategy for health research on low-dose radiation to meet national needs. The Bill would provide over $100 million to rejuvenate low-dose radiation research in the United States and allow the nation to regain its premier leadership in the world. Unfortunately, at this time, no senator has sponsored the Bill so that it appears dormant. Other bills are, however, being considered but not as prescribed (detailed or focused) as H.R. 4675. Nonetheless, Senate **Bill S2503** is a step in the right direction: **"**The Director shall carry out a research program on low-dose radiation." The related **House Bill H.R. 589** expanded a bit: "The office shall carry out a low-dose radiation research program to enhance the scientific knowledge of, and reduce uncertainties associated with, the effects of exposure to low-dose radiation to inform improved risk-management methods."

NCRP was a contributor to the **U.S. Government Accountability Office (GAO) Report on *Low Dose Radiation: Interagency Collaboration on Planning Research Could Improve Information on Health Effects*** (GAO 17-546; September 2017). The GAO report highlighted the need for federal support for funding low-level radiation research and also the MPS, describing its funding history and the need for continued funding by government agencies.

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 published a commentary on the ***Health Effects of Low Doses of Radiation: Perspectives on Integrating Radiation Biology and Epidemiology*** (2015). SC 1-26 is continuing this initiative and is preparing a new commentary on **Approaches for Integrating Radiation Biology and Epidemiology for Enhancing Low-Dose Risk Assessment**. There are critical research needs for evaluating low-dose radiation health effects (*i.e.*, to bridge the gap between molecules and the entire human body). Biologically based models coupled with high-quality, large-scale epidemiologic data such as those coming from the MPS are one way forward. The public awareness as

reflected in Congressional bills and GAO reports on the gaps in radiation knowledge further accentuates the urgency for developing and strengthening 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 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. In 2007 the 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 protection regulations. **NCRP has gone beyond the ICRP in providing guidance for the United States in Report No. 180.**

Our **financial situation**, in my view, has remained around a B–: okay (we can keep the lights on and address important protection issues facing the nation) but long-term funding possibilities, while improving somewhat, are still uncertain and make long-term planning a challenge. In addition to grants and contracts, we receive interagency support for research efforts for the MPS. We continue to reach out to government agencies to support the initiatives outlined above as well as to benefactors, donors, industry, professional societies, and universities. 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 and will work to invigorate our resource committee (Chair: James A. Brink) under the auspices of our finance committee (Chair: William E. Kennedy, Jr.). **Please send us ideas** for opportunities to support NCRP and your interest in helping. More involvement by Council and the Scientific Vice Presidents is crucial for the continued financial well being of NCRP. It is anticipated that in 2018 the Centers for Disease Control Foundation will begin raising funds for the MPS.

To secure the long-term stability of NCRP, creating a foundation with endowed funding would go a long way to address basic salary needs, support for interns and training, and expansion of the activities related to the ever-increasing needs of the nation for radiation protection. We continue to look for opportunities.

Other endeavors to increase the financial stability of NCRP continue and include the AmazonSmile® initiative where, at no cost to the individual, all purchases made on Amazon® 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 several Council members. Council members also make direct charitable contributions to NCRP and donations in memory of deceased Council members (e.g., William M. Beckner and William F. Morgan) are very much appreciated. As an example, I continue to make charitable contributions to NCRP to assist with ongoing programs. The funds can be committed to a specific topic or uncommitted and then applied to defray the costs of the annual meeting and underfunded program areas.

Our 2017 Annual Meeting was on **"**Assessment of National Efforts in Emergency Preparedness for Nuclear Terrorism: Is There a Need for Realignment to Close Remaining Gaps?" (Co-Chairs: Armin Ansari and Adela Salame-Alfie) (proceedings published in the February 2018 issue of *Health Physics*). The issue of radiological emergency preparedness is a critically important topic for our nation. This meeting took an introspective and critical look at the advances that have taken place in the last 15 y, focusing on key areas of preparedness and response. **The meeting continued enhancements** of past years including: The Honor Guard and singing of the National Anthem; videotaping each presentation; travel awards to three young scientists made possible by the generosity of RRS; questions and answers published in the

proceedings; and assistance from armed forces volunteers. The meeting highlights included the **41st Lauriston S. Taylor Lecture** by F. Ward Whicker on "Environmental Radiation and Life: A Broad View"; the **14th Annual Warren F. Sinclair Keynote Address** presented by Jack Hermann on "Aren't We Ready Yet? Closing the Planning, Response and Recovery Gaps for Radiological Terrorism"; and the **Members' Dinner Speaker** Adam Hutter with a talk entitled "Sidekicks to the Heroes: How Science and Technology Supports First Responders (And How You Can Too)." **For the first time, a commentary addressing the "remaining gaps" will be developed from an annual meeting.**

Our 2018 NCRP Annual Meeting was on **"**Radiation Protection Responsibility in Medicine**"** (Co-Chairs: Lawrence T. Dauer and Donald P. Frush). The use of radiation in medicine, for both imaging and therapy, has increased significantly over the past quarter century and has revolutionized the way medicine is practiced. However, issues of perceived, potential, theoretical and known risks associated with ionizing radiation exposure in medicine have come to the forefront of both public and professional awareness. Discussion of these important concerns and controversies was the focus of the NCRP meeting. The meeting highlights included the **42st Lauriston S. Taylor Lecture** by Hans-Georg Menzel on "Radiation Dosimetry Research for Medicine and Protection: A European Journey"; the **15th Annual Warren F. Sinclair Keynote Address** presented by Marvin Rosenstein on **"**Jus•ti•fied and Com•men•su•rate"; the **2nd Thomas S. Tenforde Topical Lecture** by Roy E. Shore on "Do the Epidemiologic Data Support Use of the Linear Nonthreshold Model for Radiation Protection?"; and the **Members' Dinner Speaker** Richard A. Meserve with a talk entitled **"**Reflections on the Fukushima Accident."

My travel and presentation schedule slowed somewhat in 2017 (related in part to a slow recovery from back surgery in 2016), but included presentations at:

- HPS 50th Midyear Meeting, Bethesda, Maryland (plenary);
- NCRP 53rd Annual Meeting, Bethesda, Maryland;
- Baltimore-Washington Chapter of the HPS Annual Meeting, Washington, D.C.;
- Memorial Sloan Kettering Cancer Center, New York;
- 64th Session of United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), Vienna, Austria (video conference presentation);
- Radiation Protection Strategic Research Needs Workshop, Oak Ridge, Tennessee;
- NASA Summer School, Brookhaven National Laboratory, New York;
- 2017 NASA Occupational Health Meeting, Kennedy Space Center, Florida;
- HPS 62nd Annual Meeting, Raleigh, North Carolina;
- 2017 Nuclear Energy Institute Radiation Protection Forum, New Orleans, Louisiana;
- 2017 NASA Triennial Health Physics Meeting, Washington, D.C.; and
- Vanderbilt University Medical Center, Nashville, Tennessee (Grand Rounds)

During 2017, I:

- received the **John S. Laughlin Visiting Professor, Memorial Sloan Kettering Cancer Center**, New York;
- was elected to the **Board of Directors of the Oak Ridge Associated Universities** (service starts 2018);
- also elected to the **Steering Committee for the Image Gently® Alliance** (service starts 2018);
- stepped down from **UNSCEAR** after 25 y representing the United States; and
- stepped down from the Main Commission of the **ICRP** after 20 y of service.

The 2017 calendar year was productive with the continuing work of standing SCs and initiation of new committees outlined above, and the publication of NCRP reports, commentaries, proceedings, statements, and scientific articles. These include:

- **NCRP Report No. 176**, *Radiation Safety Aspects of Nanotechnology* (2017).
- **NCRP Report No. 179**, *Guidance for Emergency Response Dosimetry* (2017).
- **The Proceedings of the 2016 NCRP Annual Meeting**, **"**Meeting the Needs of the Nation for Radiation Protection," (Co-Chairs: Judith L Bader, Kathryn H. Pryor, and Richard E. Toohey) was published in the February 2017 issue of *Health Physics*, including the: 40th Lauriston S. Taylor Lecture by John W. Poston, Sr. on "Radiation Protection and Regulatory Science"; the 13th Annual Warren F. Sinclair address by Richard E. Toohey on "Where Are the Radiation Professionals (WARP)?"; and the 2016 Members' Dinner talk by Randall N. Hyer, "Breaking Bad News in the High-Concern, Low-Trust Setting: How to Get Your Story Heard." An informative summary by Dr. Toohey with accompanying photographs by Casper Sun were published in the June 2016 issue of *Health Physics News*.
- **The Proceedings of the 2017 NCRP Annual Meeting**, **"**Assessment of National Efforts in Emergency Preparedness for Nuclear Terrorism: Is There a Need for Realignment to Close Remaining Gaps?" (Co-Chairs: Armin Ansari and Adela Salame-Alfie), was published in the February 2018 issue of *Health Physics*, including the 41st Lauriston S. Taylor Lecture by F. Ward Whicker on "Environmental Radiation and Life: A Broad View"; the 14th Annual Warren F. Sinclair address presented by Jack Hermann on "Aren't We Ready Yet? Closing the Planning, Response and Recovery Gaps for Radiological Terrorism"; and the Members' Dinner Speaker Adam Hutter with a talk entitled "Sidekicks to the Heroes: How Science and Technology Supports First Responders (and How You Can Too)." A summary by Drs. Ansari, Salame-Alfie, and Toohey with photos by Caspar Sun, Cindy O'Brien, and Tom Johnson was published in the April 2017 issue of *Health Physics News*.

Active committees are preparing the reports and commentaries highlighted at the beginning of this President's Message. In addition, NCRP has continued to move forward t**o address the evolving and challenging issues of radiation protection facing our nation**. These include:

- **To draw younger professionals into the protection arena**, we continue our partnership with RRS, who provides travel support for young scientists to attend the NCRP annual meeting. Two were able to attend in 2017 and three are planned for 2018. **CC 2 on Meeting the Needs of the Nation for Radiation Protection** is making important inroads on further delineating the problems with a dwindling workforce and suggesting corrective actions.
- **NCRP was an instrumental part of the HPS midyear meetings** in 2016 and 2017, organized two sessions in Denver at the 2018 HPS midyear meeting, and is considering the possibility for the 2019 HPS midyear meeting in San Diego.
- **Partnering with CRCPD** to sponsor the **International Atomic Energy Agency (IAEA) Ninth International Symposium on NORM** to be held in Denver, September 23–27, 2019.
- Supporting HPS in developing the program for International Radiation Protection Association (IRPA 16), to be held in Orlando in 2024 with the theme "Radiation Harmonization-Standing United for Protection."
- A major and long-lasting accomplishment focuses on the CC 1 committee on **Radiation Protection Guidance for the United States**. CC 1 has worked diligently to create a document that will be useful for the United States for many years to come: practical, implementable, and "relatively" easy to understand. The goal is to provide adequate protection against the adverse consequences of radiation

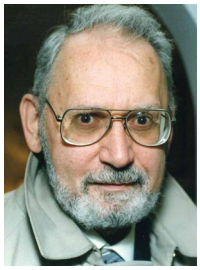
without unduly limiting the beneficial uses. NCRP Report No. 180, *Management of Exposure to Ionizing Radiation: Radiation Protection Guidance for the United States* (2018) will be published shortly.

- **We partner with agencies** (federal, state and local) with substantial interests and programs involving radiation and protection. These include the CDC, DHS, DOD, DOE, EPA, NASA, National Nuclear Security Administration, U.S. Navy, New York City (NYC), NRC, 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 full PAC meetings and then a joint session of all PACs just before the annual meeting to present current activities and future plans and visions. This rewarding experience, begun in 2014, has become a mainstay of the annual meeting. An innovation in 2015 was the individual publication of PAC activities and vision by their chairs. Similar summaries were published in 2017.
- **Issues surrounding radiofrequencies could be considered in the future** such as cell phone exposures and other uses of nonionizing radiation, including concerns over electromagnetic field exposures. The NCRP Advisory Panel on Nonionizing Radiation was reconstituted in 2015 (Chair: Jerrold T. Bushberg).
- **We are working on becoming more attuned to the modern age of social media** with Twitter®, Facebook®, YouTube®, Instagram®, video interviews, and other approaches to outreach. Our Facebook® page is accruing hits as we speak, thanks to Jessica Wieder.
- **We continue publication arrangements with the American Association of Physicists in Medicine made in 2015 for a period of 5 y to make PDFs of NCRP publications available** to their members, and **in 2017 we reached an agreement with HPS** to make NCRP publications available to their members for a deeply discounted rate (and some old publications for free). These arrangements are providing wider distribution of NCRP recommendations as well as securing funding for a portion of our publication revenue. We continue to work on ways to gain other partners in the distribution of NCRP publications. **A special licensing agreement was made with the U.S. Navy** for Report No. 161 — *Management of Persons Contaminated with Radionuclides* (2008). Continued discussions are ongoing with DOD and societies regarding a yearly fee to access our current and future documents.
- **NCRP continues to participate in meetings or conferences** of CRCPD, HPS, ICRP, NASA, NRC RIC, RRS, UNSCEAR, and more. These venues increase NCRP visibility and impact.
- **Approaches to improve radiation risk communication**, perception and outreach continue to be developed. As the NCRP President, I continue to provide interviews with the *New York Times*, *Scientific American*, and other media on issues ranging from cellular telephones to Fukushima. More will be done!
- **Expanding our efforts in medicine**, such as quality management of radiological medical imaging and electronic tracking of patient exposures continues. As listed above, updating the medical component of NCRP Report No. 160 (2009) began with the formation of SC 4-9 on Medical Exposure to Patients in the United States in January 2017 and is long on its way.

NCRP reports, activities, members, programs and more can be found on the website, http://NCRPonline.org. The NCRP program of activities is made possible by the partnership and financial support from many government agencies including CDC, NASA, NCI, NYC, DOD, DOE, DHS, EPA, and NRC, as noted above. In addition, gifts from our corporate sponsors and many collaborating organizations, as well as individual donors, remain critical to our continued success and are gratefully acknowledged.

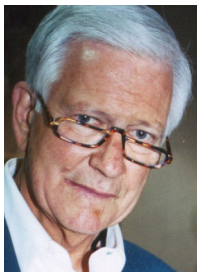
IN MEMORIAM

It is with great sadness that I recognize the passing of seven NCRP Council members, participants, remarkable scientists, leaders, and personal friends:

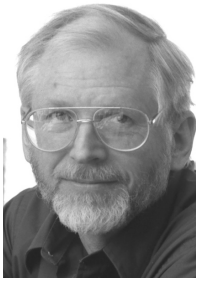


Seymour Abrahamson: Seymour died in July 2016 at the age of 88. He was Council Member, 1967 to 1997; Distinguished Emeritus Member, 1997; Lauriston S. Taylor Lecturer, 1996; Board of Directors, 1983 to 1990; Chair SC 1-1 and Member of SC 1-2, SC 40. He studied under the Nobel Laureate geneticist Herman J. Muller and devoted much of his life to studying the genetic effects of radiation, from the fruit fly to the survivors of the atomic bombing in Hiroshima and Nagasaki. He worked at ABCC (now RERF) in Japan for 7 y and was awarded the distinguished service award by the Emperor. He counted the distinguished population geneticist (and former Distinguished Council member) Dr. James F. Crow among his closest friends and greatest mentors. As a youth, Seymour was athletic and a figure skater, but a car crash left him permanently disabled. He walked with a brace and a cane, but never complained. His wife was Wisconsin Supreme Court Justice Shirley Abrahamson, and the couple had been married for 62 y.

R.J. Michael Fry: Michael died peacefully on November 24, 2017, at the age of 92 surrounded by his family. He became a member of NCRP in 1981 and was on the Board of Directors, 1990 to 1993; the 1994 Lauriston S. Taylor Lecturer; chaired the 1987 Annual Meeting Program Committee; served in developing NCRP Reports No. 64, 98, 104, 115, 116, 117, 132, 150, and 153 that reflected his interest in radiation carcinogenesis and established many of the criteria used by NASA for space radiation protection. He served on committees of the National Academy of Sciences (including the Board of Radiation Effects Research), ICRP, NASA, National Institutes of Health, and had many years of service with RRS. Michael influenced so many careers, but it was the personal relationships that were so very much enjoyed and what will be missed most of all. He was indeed a treasure — to his family, friends, and the world. He made us laugh.



A. Everette James, Jr.: Everette James died in March 2017 at the age of 78. He was an NCRP Council Member, 1979 to 1997, serving on both the Budget and Finance and Nominating Committees. He chaired SC 51B that produced NCRP Report No. 73 on *Protection in Nuclear Medicine and Ultrasound Diagnostic Procedures in Children* (1983). He was the Director of the Radiological Research Laboratory at Johns Hopkins Medical Center; Chair and Professor of Radiological Sciences at Vanderbilt University School of Medicine; and served as a consultant to the National Zoo of the Smithsonian, traveling worldwide in the study of exotic animals. He was President of the Society of Chairmen of Academic Radiology Departments, the Association of University Radiologists, and the American Roentgen Ray Society. He authored 540 articles and a number of popular novels. There are many delightful stories about him and shenanigans at Massachusetts General Hospital and climbing through a South American forest to x-ray tamarin monkeys! He was a renaissance man and a true "southern gentleman."



Charles E. Land: Charles was a personal friend who I had worked with since 1978 at NCI. He was Council Member, 1981 to 2005; Lauriston S. Taylor Lecturer, 2010; Annual Meeting Program Committee, 1995, 2008; Member PAC-1, SC 1-2, SC 1-5, SC 1-7, SC 56, SC 57, SC 59, SC 63, SC 79. His career started in Hiroshima, Japan, at the Atomic Bomb Casualty Commission; together we founded the Radiation Epidemiology Branch at NCI; served on the Biological Effects of Ionizing Radiation (BEIR III) Committee; the Three-Mile Island Follow-Up Research Committee; Member of ICRP Committee 1. Charles was brilliant and humble, quiet and friendly, a long-distance runner, a shakuhachi (Japanese flute) player, delightful to be around, and loved his family. His accomplishments are legion, and he will be missed.

Charles B. Meinhold: Charlie was the third NCRP president (1991 to 2002), a remarkable individual who was active in virtually all aspects of radiation protection and safety throughout the world. He was a Council member, 1978 to 2002; Lauriston S. Taylor Lecturer, 2003; Board of Directors, 1980 to 2002; Chair of SC 1 and SC 46; at Brookhaven National Laboratory (BNL), 1957 to 2000; Member of the ICRP Main Commission, 1978 to 2002, and Vice-Chairman, 1993 to 1997; President of the IRPA, 1996; Member of UNSCEAR, 1996 to 2009; President of HPS, 1981 to 1982; Honorary Professor of the China Institute for Radiation Protection. His daughter, Kathy, said it best: "He was a leading expert in the area of health physics for many years, traveled all over the world sharing his knowledge and was a driving force at BNL. He was happily married for 61 y. He had 5 crazy kids, 3 kids-in-law and 12 grandchildren that he was very proud of and a new grandson-in-law. He was a man of both Faith and Science and would gladly explain how the two could coexist. He sailed many miles, drank many drinks, enjoyed many meals and laughed many laughs. More smiles than sadness, more good than bad. We will miss him but it was his time to fly."

William Jackson Schull: Jack was one of the world's greatest scientists and experts on radiation genetics. He died in June 2017 at the age of 95. He was a Council Member, 1984 to 1990; Distinguished Emeritus Member, 1990; Member of the Annual Meeting Program Committee, 1987; Member of SC 1-2 and NCRP Report No. 115 (*Risk Estimates for Radiation Protection*, 1993). Jack was Professor Emeritus, Human Genetics Center, the University of Texas Health Science Center. With Jim Neal they formed the Department of Genetics at the Atomic Bomb Casualty Commission (ABCC) in Hiroshima and both were credited with developing the genetics program at ABCC that led to the surprising conclusion that no significant heritable effects of preconception radiation exposure occurred among 70,000 children born to atomic-bomb survivors. He spent many years as Director of ABCC and its successor, Radiation Effects Research Foundation (RERF). He served on ICRP's Committee 1 and was author of "A Song Among the Ruins," his lyrical account of his early experiences in Japan in the 1940s and 1950s. He continued to stay active even in his 90s where he helped me in an international study involving the Genetic Consequences of Cancer Treatment.

Ralph Harold Thomas: Ralph was one of the true pioneers in the field of accelerator health physics and died October 2017 at the age of 84. He was a Council Member, 1990 to 1996; advisor to SC 6-5; chaired SC 46-8 that authored Report No. 144 (*Radiation Protection for Particle Accelerator Facilities*); served on ICRP and the International Commission on Radiation Units and Measurements committees for more than 20 y. He was a Fellow of HPS, the Society of Radiological Protection, the Institute of Physics, and the Royal Society of Health. He was one of the founders of the HPS accelerator section and it's first president. He was born in the working-class town of Reading, Berkshire, England, and never fully lost his U.K. accent. He was a gardener, lover of classical music, and an avid reader of all subjects. Ralph was a consummate English gentleman and a true man of letters.

Reflections on Moving On

Seven years went by in the blink of an eye. It's been a great adventure and a happy journey. I've appreciated the guidance, help, direction and support from the staff, Council members, and SCs. A few reflections on my tenure as the fifth president of NCRP (2012 to 2018).

The Council accomplishments were legion and our statue as one of the premier radiation protection organization in the world was enhanced.

- **Five published reports** (Nos. 173, 174, 175, 176, 179), **five commentaries** (Nos. 23, 24, 25, 26, 27), and **two published Statements** (Nos. 11, 12). In addition, there are **11 reports and commentaries to be published this year** (CC 1, CC 2, SC 1-20, SC 1-26, SC 2-7, SC 4-5, SC 4-7, SC 4-8, SC 4-9, SC 5-2, SC 6-9), and one statement (SC 4-10), and **four reports and commentaries planned for 2019 to 2020** (SC 1-27, SC 3-1P2, SC 6-10, SC 6-11, SC 6-12). **All total, 26 NCRP reports, commentaries and statements**. And they are:

Published:

- Report No. 179, *Guidance for Emergency Response Dosimetry* (2017)
- Report No. 176, *Radiation Safety Aspects of Nanotechnology* (2017)
- Report No. 175, *Decision Making for Late-Phase Recovery from Major Nuclear or Radiological Incidents* (2014)
- Report No. 174, *Preconception and Prenatal Radiation Exposure: Health Effects and Protective Guidance* (2013)
- Report No. 173, *Investigation of Radiological Incidents* (2012)
- Commentary No. 27, *Implications of Recent Epidemiologic Studies for the Linear-Nonthreshold Model and Radiation Protection* (2018)
- Commentary No. 26, *Guidance on Radiation Dose Limits for the Lens of the Eye* (2016)
- Commentary No. 25, *Potential for Central Nervous System Effects from Radiation Exposure During Space Activities, Phase I: Overview* (2016)
- Commentary No. 24, *Health Effects of Low Doses of Radiation: Perspectives on Integrating Radiation Biology and Epidemiology* (2015)
- Commentary No. 23, *Radiation Protection for Space Activities: Supplement to Previous Recommendations* (2014)

To be published in 2018/early 2019:

- Report No. 180 (CC 1), Management of Exposure to Ionizing Radiation: Radiation Protection Guidance for the United States (2018)
- CC 2, Meeting the Needs of the Nation for Radiation Protection
- Report No. 181 (SC 1-20), Evaluation of the Relative Effectiveness of Low-Energy Photons and Electrons in Inducing Cancer In Humans
- SC 1-26, Approaches for Integrating Radiation Biology and Epidemiology for Enhancing Low-Dose Risk Assessment
- SC 2-7, Radiation Safety of Sealed Radioactive Sources
- Report No. 177 (SC 4-5), Radiation Protection in Dentistry and Oral & Maxillofacial Imaging
- SC 4-7, Evaluating and Communicating Radiation Risks for Studies Involving Human Subjects: Guidance for Researchers and Reviewing Bodies
- SC 4-8, Improving Patient Dose Utilization in Computed Tomography
- SC 4-9, Medical Exposure of Patients in the United States
- SC 4-10, Statement, Error Prevention in Radiation Therapy
- SC 5-2, Radiation Protection for NORM and TENORM from Oil and Gas Recovery
- Report No. 178 (SC 6-9), Deriving Organ Doses and Their Uncertainty for Epidemiologic Studies (with a focus on the One Million U.S. Workers and Veterans Study of Low-Dose Radiation Health Effects)

To be published 2019 or 2020 from active committees:

- SC 1-27, Evaluation of Sex-Specific Differences in Lung Cancer Radiation Risks and Recommendations for Use of Transfer Models (likely 2020)
- SC 3-1P2, Implementation of Guidance for Emergency Responder Dosimetry (early 2019)
- SC 6-10, Occupational Doses of Pilots and Aircrew (to start 2018)
- SC 6-11, Dosimetry Guidance for Medical Radiation Workers with a Focus on Lung Dose Reconstruction (likely 2019)
- SC 6-12, Development of Models for Brain Dosimetry for Internally Deposited Radionuclides (likely 2019)

Other changes I thought noteworthy during 2012 to 2018:

- Having P**AC meetings at every Annual Meeting** has energized NCRP and hopefully will continue to empower the Council and PAC members for continued enthusiastic participation, direction and vision.
- The singing of the National Anthem and presentation of colors at each Annual Meeting.
- Written questions and published answers from the Annual Meeting.
- Recognition of the Sinclair and Taylor Lecturers with silver and gold medals.
- NCRP/RRS Scholars Program since 2013. To attract young professionals into the protection arena.
- Publication of the Annual Meeting proceedings in the same calendar year; well, never made it but we did manage to publish the proceedings in February of the next year and before the next annual meeting.
- Rapid publication of the Annual Meeting summary in *Health Physics News*.
- Publication of the annual dinner presentation. These have always been memorable and now we share with the rest of the world!
- Enhancing partnerships with:
  - Image Gently®
  - CDC (webinars and studio filmed educational modules)

  - CRCPD (including, 2019 IAEA Symposium on NORM)
  - Providing content and NCRP symposia for HPS mid-year meetings.
  - DOD (including going down for a day on an attack nuclear submarine)
  - Enhancing partnerships with emergency response and preparedness (attending Vigilant Guardian exercise in San Francisco and tabletops on Radiation Injury Treatment Network).
  - IRPA and assisting with the HPS bid and then the program for 2024 in Orlando.
  - Partnering with international organizations such as ICRP (after 20 y of service, but two Council members remain on the Main Commission).
  - Partnering with UNSCEAR (after 25 y of service, but seven Council members remain on the committee)
- Directing the national study on One Million U.S. Radiation Workers and Veterans [Million Person Study (MPS)], which I hope to continue for several years.
- Regaining or renewing broad sponsor support for NCRP programs, including from CDC, DOE, DTRA, EPA, NASA, NCI, NRC, U.S. Air Force, U.S. Army, U.S. Navy, VA, and Vanderbilt University. More is needed!
- I believe that **NCRP Report No. 180 on Management of Exposure to Ionizing Radiation: Radiation Protection Guidance for the United States (2018) will be a landmark publication** that will change the approach for radiation protection guidance not only in the United States, but also in the rest of the world.
- I further believe that **Commentary No. 27 on Implications of Recent Epidemiologic Studies for the Linear-Nonthreshold Model and Radiation Protection will be a watershed document** that lasts for many years as well as to become a paradigm of the proper approaches to systematically evaluate epidemiologic studies based on methods, dosimetry and statistics.
- The creation of PAC 7 on Radiation Education, Risk Communication, Outreach, and Policy is also an important initiative for NCRP. We must communicate our message better in today's world of social media and instant news.
- Expediting the publication of NCRP reports and commentaries, but I could have done much better.
- Improving (but unfortunately not yet insuring) a broad-based program for NCRP financial security. There are a lot of balls in the air such as line items in two appropriations bills which provided funds to NCRP and two bills being considered by Congress on low-dose radiation research needs, and discussions with CDC and their Foundation, but future funding issues have yet to be resolved and are the focus of current efforts. Not securing long-term financial security for the NCRP is perhaps my biggest regret, but I'm still optimistic.
- 2018 had more Council discussion at the Annual Meeting than previously, but it's far from sufficient. There needs to be more engagement with the PAC chairs as well as the Council in forums so that we can enhance the value of membership in directing the future of NCRP (as well as to help in raising support for the needs and gaps for the future in radiation protection).
- NCRP might consider establishing an outside advisory committee of senior professionals who are not necessarily radiation specialists and who are not Council members. Such a review group might provide broad guidance to enhance overall direction and future NCRP initiatives.

Finally, NCRP remains a dynamic and influential organization only because of the generous contributions of time and knowledge made 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 changing times and opportunities abound. We are limited only by our imaginations (and shrinking budgets!). We balance two issues in management articulated by Admiral Rickover — the need to embrace innovation without losing sight of or capitulating to the

process (the routine hard work) that got NCRP where we are today and keeps us on an even keel. We should steer clear of paralysis by analysis, and not get stuck on processes to the hindrance of solutions. NCRP must continue to examine itself and adapt when necessary to meet new challenges. 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 the challenges of radiation protection for the 21st century! Your help, guidance, and financial support are essential for the future of NCRP.

Paraphrasing John Updike, an aging NCRP president has the not insignificant satisfaction of a shelf of NCRP reports and commentaries behind him that, as they wait for their ideal readers to discover them, will outlast him (and the current Council) for a while. The pleasures, for him, recognizing opportunities in radiation protection and research — the first flush of inspiration, resource development, the patient years of working with Council members and committees, the final draft of the document, the merry-go-round of conference and scientific meeting presentations, and at last the published volume (and/or electronic PDF) — remain and retain creation's giddy bliss. Among those diminishing neurons there lurks the irrational hope that the last report might be the best (quite possibly: NCRP Report No. 180 and Commentary No. 27) but, more importantly, that his unbounded vision and enthusiasm for the future of NCRP and radiation protection might pale in comparison with the future that will be! **May NCRP live long and prosper!**

The vision and enthusiasm for the future of NCRP is unbounded!

John D. Boice, Jr.
President

Membership

There are 96 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 engineering, nuclear medicine, pathology, physics, public health, public policy, radiation measurements, radiation therapy, radiobiology, radiology, risk analysis and communication, statistics, and waste management. In 2017 there were 21 vacancies; 10 new members were elected, and 7 members were re-elected. The 10 new members were:

Sara D. DeCair	Christopher N. Passmore
Cynthia Flannery	Mark J. Rivard
Willie O. Harris	Kathleen L. Shingleton
Janice L. Huff	Jeffrey J. Whicker
Michael A. Noska	Jessica S. Wieder

2017 Council Membership, Affiliation, and Current Term

Sally A. Amundson	Columbia University Medical Center	2016–2022
Armin Ansari	Centers for Disease Control and Prevention	2015–2021
A. Iulian Apostoaei	Oak Ridge Center for Risk Analysis, Inc.	2012–2018
Kimberly E. Applegate	University of Kentucky	2013–2019
Edouard I. Azzam	Rutgers, The State University of New Jersey	2012–2018
Judith L. Bader	U.S. Department of Health & Human Services	2014–2020
Stephen Balter	Columbia-Presbyterian Medical Center	2013–2019
Daniel J. Barnett	Johns Hopkins Bloomberg School of Public Health	2015–2021
Jonine L. Bernstein	Memorial Sloan-Kettering Cancer Center	2012–2018

Eleanor A. Blakely	Lawrence Berkeley National Laboratory	2012–2018
William F. Blakely	Armed Forces Radiobiology Research Institute	2015–2021
Daniel J. Blumenthal	U.S. Department of Energy	2015–2021
John D. Boice, Jr.	National Council on Radiation Protection and Measurements	2012–2018
Wesley E. Bolch	University of Florida	2017–2023
Michael Boyd	U.S. Environmental Protection Agency	2014–2020
Richard R. Brey	Idaho State University	2013–2019
James A. Brink	Massachusetts General Hospital	2017–2023
Brooke R. Buddemeier	Lawrence Livermore National Laboratory	2015–2021
Jerrold T. Bushberg	University of California, Davis	2014–2020
Polly Y. Chang	SRI International	2017–2023
C. Norman Coleman	National Cancer Institute	2016–2022
Donald A. Cool	Electric Power Research Institute	2013–2019
Michael L. Corradini	University of Wisconsin, Madison	2016–2022
Francis A. Cucinotta	University of Nevada, Las Vegas	2013–2019
Lawrence T. Dauer	Memorial Sloan-Kettering Cancer Center	2012–2018
Scott Davis	Fred Hutchinson Cancer Research Center	2016–2022
Sara D. DeCair	U.S. Environmental Protection Agency	2017–2023
Christine A. Donahue	CB&I	2015–2021
Joseph R. Dynlacht	Indiana University School of Medicine	2014–2020
Andrew J. Einstein	Columbia University	2012–2018
Cynthia Flannery	U.S. Nuclear Regulatory Commission	2017–2023
Patricia A. Fleming	Saint Mary's College, Notre Dame	2015–2021
Donald P. Frush	Duke University Medical Center	2016–2022
Ronald E. Goans	MJW Corporation	2013–2019
Eric M. Goldin	Retired	2015–2021
Helen A. Grogan	Cascade Scientific, Inc.	2014–2020
Willie O. Harris	Exelon Nuclear	2017–2023
Kathryn D. Held	National Council on Radiation Protection and Measurements & Massachusetts General Hospital	2012–2018
Kathryn A. Higley	Oregon State University	2014–2020
Roger W. Howell	Rutgers, The State University of New Jersey	2015–2021
Janice L. Huff	National Aeronautics and Space Administration	2017–2023
Randall N. Hyer	Center for Risk Communication	2016–2022
William E. Irwin	Vermont Department of Health	2015–2021
Cynthia G. Jones	U.S. Nuclear Regulatory Commission	2017–2023
Timothy J. Jorgensen	Georgetown University Medical Center	2013–2019
William E. Kennedy, Jr.	Dade Moeller	2016–2022
Katherine A. Kiel	College of the Holy Cross	2015–2021

Gladys A. Klemic	U.S. Department of Homeland Security	2016–2022
Linda A. Kroger	University of California Davis School of Medicine	2016–2022
Amy Kronenberg	Lawrence Berkeley National Laboratory	2017–2023
John J. Lanza	Florida Department of Health	2016–2022
Edwin M. Leidholdt, Jr.	U.S. Department of Veterans Affairs	2012–2018
Jill A. Lipoti	Retired	2013–2019
Mark P. Little	National Cancer Institute	2016–2022
Paul A. Locke	Johns Hopkins University	2016–2022
Alan G. Lurie	University of Connecticut School of Dental Medicine	2016–2022
Mahadevappa Mahesh	Johns Hopkins Hospital	2015–2021
Donald M. Mayer	Indian Point Energy Center	2015–2021
Ruth E. McBurney	Conference of Radiation Control Program Directors, Inc.	2013–2019
Charles W. Miller	Consultant	2012–2018
Donald L. Miller	Food and Drug Administration	2012–2018
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 / National Aeronautics and Space Administration	2012–2018
Wayne D. Newhauser	Louisiana State University	2013–2019
Michael A. Noska	U.S. Food and Drug Administration	2017–2023
Harald Paganetti	Massachusetts General Hospital	2012–2018
Christopher N. Passmore	Landauer, Inc.	2017–2023
David J. Pawel	U.S. Environmental Protection Agency	2017–2023
Kathryn H. Pryor	Pacific Northwest National Laboratory	2016–2022
Mark J. Rivard	Tufts Medical Center	2017–2023
Adela Salame-Alfie	Centers for Disease Control and Prevention	2015–2021
Ehsan Samei	Duke University Medical Center	2013–2019
Debra M. Scroggs	DMcS Consulting	2012–2018
J. Anthony Seibert	University of California Davis Medical Center	2014–2020
George Sgouros	Johns Hopkins University School of Medicine	2013–2019
Kathleen L. Shingleton	Lawrence Livermore National Laboratory	2017–2023
Steven L. Simon	National Cancer Institute	2016–2022
David C. Spelic	Center for Devices and Radiological Health, FDA	2016–2022
Michael D. Story	University of Texas, Southwestern Medical Center at Dallas	2014–2020
Daniel O. Stram	University of Southern California	2013–2019
Glenn M. Sturchio	Mayo Clinic	2016–2022
Steven G. Sutlief	Landauer Medical Physics	2012–2018
Tammy P. Taylor	Pacific Northwest National Laboratory	2016–2022
Julie K. Timins	New Jersey Commission on Radiation Protection	2016–2022

Richard E. Toohey	M.H. Chew	2012–2018
Michael M. Weil	Colorado State University	2017–2023
Jeffrey J. Whicker	Los Alamos National Laboratory	2017–2023
Chris G. Whipple	Ramboll Environ	2013–2019
Robert C. Whitcomb, Jr.	Centers for Disease Control and Prevention	2014–2020
Jessica S. Wieder	U.S. Environmental Protection Agency	2017–2023
Jacqueline P. Williams	University of Rochester Medical College	2012–2018
Gayle E. Woloschak	Northwestern University	2015–2021
X. George Xu	Renesselaer Polytechnic Institute	2014–2020
R. Craig Yoder	Retired	2014–2020
Cary Zeitlin	Leidos	2014–2020

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	Ruth E. McBurney	

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Senior Vice President	Jerrold T. Bushberg
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A. Alan Moghissi
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Marvin Rosenstein
Lawrence N. Rothenberg
Henry D. Royal
Michael T. Ryan
William J. Schull†
Stephen M. Seltzer
Roy E. Shore
Paul Slovic
Daniel J. Strom
John E. Till
Lawrence W. Townsend
Robert L. Ullrich
Richard J. Vetter
F. Ward Whicker
Susan D. Wiltshire
Marvin C. Ziskin

*Elected to Distinguished Emeritus Membership March 7, 2017.
†Deceased during 2017.

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.

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E. Stephen Amis, Jr.
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Mary M. Austin-Seymour
John W. Baum
Steven M. Becker*
Merrill A. Bender
Mythreyi Bhargavan-Chatfield
Frederick J. Bonte
Harold S. Boyne
John W. Brand
David J. Brenner
A. Bertrand Brill
Thomas F. Budinger
John F. Cardella
Stephanie K. Carlson
Paul L. Carson
Donald K. Chadwick
Charles E. Chambers
Lawrence L. Chi
Chung-Kwang Chou
Kelly L. Classic
Stephen F. Cleary
James E. Cleaver
Fred T. Cross
Stanley B. Curtis
John F. Dicello
Richard L. Doan
Carl H. Durney
David A. Eastmond
Marc Edwards
Charles M. Eisenhauer
Joe A. Elder
Edward R. Epp
Alan J. Fischman
H. Keith Florig
Norman C. Fost*
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Robert L. Goldberg
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Richard A. Tell
Joop W. Thiessen
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John C. Villforth
Louis K. Wagner
Daniel E. Wartenberg
Stuart C. White
J. Frank Wilson
Shaio Y. Woo*
Andrew J. Wyrobek
Marco A. Zaider
Pat B. Zanzonico
Gary H. Zeman*

*Consociate Membership effective March 7, 2017.

Administrative Committees

Budget & Finance Committee (appointed by the Board of Directors, March 7, 2017)

William E. Kennedy, Jr., *Chairman*

Jerrold T. Bushberg
John J. Lanza
Kathleen L. Shingleton
R. Craig Yoder

Nominating Committee (appointed by the Board of Directors, March 7, 2017)

Donald L. Miller, *Chairman*

Kathryn H. Pryor
Adela Salame-Alfie
John E. Till
Michael M. Weil

Program Committee for 2018 Annual Meeting

(appointed by the Board of Directors, March 7, 2017)

Lawrence T. Dauer & Donald P. Frush, *Co-Chairs*

Linda A. Kroger
Fred A. Mettler, Jr.
Donald L. Miller
Julie E.K. Timins
Pat B. Zanzonico

NCRP

Scientific & Administrative Staff

Kathryn D. Held	Executive Director
Laura J. Atwell	Office Manager
Sarah S. Cohen	Technical Staff Consultant
Joel E. Gray	Technical Staff Consultant
Michael P. Grissom	Technical Staff Consultant
Cindy L. O'Brien	Managing Editor
Beverly A. Ottman	Receptionist
R. Julian Preston	Advisor to the President
Jerome S. Puskin	Technical Staff Consultant
Marvin Rosenstein	Technical Staff Consultant & Advisor to the President
Roy E. Shore	Advisor to the President
James M. Smith	Technical Staff Consultant
Richard E. Toohey	Advisor to the President
Lawrence W. Townsend	Technical Staff Consultant
Richard J. Vetter	Technical Staff Consultant
Myrna A. Young	Financial Records Manager

Council Committees, Program Area Committees, & Advisory Panel

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 two Council committees, seven program area committees, and an advisory panel. They are:

Council Committees

Radiation Protection Guidance for the United States, Kenneth R. Kase & Donald A. Cool

Meeting the Needs of the Nation for Radiation Protection, Wayne D. Newhauser & Jacqueline P. Williams

Program Area Committees and Committee Chairs

Basic Criteria, Epidemiology, Radiobiology, and Risk	Gayle E. Woloschak Jonine Bernstein
Operational Radiation Safety	Kathryn H. Pryor
Nuclear and Radiological Security and Safety	Armin Ansari Brooke R. Buddemeier
Radiation Protection in Medicine	James A. Brink Donald L. Miller
Environmental Radiation and Radioactive Waste Issues	Bruce A. Napier
Radiation Measurements and Dosimetry	Steven L. Simon
Radiation Education, Risk Communication, Outreach, and Policy	Randall N. Hyer

Advisory Panel

Nonionizing Radiation, Jerrold T. Bushberg

Vice Presidents

Each scientific program area committee is chaired by a 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

NCRP

Radiation Protection Guidance for the United States

Chair, Kenneth R. Kase

Goals 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: Revising after Council review

Kenneth R. Kase, *Chair*
Donald A. Cool, *Co-Chair*
Armin Ansari
John D. Boice, Jr.
Jerrold T. Bushberg
Lawrence T. Dauer
Darrell R. Fisher
Patricia A. Fleming
Kathryn A. Higley
Randall N. Hyer
William E. Irwin
Fred A. Mettler, Jr.
Donald L. Miller
R. Julian Preston
Gayle E. Woloschak
John E. Till, *Liaison PAC 7*
S. James Adelstein, *Consultant*
Ralph Andersen, *Consultant*
Michael Boyd, *Consultant*
Marvin Rosenstein, *Technical Staff Consultant*

NCRP

Meeting the Needs of the Nation for Radiation Protection

Chair, Wayne D. Newhauser

Goals of Council Committee (CC) 2

- Monitor graduation and employment statistics for radiation professionals, including but not limited to health physicists, radiobiologists, radioecologists, radiologists, radiation oncologists, nuclear medicine physicians, radiochemists, radiation protection engineers, and allied disciplines.
- Continually assess, revise and renew the comprehensive plan initiated with Where Are the Radiation Professionals? (WARP).
- Promote a government led initiative to develop and strengthen human capital in radiation science and radiation protection.

Members of CC 2

Wayne D. Newhauser, *Chair*
Jacqueline P. Williams, *Co-Chair*
Writing Team Leaders:
Edward I. Bluth
Michael A. Noska
Sergei Tolmachev
Lawrence W. Townsend
Lydia Zablotska

Basic Criteria, Epidemiology, Radiobiology, & Risk

Vice President, Gayle E.Woloschak

Goals of Program Area Committee (PAC) 1

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

Members of PAC 1

Gayle E.Woloschak, *Vice President*
Jonine Bernstein, *Co-Chair*
Sally A. Amundson
Edouard I. Azzam
Joel S. Bedford
Polly Y. Chang
Nobuyuki Hamada
Ann R. Kennedy
Amy Kronenberg
Evagelia C. Laiakis
Mark P. Little
Gregory A. Nelson
Harald Paganetti
David J. Pawel
George Sgouros
Roy E. Shore
Michael D. Story
Michael M. Weil
Jacqueline P. Williams
John D. Boice, Jr., *NCRP Contact*

Active Scientific Committees Under PAC 1

SC 1-20 Biological Effectiveness of Low Linear-Energy Transfer Radiation as a Function of Energy
Status: Preparing printer's manuscript
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 1-24 Phase 2: Radiation Exposures in Space and the Potential for Central Nervous System Effects

Status: Drafting
Leslie A. Braby, *Co-Chair*
Jacob Raber, *Co-Chair*
Polly Chang
David F. Dinges
Dudley T. Goodhead
David Herr
John Hopewell
Janice Huff
Kevin Krull
Richard M. Linnehan (2016 - 2017)
Thomas J. MacVittie
M. Kerry O'Banion
Michael Qin
James Root
Susanna Rosi
Peter Winsauer
Gregory A. Nelson, *NASA Observer*
Lawrence W. Townsend, *Technical Staff Consultant*

SC 1-25 Recent Epidemiologic Studies and Implications for the Linear-Nonthreshold Model

Status: Revising after Council review
Roy E. Shore, *Chair*
Lawrence T. Dauer, *Co-Chair*
Harold L. Beck
Emily A. Caffrey
Scott Davis
Helen A. Grogan
Randall N. Hyer
Fred A. Mettler, Jr.
R. Julian Preston
John E. Till
Richard Wakeford
Linda Walsh
Richard J. Vetter, *Technical Staff Consultant*

SC 1-26 Approaches for Integrating Radiation Biology and Epidemiology for Enhancing Low Dose Risk Assessment

Status: Drafting

R. Julian Preston, *Chair*
Werner Rühm, *Co-Chair*
Edouard I. Azzam
Simon Bouffler
Mark P. Little
Roy E. Shore
Igor Shuryak
Michael M. Weil
Jerome S. Puskin, *Technical Staff Consultant*

Operational Radiation Safety

Vice President, Kathryn H. Pryor

Goals of Program Area Committee (PAC) 2

- Serve as a national resource for information on operational radiation safety.
- Formulate guidance regarding the application of operational radiation safety principles.

Members of PAC 2

Kathryn H. Pryor, *Vice President*
Edgar D. Bailey
Christine A. Donahue
John R. Frazier
Eric M. Goldin
Barbara L. Hamrick
Michael Littleton
David S. Myers
John W. Poston, Sr.
Debra M. Scroggs
Kathleen L. Shingleton
Glenn M. Sturchio
Joshua Walkowicz
James S. Willison
James G. Yusko
John D. Boice, Jr., *NCRP Contact*

Active Scientific Committees Under PAC 2

SC 2-7 Radiation Safety of Sealed Radioactive Sources

Status: Revising after Council review
Kathryn H. Pryor, *Chair*
Edgar D. Bailey
Christine A. Donahue
John R. Frazier
Eric M. Goldin
Michael Littleton
David S. Myers

John W. Poston, Sr.
Kathleen L. Shingleton
Glen M. Sturchio
Joshua Walkowicz
James S. Willison
James G. Yusko
James L. Thompson, *Consultant*

Completed in 2017

NCRP Report No. 176, *Radiation Safety Aspects of Nanotechnology*, was issued March 2, 2017. This Report was drafted by Scientific Committee 2-6 under the chairmanship of Mark D. Hoover and David S. Myers. Committee members included: Leigh J. Cash, Raymond A. Guilmette, Wolfgang G. Kreyling, Gunter Oberdoerster, and Rachel Smith.

Nuclear & Radiological Security & Safety

Vice President, Armin Ansari

Goals 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 nuclear or radiological explosions or 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.

Members of PAC 3

Armin Ansari, *Vice President*
Brooke R. Buddemeier, *Co-Chair*
Judith L. Bader
Daniel J. Blumenthal
Lawrence L. Chi
C. Norman Coleman
Nicholas Dainiak
Sara DeCair
John Donnelly
Joseph R. Dynlacht
Frieda Fisher-Tyler
William E. Irwin
Gladys A. Klemic
John J. Lanza
Stephen V. Musolino
Michael A. Noska
Adela Salame-Alfie
Tammy P. Taylor

James D. Rogers, *Consultant*
Benjamin Stevenson, *Consultant*
John D. Boice, Jr., *NCRP Contact*

SC 3-1 Phase II Implementation of Guidance for Emergency Responder Dosimetry

Status: Drafting
Stephen V. Musolino, Co-*Chair*
Adela Salame-Alfie, *Co-Chair*
Brooke R. Buddemeier
Helen A. Grogan
William Haley
William E. Irwin
David Pasquale
Richard Schlueck
Jessica S. Wieder
John Donnelly, Sr., *Consultant*
James M. Smith, *Technical Staff Consultant*

Completed in 2017

NCRP Report No. 179, *Guidance for Emergency Response Dosimetry*, was issued October 2, 2017. This Report was drafted by Scientific Committee 3-1 under the chairmanship of Stephen V. Musolino and Adela Salame-Alfie. Committee members included: Judith L. Bader, Daniel Blumenthal, Brooke R. Buddemeier, Helen A. Grogan, William E. Irwin, Gladys Klemic, Gregory Komp, Ruth E. McBurney, Jeanine Prudhomme, Richard Schlueck, Tammy P. Taylor, and Jessica Wieder; and Consultant, Lawrence T. Dauer.

NCRP

Radiation Protection in Medicine

Vice President, James A. Brink

Goals 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.
- 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
Joel E. Gray
Mannudeep K.S. Kalra
Linda A. Kroger
Edwin M. Leidholdt
Alan G. Lurie
Mahadevappa Mahesh
Fred A. Mettler, Jr.
Wayne D. Newhauser
Ehsan Samei
J. Anthony Seibert
David C. Spelic
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: Revising after Council review
Mel L. Kantor, *Co-Chair*
Alan G. Lurie, *Co-Chair*
Mansur Ahmad
Veeratrishul Allareddy
John B. Ludlow
Edwin T. Parks
Eleonore D. Paunovich
Robert J. Pizzutiello
Robert Sauer
David C. Spelic
Edwin M. Leidholdt, Jr., *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: Revising after Council review
Julie E.K. Timins, *Chair*
Jerrold T. Bushberg
Patricia A. Fleming
Linda A. Kroger
Edwin M. Leidholdt, Jr.
Donald L. Miller
Robert E. Reiman
J. Anthony Seibert
Steven G. Sutlief
Michael P. Grissom, *Technical Staff Consultant*

SC 4-8 Improving Patient Dose Utilization in Computed Tomography
Status: Preparing for PAC review
Mannudeep K.S. Kalra, *Chair*
Edwin M. Leidholdt, Jr., *Co-Chair*
Andrew J. Einstein
Donald P. Frush
Mahadevappa Mahesh
Ehsan Samei
John Boone, *Consultant*
Michael McNitt-Gray, *Consultant*

SC 4-9 Medical Exposure of Patients in the United States

Status: Drafting

Fred A. Mettler, Jr., *Chair*
Mahadevappa Mahesh, *Co-Chair*
Charles E. Chambers
Mythreyi Bhargavan Chatfield
Jennifer G. Elee
Donald P. Frush
Michael T. Milano
Donald L. Miller
Henry D. Royal
David C. Spelic
Armin Ansari, *Advisor*
Wesley E. Bolch, *Advisor*
Gary M. Guebert, *Advisor*
Robert H. Sherrier, *Advisor*
James M. Smith, *Advisor*
Richard J. Vetter, *Technical Staff Consultant*

NCRP

Environmental Radiation & Radioactive Waste Issues

Vice President, Bruce A. Napier

Goals 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.
- Encourage scientific and technical discourse on the cost-benefit of activities generating radioactive and mixed wastes.

Members of PAC 5

Bruce A. Napier, *Vice President*
S.Y. Chen
Allen G. Croff
Jonathan D. Edwards
R. William Field
Kathryn A. Higley
E. Vincent Holahan
William E. Kennedy, Jr.
Katherine A. Kiel
Jill A. Lipoti
Ruth E. McBurney
Brian A. Powell
Andrew Wallo, III
John D. Boice, Jr., *NCRP Contact*

Active Scientific Committees Under PAC 5

SC 5-2 Radiation Protection for Naturally Occurring Radioactive Materials (NORM) and Technologically Enhanced NORM (TENORM) from Oil and Gas Recovery
Status: Drafting

NCRP

William E. Kennedy, Jr., *Chair*
David J. Allard
Martin Barrie
Philip Egidi
Gary Forsee
Ray Johnson
Andrew J. Lombardo
Ruth E. McBurney
John R. Frazier, *Technical Staff Consultant*

NCRP

Radiation Measurements & Dosimetry

Vice President, Steven L. Simon

Goals 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.
- 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
Richard R. Brey
Raymond A. Guilmette
Richard T. Kouzes
Jeffrey J. Whicker
R. Craig Yoder
Cary Zeitlin
Gary H. Zeman
John D. Boice, Jr., *NCRP Contact*

SC 6-9 U.S. Radiation Workers and Nuclear Weapons Test Participants Radiation Dose Assessment
Status: Preparing printer's manuscript
Andre Bouville, *Chair*
Richard E. Toohey, *Co-Chair*
Harold L. Beck
Lawrence T. Dauer
Keith F. Eckerman
Derek Hagemeyer
Donald L. Miller
Bruce A. Napier

Kathryn H. Pryor
David A. Schauer
Daniel O. Stram
James L. Thompson
John E. Till
R. Craig Yoder
Cary Zeitlin
Stephen Balter, *Consultant*
Terry A. Brock, *Consultant*
Richard W. Leggett, *Consultant*
Marvin Rosenstein, *Technical Staff Consultant*

NCRP

Radiation Education, Risk Communication, Outreach, & Policy

Vice President, Randall N. Hyer

Goals 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

Randall N. Hyer, *Vice President*
Steven M. Becker
Ray Johnson
P. Andrew Karam
Paul A. Locke
M. Carol McCurley
Charles W. Miller
John E. Till
Jessica S. Wieder
Vivi Siegel, *Consultant*
John D. Boice, Jr., *NCRP Contact*

NCRP

Nonionizing Radiation

Goals 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, *Chairman*
Chung-Kwang Chou
Joseph A. Elder
Kenneth R. Foster
David A. Savitz
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 2017 are:

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 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
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
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 Chairs 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 2017 are:

Australian Radiation Protection and Nuclear Safety Agency

Bundesamt fur 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 a l'Energie Atomique (France)

Commonwealth Scientific Instrumentation Research
Organization (Australia)

European Commission

Heads of the European Radiological Protection Competent
Authorities

Health Council of the Netherlands

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

Public Health England

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

Contracts & Grants

The following government entities have provided support for NCRP's work through contracts and grants:

Centers for Disease Control and Prevention
National Aeronautics and Space Administration
U.S. Department of Energy
U.S. Department of Homeland Security
U.S. Navy
U.S. Nuclear Regulatory Commission

Contributors & Corporate Sponsors

American Academy of Health Physics
American Association of Physicists in Medicine
American College of Radiology Foundation
American Registry of Radiologic Technologists
American Roentgen Ray Society
American Society for Radiation Oncology
American Society of Radiologic Technologists
Conference of Radiation Control Program Directors, Inc.
Council on Radionuclides and Radiopharmaceuticals
Health Physics Society
Individuals
Landauer, Inc.
Nuclear Energy Institute
Radiological Society of North America
Society of Nuclear Medicine and Molecular Imaging
Society of Pediatric Radiology

Giving Tuesday Donations

S. James Adelstein
Armin Ansari
Jonine L. Bernstein
William F. Blakely
John D. Boice, Jr.
Thomas B. Borak
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Lawrence T. Dauer
Eric J. Hall
Kathryn D. Held
Amy Kronenberg
Thomas S. Tenforde
Richard E. Toohey
Richard J. Vetter

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 (96), Distinguished Emeritus Members (73), Collaborating Organizations (77), 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 commentaries, statements, and presidential 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. 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. 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

Year	Title	Lecturer
2017	Environmental Radiation and Life: A Broad View	F. Ward Whicker
2016	Radiation Protection and Regulatory Science	John W. Poston, Sr.
2015	Dosimetry of Internal Emitters: Contributions of Radiation Protection Bodies and Radiological Events	Keith F. Eckerman
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 *What Ifs*, *Wows*, and *Who Cares* 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: *Unde Venimus Quoque Imus*	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 of 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

Year	Title	Lecturer
2017	Aren't We Ready Yet? Closing the Planning, Response and Recovery Gaps for Radiological Terrorism	Jack Herrmann
2016	WARP: Where are the Radiation Professionals?	Richard E. Toohey
2015	Influence of NCRP on Radiation Protection in the United States: Guidance and Regulation	Kenneth R. Kase
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.

Thomas S. Tenforde Topical Lecture

Year	Title	Lecturer
2015	Ethics and Radiation Protection	Jacques Lochard

Annual Meetings

Year	Topic
2017	Assessment of National Efforts in Emergency Preparedness for Nuclear Terrorism
2016	Meeting the Needs of the Nation for Radiation Protection
2015	Changing Regulations and Radiation Guidance: What Does the Future Hold?
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

2017 Annual Meeting

The Fifty-Third Annual Meeting of NCRP was held March 6–7, 2017 at the Hyatt Regency Bethesda in Bethesda, Maryland. The topic of the meeting was "Assessment of National Efforts in Emergency Preparedness for Nuclear Terrorism." The sessions and presentations were as follows:

Fourteenth Annual Warren K. Sinclair Keynote Address

Aren't We Ready Yet? Closing the Planning, Response and Recovery Gaps for Radiological Terrorism, Jack Herrmann

Are Existing Plans Sufficient for the Evolving Threat Environment?

Preparedness is More Than a Plan: Medical Considerations for Radiation Response, John F. Koerner

Radiological Preparedness in the Land of Lincoln, Joseph G. Klinger

The ROSS: A Rad/Nuc Emergency Subject Matter Expert Filling a Critical National Need, William E. Irwin

Guidance, Training and Exercises: Emergency Responders

Educating the Public About the Unthinkable: Development of a Preincident Nuclear Explosion Public Information Program, Robert M. Levin

Radiological/Nuclear Preparedness in the First Responder Community, David Pasquale

A Retrospective Look at Rad Resilient City, UPMC's 2011 Preparedness Checklist to Save Lives Following a Nuclear Detonation, Monica Schoch-Spana

Guidance, Training and Exercises: First Receivers, Public Health

First Receiver Gaps, Cullen Case

Triaging Thousands: Challenges in Survivor Screening After a Nuclear Detonation, John L. Hick

All-of-Nation Planning Approach to Medical Preparedness and Effective Response, C. Norman Coleman

The Unmet Need to Engage/Train/ Prepare the Medical Community for Mass Casualty Radiation Incidents, Judith L. Bader

When the Walls Come Tumbling Down: Medical Surge Response to Nuclear Detonation, Dan Hanfling

Recovery, Resilience and Reality: Going Beyond NCRP Report No. 175

Progress and Possibilities, Gerilee W. Bennett and Jill A. Lipoti

Contemplating Completion: Defining an Exit Strategy, John J. Cardarelli, II and Sara DeCair

Forty-First Lauriston S. Taylor Lecture on Radiation Protection and Measurements

Environmental Radiation and Life: A Broad View, F. Ward Whicker

Communication, Education, and Public Information

Communication Challenges in Crisis and Transition, Michelle M. Laver

Emergency Responder Communication Challenges Regarding Radiological Terrorism for the New Administration, Robert Ingram

Critical Areas for Improvement in Communications Regarding Radiological Terrorism, David P. Ropeik

Bringing it All Together: Conclusions and Path Forward

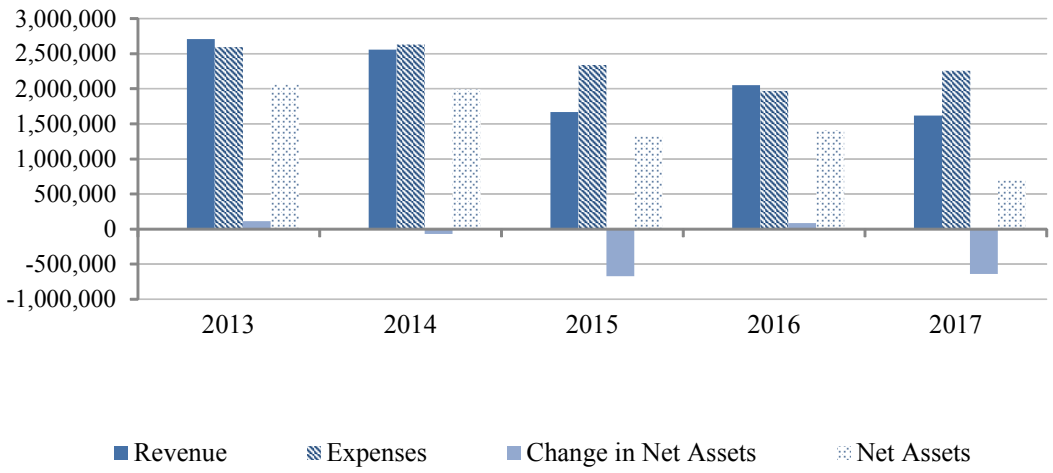
NCRP Vision for the Future and Program Area Committee Activities, John D. Boice, Jr.

Serving on the Program Committee for the 2017 Annual Meeting were: *Co-Chairs*, Armin Ansari and Adela Salame-Alfie; and Committee members, Sally A. Amundson, James S. Blumenstock, Daniel J. Blumenthal, Cullen Case, Jr., C. Norman Coleman, John F. Koerner, and Tammy P. Taylor. The proceedings of the 2017 Annual Meeting will be published in *Health Physics*.

Financial Summary

The table and bar graph presented below exhibit NCRP's year-end financial data for 2017 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
2013	2,706,268	2,595,346	110,922	2,062,496
2014	2,558,691	2,629,610	(70,919)	1,991,577
2015	1,668,085	2,337,573	(669,488)	1,322,089
2016	2,052,919	1,968,950	83,969	1,406,058
2017	1,618,444	2,256,630	(638,186)	698,123



Appendix 1. Finances

Exhibit A
Statement of Financial Position
For the year ended December 31, 2017

(unaudited)

Current Assets	
Cash and cash equivalents	$ 14,060
Investments [at market]	1,115,007
Accounts receivable:	
Publications	137
Grants and contracts	73,019
International Commission on Radiation Units and Measurements	864
Other	2,000
Inventory—publications	49,397
Prepaid expenses and other assets	17,704
Total current assets	1,272,188
Property and Equipment [at cost]	
Furniture and equipment	182,727
Less accumulated depreciation	(175,373)
Total property and equipment	7,354
TOTAL ASSETS	$ 1,279,542
Liabilities	
Line of credit	122,077
Accounts payable and accrued expenses	223,247
Deferred revenue	35,000
Total current liabilities	380,324
Other Liabilities	
Deferred rent liability	25,150
Accrued post-retirement benefits	175,945
Total other liabilities	201,095
TOTAL LIABILITIES	581,419

Net Assets	
Unrestricted:	
Undesignated	(657,964)
Board designated	1,076,321
Temporarily restricted	244,766
Permanently restricted	35,000
TOTAL NET ASSETS	698,123
TOTAL LIABILITIES AND NET ASSETS	$1,279,542

Exhibit B
Statement of Activities
For the year ended December 31, 2017
(unaudited)

	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
Revenue and Other Increases				
Contracts and grants	$ 995,388	$ —	$ —	$ 995,388
Contributions	118,336	11,273	—	129,609
Corporate sponsorship	20,000	—	—	20,000
Contributed professional services	165,550	—	—	165,550
Sales of publications	164,886	—	—	164,886
Dividends and interest	45,717	5,929	—	51,646
Net realized and unrealized gain on investments	74,785	4,375	—	79,160
Professional and administrative services	12,205	—	—	12,205
Total revenue and other increases	1,596,867	21,577	—	1,618,444
Expenses and Other Decreases				
Program costs:				
Contracts and grants	767,612	—	—	767,612
Publications	83,575	—	—	83,575
Contributed professional services	165,550	—	—	165,550
Total program costs	1,016,737	—	—	1,016,737
Management and general expenses	964,136	—	—	964,136
Total expenses	1,980,873	—	—	1,980,873
Write-down of publications inventory*	230,552	—	—	230,552
Investment fees	10,543	419	—	10,962
Post-retirement benefit change	34,243	—	—	34,243
	2,256,211	419	—	2,256,630
Change in Net Assets	(659,344)	21,158	—	(638,186)
Net Assets at Beginning of Year	1,077,701	223,608	35,000	1,336,309
Net Assets at End of Year	$ 418,357	$ 244,766	$ 35,000	$ 698,123

*A one-time write-off reflecting disposal of a large inventory of out-of-date publications that were no longer being purchased.

Exhibit C
Statement of Cash Flow
For the year ended December 31, 2017

(unaudited)

Cash flows from operating activities:	
Change in net assets	$ (638,186)
Adjustments to reconcile change in net assets to cash provided by operating activities	
Write-down of publications inventory*	230,552
Depreciation	6,224
Net realized and unrealized gain on investments	(79,160)
(Increase) decrease in assets:	
Accounts receivable	41,609
Inventory—publications	17,816
Prepaid expenses and other assets	6
Increase (decrease) in liabilities:	
Accounts payable and accrued expenses	(25,916)
Deferred rent liability	9,677
Accrued post-retirement benefits	33,993
Net cash used by operating activities	(403,385)
Cash flows from investing activities:	
Purchase of equipment	(2,740)
Purchase of investments	(32,911)
Sale of investments	183,018
Net cash provided by investing activities	147,367
Cash flows from financing activities:	
Net borrowings on line of credit	122,077
Net increase in cash and cash equivalents	(133,941)
Cash and cash equivalents at beginning of year	148,001
Cash and cash equivalents at end of year	$ 14,060

*A one-time write-off reflecting disposal of a large inventory of out-of-date publications that were no longer being purchased.

Schedule 1
Schedule of Contracts and Grants Revenue
For the year ended December 31, 2017

(unaudited)

Contracts	
U.S. Department of Homeland Security	$ 137,391
Total contracts	**137,391**
Grants	
Centers for Disease Control and Prevention	422,475
National Aeronautics and Space Administration	281,845
U.S. Department of Energy	45,653
U.S. Navy	24,063
U.S. Nuclear Regulatory Commission	83,961
Total grants	**857,997**
Total contracts and grants revenue	**$ 995,388**

Schedule 2
Schedule of Contributions & Corporate Sponsorship Revenue
For the year ended December 31, 2017

(unaudited)

Contributions	
American Academy of Health Physics*	$ 2,000
American Association of Physicists in Medicine	5,400
American College of Radiology Foundation	25,000
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
Conference of Radiation Control Program Directors, Inc.	2,000
Council on Radionuclides and Radiopharmaceuticals	2,000
Health Physics Society	12,000
Individuals	13,936
Landauer, Inc.	3,000
Radiological Society of North America	25,000
Society of Nuclear Medicine and Molecular Imaging	5,000
Society of Pediatric Radiology	500
Total contributions	**$ 118,336**
Corporate Sponsors	
Landauer, Inc.	$ 10,000
Nuclear Energy Institute	10,000
Total Corporate Sponsors	**$ 20,000**

*Contributions pledged in 2017 but received in January 2018.

Appendix 2. Publications

Distribution of NCRP Publications

(during the period May 16, 1931 through December 31, 2017)

No.	Title and Year of Publication	Number of Copies Distributed				
		Government Printing Office[a]	NCRP Publications[b] 2017		Total NCRP Publications[c]	All Sources Combined
			Hardcopy	E-Pub		
NCRP Reports						
179	Guidance for Emergency Response Dosimetry (2017)	__d	77	19	96	96
176	Radiation Safety Aspects of Nanotechnology (2017)	__d	54	12	66	66
175	Decision Making for Late-Phase Recovery from Major Nuclear or Radiological Incidents (2014)	__d	20	15	340	340
174	Preconception and Prenatal Radiation Exposure: Health Effects and Protective Guidance (2013)	__d	9	15	424	424
173	Investigation of Radiological Incidents (2012)	__d	10	11	317	317
172	Reference Levels and Achievable Doses in Medical and Dental Imaging: Recommendations for the United States (2012)	__d	0	21	668	668
171	Uncertainties in the Estimation of Radiation Risks and Probability of Disease Causation (2012)	__d	7	5	337	337
170	Second Primary Cancers and Cardiovascular Disease After Radiation Therapy (2011)	__d	2	4	270	270
169	Design of Effective Radiological Effluent Monitoring and Environmental Surveillance Programs (2010)	__d	4	3	244	244
168	Radiation Dose Management for Fluoroscopically-Guided Interventional Medical Procedures (2010)	__d	8	13	865	865
167	Potential Impact of Genetic Susceptibility and Previous Radiation Exposure on Radiation Risk for Astronauts (2010)	__d	0	0	181	181
166	Population Monitoring and Radionuclide Decorporation Following a Radiological or Nuclear Incident (2010)	__d	6	9	390	390
165	Responding to a Radiological or Nuclear Terrorism Incident: A Guide for Decision Makers (2010)	__d	10	7	991	991
164	Uncertainties in Internal Radiation Dosimetry (2009)	__d	0	7	208	208
163	Radiation Dose Reconstruction: Principles and Practices (2009)	__d	7	4	392	392

No.	Title and Year of Publication	Number of Copies Distributed				
		Government Printing Office[a]	NCRP Publications[b] 2017		Total NCRP Publications[c]	All Sources Combined
			Hardcopy	E-Pub		
162	Self Assessment of Radiation-Safety Programs (2009)	__d	4	6	588	588
161	Management of Persons Contaminated with Radionuclides (2009)	__d	3	33	1,432	1,432
160	Ionizing Radiation Exposure of the Population of the United States (2009)	__d	46	13	1,849	1,849
159	Risk to the Thyroid from Ionizing Radiation (2008)	__d	1	4	316	316
158	Uncertainties in the Measurement and Dosimetry of External Radiation (2007)	__d	1	5	737	737
157	Radiation Protection in Educational Institutions (2007)	__d	2	5	917	917
156	Development of a Biokinetic Model for Radionuclide-Contaminated Wounds and Procedures for Their Assessment, Dosimetry and Treatment (2006)	__d	3	6	820	820
155	Management of Radionuclide Therapy Patients (2006)	__d	1	4	1,225	1,225
154	Cesium-137 in the Environment: Radioecology and Approaches to Assessment and Management (2006)	__d	1	1	607	607
153	Information Needed to Make Radiation Protection Recommendations for Space Missions Beyond Low-Earth Orbit (2006)	__d	2	4	736	736
152	Performance Assessment of Near-Surface Facilities for Disposal of Low-Level Radioactive Waste (2005)	__d	1	3	598	598
151	Structural Shielding Design and Evaluation for Megavoltage X- and Gamma-Ray Radiotherapy Facilities (2005)	__d	21	43	3,759	3,759
150	Extrapolation of Radiation-Induced Cancer Risks from Nonhuman Experimental Systems to Humans (2005)	__d	0	1	727	727
149	A Guide to Mammography and Other Breast Imaging Procedures (2004)	__d	0	2	1,184	1,184
148	Radiation Protection in Veterinary Medicine (2004)	__d	3	8	1,296	1,296
147	Structural Shielding Design for Medical X-Ray Imaging Facilities (2004)	__d	27	45	4,743	4,743
	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	1	2	1,120	1,120
145	Radiation Protection in Dentistry (2003)	__d	7	26	2,514	2,514
144	Radiation Protection for Particle Accelerator Facilities (2003)	__d	6	16	2,332	2,332
143	Management Techniques for Laboratories and Other Small Institutional Generators to Minimize Off-Site Disposal of Low-Level Radioactive Waste (2003)	__d	1	0	741	741

No.	Title and Year of Publication	Number of Copies Distributed				
		Government Printing Office[a]	NCRP Publications[b] 2017		Total NCRP Publications[c]	All Sources Combined
			Hardcopy	E-Pub		
142	Operational Radiation Safety Program for Astronauts in Low-Earth Orbit: A Basic Framework (2002)	__d	16	2	1,184	1,184
141	Managing Potentially Radioactive Scrap Metal (2002)	__d	18	3	1,269	1,269
140	Exposure Criteria for Medical Diagnostic Ultrasound: II. Criteria Based on All Known Mechanisms (2002)	__d	1	1	831	831
139	Risk-Based Classification of Radioactive and Hazardous Chemical Wastes (2002)	__d	0	0	1,004	1,004
138	Management of Terrorist Events Involving Radioactive Material (2001)	__d	3	4	7,627	7,627
137	Fluence-Based and Microdosimetric Event-Based Methods for Radiation Protection in Space (2001)	__d	15	1	804	804
136	Evaluation of the Linear-Nonthreshold Dose-Response Model for Ionizing Radiation (2001)	__d	17	4	1,426	1,426
135	Liver Cancer Risk from Internally-Deposited Radionuclides (2001)	__d	0	0	1,122	1,122
134	Operational Radiation Safety Training (2000)	__d	2	5	1,377	1,377
133	Radiation Protection for Procedures Performed Outside the Radiology Department (2000)	__d	2	3	1,737	1,737
132	Radiation Protection Guidance for Activities in Low-Earth Orbit (2000)	__d	0	2	1,064	1,064
131	Scientific Basis for Evaluating the Risks to Populations from Space Applications of Plutonium (2001)	__d	1	1	806	806
130	Biological Effects and Exposure Limits for “Hot Particles” (1999)	__d	19	2	1,174	1,174
129	Recommended Screening Limits for Contaminated Surface Soil and Review of Factors Relevant to Site-Specific Studies (1999)	__d	16	4	1,722	1,722
128	Radionuclide Exposure of the Embryo/Fetus (1998)	__d	0	2	1,624	1,624
127	Operational Radiation Safety Program (1998)	__d	32	10	2,540	2,540
126	Uncertainties in Fatal Cancer Risk Estimates Used in Radiation Protection (1997)	__d	15	2	1,926	1,926
125	Deposition, Retention and Dosimetry of Inhaled Radioactive Substances (1997)	__d	2	3	2,583	2,583
124	Sources and Magnitude of Occupational and Public Exposures from Nuclear Medicine Procedures (1996)	__d	0	5	3,225	3,225
123	Screening Models for Releases of Radionuclides to Atmosphere, Surface Water, and Ground (1996)	__d	0	14	3,251	3,251

No.	Title and Year of Publication	Number of Copies Distributed				
		Government Printing Office[a]	NCRP Publications[b] 2017		Total NCRP Publications[c]	All Sources Combined
			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	2	3	3,404	3,404
121	Principles and Application of Collective Dose in Radiation Protection (1995)	__d	0	0	2,472	2,472
120	Dose Control at Nuclear Power Plants (1994)	__d	0	0	3,010	3,010
119	A Practical Guide to the Determination of Human Exposure to Radiofrequency Fields (1993)	__d	0	3	3,536	3,536
118	Radiation Protection in the Mineral Extraction Industry (1993)	__d	15	0	2,662	2,662
117	Research Needs for Radiation Protection (1993)	__d	15	0	1,973	1,973
116	Limitation of Exposure to Ionizing Radiation (1993)	__d	4	20	7,384	7,384
115	Risk Estimates for Radiation Protection (1993)	__d	0	1	3,194	3,194
114	Maintaining Radiation Protection Records (1992)	__d	2	1	2,477	2,477
113	Exposure Criteria for Medical Diagnostic Ultrasound: I. Criteria Based on Thermal Mechanisms (1992)	__d	0	2	3,290	3,290
112	Calibration of Survey Instruments Used in Radiation Protection for the Assessment of Ionizing Radiation Fields and Radioactive Surface Contamination (1991)	__d	17	5	3,892	3,892
111	Developing Radiation Emergency Plans for Academic, Medical and Industrial Facilities (1991)	__d	1	1	4,092	4,092
110	Some Aspects of Strontium Radiobiology (1991)	__d	0	0	2,575	2,575
109	Effects of Ionizing Radiation on Aquatic Organisms (1991)	__d	16	0	2,229	2,229
108	Conceptual Basis for Calculations of Absorbed-Dose Distributions (1991)	__d	0	1	3,141	3,141
107	Implementation of the Principle of As Low As Reasonably Achievable (ALARA) for Medical and Dental Personnel (1990)	__d	0	0	3,406	3,406
106	Limit for Exposure to “Hot Particles” on the Skin (1990)	__d	1	1	2,892	2,892
105	Radiation Protection for Medical and Allied Health Personnel (1989)	__d	2	7	6,859	6,859
104	The Relative Biological Effectiveness of Radiations of Different Quality (1990)	__d	0	1	2,421	2,421
103	Control of Radon in Houses (1989)	__d	0	1	3,770	3,770
102	Medical X-Ray, Electron Beam and Gamma-Ray Protection for Energies up to 50 MeV (Equipment Design, Performance and Use) (1989)	__d	4	9	7,857	7,857
101	Exposure of the U.S. Population from Occupational Radiation (1989)	__d	1	0	4,166	4,166

No.	Title and Year of Publication	Number of Copies Distributed				
		Government Printing Office[a]	NCRP Publications[b] 2017		Total NCRP Publications[c]	All Sources Combined
			Hardcopy	E-Pub		
100	Exposure of the U.S. Population from Diagnostic Medical Radiation (1989)	__d	0	0	4,984	4,984
99	Quality Assurance for Diagnostic Imaging (1988)	__d	0	4	4,876	4,876
98	Guidance on Radiation Received in Space Activities (1989)	__d	0	1	3,414	3,414
97	Measurement of Radon and Radon Daughters in Air (1988)	__d	0	0	4,258	4,258
96	Comparative Carcinogenicity of Ionizing Radiation and Chemicals (1989)	__d	0	0	4,098	4,098
95	Radiation Exposure of the U.S. Population from Consumer Products and Miscellaneous Sources (1987)	__d	0	1	4,289	4,289
94	Exposure of the Population in the United States and Canada from Natural Background Radiation (1987)	__d	0	0	4,436	4,436
93	Ionizing Radiation Exposure of the Population of the United States (1987)	__d	0	0	7,395	7,395
92	Public Radiation Exposure from Nuclear Power Generation in the United States (1987)	__d	0	0	3,691	3,691
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	0	2,909	2,909
89	Genetic Effects from Internally Deposited Radionuclides (1987)	__d	0	0	3,968	3,968
88	Radiation Alarms and Access Control Systems (1986)	__d	2	3	4,820	4,820
87	Use of Bioassay Procedures for Assessment of Internal Radionuclide Deposition (1987)	__d	0	0	4,266	4,266
86	Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields (1986)	__d	0	2	5,322	5,322
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	0	4,264	4,264
83	The Experimental Basis for Absorbed-Dose Calculations in Medical Uses of Radionuclides (1985)	__d	0	0	3,552	3,552
82	SI Units in Radiation Protection and Measurements (1985)	__d	0	1	4,592	4,592
81	Carbon-14 in the Environment (1985)	__d	0	0	4,002	4,002
80	Induction of Thyroid Cancer by Ionizing Radiation (1985)	__d	0	0	4,272	4,272
79	Neutron Contamination from Medical Electron Accelerators (1984)	__d	0	10	4,859	4,859
78	Evaluation of Occupational and Environmental Exposures to Radon and Radon Daughters in the United States (1984)	__d	0	0	6,480	6,480

No.	Title and Year of Publication	Number of Copies Distributed				
		Government Printing Office[a]	NCRP Publications[b] 2017		Total NCRP Publications[c]	All Sources Combined
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77	Exposures from the Uranium Series with Emphasis on Radon and Its Daughters (1984)	__d	0	0	6,656	6,656
76	Radiological Assessment: Predicting the Transport, Bioaccumulation, and Uptake by Man of Radionuclides Released to the Environment (1984)	__d	0	0	6,694	6,694
75	Iodine-129: Evaluation of Release from Nuclear Power Generation (1983)	__d	0	1	5,950	5,950
74	Biological Effects of Ultrasound: Mechanisms and Clinical Implications (1983)	__d	0	3	11,235	11,235
73	Protection in Nuclear Medicine and Ultrasound Diagnostic Procedures in Children (1983)	__d	0	0	5,504	5,504
72	Radiation Protection and Measurement for Low-Voltage Neutron Generators (1983)	__d	0	1	4,454	4,454
71	Operational Radiation Safety—Training (1983)	__d	0	0	5,074	5,074
70	Nuclear Medicine—Factors Influencing the Choice and Use of Radionuclides in Diagnosis and Therapy (1982)	__d	0	0	5,418	5,418
69	Dosimetry of X-Ray and Gamma-Ray Beams for Radiation Therapy in the Energy Range 10 keV to 50 MeV (1981)	__d	0	1	5,030	5,030
68	Radiation Protection in Pediatric Radiology (1981)	__d	0	0	4,509	4,509
67	Radiofrequency Electromagnetic Fields—Properties, Quantities and Units, Biophysical Interaction and Measurements (1981)	__d	0	0	5,460	5,460
66	Mammography (1980)	__d	0	0	4,598	4,598
65	Management of Persons Accidentally Contaminated with Radionuclides (1980)	__d	0	1	18,450	18,450
64	Influence of Dose and Its Distribution in Time on Dose-Response Relationships for Low-LET Radiations (1980)	__d	0	0	5,252	5,252
63	Tritium and Other Radionuclide Labeled Organic Compounds Incorporated in Genetic Material (1979)	__d	0	0	4,331	4,331
62	Tritium in the Environment (1979)	__d	0	1	3,972	3,972
61	Radiation Safety Training Criteria for Industrial Radiography (1978)	__d	0	0	6,177	6,177
60	Physical, Chemical and Biological Properties of Radiocerium Relevant to Radiation Protection Guidelines (1979)	__d	1	1	4,038	4,038
59	Operational Radiation Safety Program (1979)	__d	0	0	8,046	8,046
58	A Handbook of Radioactivity Measurements Procedures (1978)	__d	0	0	13,645	13,645

No.	Title and Year of Publication	Number of Copies Distributed				
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57	Instrumentation and Monitoring Methods for Radiation Protection (1978)	__d	15	1	11,000	11,000
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	0	6,847	6,847
54	Medical Radiation Exposure of Pregnant and Potentially Pregnant Women (1977)	__d	0	2	10,611	10,611
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	1	4,714	4,714
51	Radiation Protection Design Guidelines for 0.1-100 MeV Particle Accelerator Facilities (1977)	__d	0	1	8,514	8,514
50	Environmental Radiation Measurements (1976)	__d	0	0	7,929	7,929
49	Structural Shielding Design and Evaluation for Medical Use of X Rays and Gamma Rays of Energies up to 10 MeV (1976)	__d	0	17	17,743	17,743
	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	0	6,395	6,395
46	Alpha-Emitting Particles in Lungs (1975)	__d	0	0	6,090	6,090
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	6,575	6,575
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	0	2	47,251	47,251
41	Specification of Gamma-Ray Brachytherapy Sources (1974)	__d	0	0	5,476	5,476
40	Protection Against Radiation from Brachytherapy Sources (1972)	__d	0	0	9,809	9,809
39	Basic Radiation Protection Criteria (1971)	__d	__e	0	40,393	40,393
38	Protection Against Neutron Radiation (1971)	__d	1	3	8,998	8,998
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	17,662	17,662
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	22,363	22,363
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	0	0	9,953	34,403
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	3,836	7,980
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	1	0	7,450	59,976
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

No.	Title and Year of Publication	Number of Copies Distributed				
		Government Printing Office[a]	NCRP Publications[b] 2017		Total NCRP Publications[c]	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	7,659	58,159
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
	Total NCRP Reports Distributed	959,448	605	555	958,470	1,917,918
	Lauriston S. Taylor Lectures					
40	Radiation Protection and Regulatory Science, John W. Poston, Sr. (2016), Health Phys. **112**(2), 193–198 (2017)					
39	Dosimetry of Internal Emitters: Contributions of Radiation Protection Bodies and Radiological Events, Keith F. Eckerman (2015), Health Phys. **110**(2), 192–200 (2016)	__i	__i	__i		__i
38	On the Shoulders of Giants: Radiation Protection Over 50 Years, Fred A. Mettler, Jr. (2014), Health Phys. **108**(2), 102–110 (2015)	__i	__i	__i		__i
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33	Radiation Epidemiology: The Golden Age and Remaining Challenges, John D. Boice, Jr. (2009), Health Phys. **100**(1) 59-76 (2011)	__i	__i	__i		__i
32	Radiation Standards, Dose/Risk Assessments, Public Interactions, and Yucca Mountain: Thinking Outside the Box, Dade W. Moeller (2008,) Health Phys. **97**, 376–391 (2009)	__i	__i	__i		__i
31	The Quest for Therapeutic Actinide Chelators, Patricia W. Durbin (2007), Health Phys. **95**, 465–492 (2008)	__i	__i	__i		__i
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28	Radiation Protection in the Aftermath of a Terrorist Attack Involving Exposure to Ionizing Radiation, Abel J. Gonzalez (2004), Health Phys. **89**, 418–446 (2005)	__i	__i	__i		__i
27	The Evolution of Radiation Protection–From Erythema to Genetic Risks to Risks of Cancer to ?, Charles B. Meinhold (2003), Health Phys. **87**, 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. **85**, 4–12 (2003)	__i	__i	__i		__i
25	Assuring the Safety of Medical Diagnostic Ultrasound, Wesley L. Nyborg (2001), Health Phys. **82**, 578–587 (2002)	__i	__i	__i		__i
24	Administered Radioactivity: *Unde Venimus Quoque Imus,* S. James Adelstein (2000), Health Phys. **80,** 317–324 (2001)	__i	__i	__i		__i
23	Back to Background: Natural Radiation and Radioactivity Exposed, Naomi H. Harley (1999), Health Phys. **79**, 121–128 (2000)	__i	__i	__i		__i
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17	Science, Radiation Protection and the NCRP, Warren K. Sinclair (1993)	__d	0	__ j	544	544
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15	When is a Dose Not a Dose?, Victor P. Bond (1991)	__d	0	0	752	752
14	Radiation Protection and the Internal Emitter Saga, J. Newell Stannard (1990)	__d	0	0	354	354
13	Radiobiology and Radiation Protection: The Past Century and Prospects for the Future, Arthur C. Upton (1989)	__d	0	0	580	580
12	How Safe is Safe Enough?, Bo Lindell (1988)	__d	0	0	1,010	1,010
11	How to Be Quantitative about Radiation Risk Estimates, Seymour Jablon (1987)	__d	0	0	1,023	1,023
10	Biological Effects of Non-Ionizing Radiations: Cellular Properties and Interactions, Herman P. Schwan (1986)	__d	0	0	1,692	1,692
9	Truth (and Beauty) in Radiation Measurement, John H. Harley (1985)	__d	0	0	765	765
8	Limitation and Assessment in Radiation Protection, Harald H. Rossi (1984)	__d	0	0	1,530	1,530
7	The Human Environment—Past, Present and Future, Merril Eisenbud (1983)	__d	0	0	1,034	1,034
6	Ethics, Trade-Offs and Medical Radiation, Eugene L. Saenger (1982)	__d	0	0	1,251	1,251
5	How Well Can We Assess Genetic Risk? Not Very, 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, Harold O. Wyckoff (1980)	__d	0	0	1,852	1,852
3	Radiation Protection—Concepts and Trade Offs, Hymer L. Friedell (1979)	__d	0	0	2,085	2,085
2	Why be Quantitative about Radiation Risk Estimates? Sir Edward E. Pochin (1978)	__d	0	__ j	2,338	2,338
1	The Squares of the Natural Numbers in Radiation Protection, Herbert M. Parker (1977)	__d	0	__ j	1,513	1,513
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NCRP Annual Meeting Proceedings						
38	Meeting the Needs of the Nation for Radiation Protection: How Did We Get Here?, Proceedings of the Fifty-Second Annual Meeting held April 11–12, 2016. Health Phys. **112**(2), 111–234. (2017)	__i	__i	__i		__i
37	Changing Regulations and Radiation Guidance: What Does the Future Hold?, Proceedings of the Fifty-First Annual Meeting held March 16–17, 2015. Health Phys. **110**(2), 97–237 (2016)	__i	__i	__i		__i
36	NCRP: Achievements of the Past 50 Years and Addressing the Needs of the Future, Proceedings of the Fiftieth Annual Meeting held March 10–11, 2014. Health Phys. **108**(2), 97–241 (2015)	__i	__i	__i		__i
35	Radiation Dose and the Impacts on Exposed Populations, Proceedings of the Forty-Ninth Annual Meeting held March 11–12, 2013. Health Phys. **106**(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. **105**(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 7–8, 2011. Health Phys. **103**(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. **101**(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. **100**(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. **97**(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. **95**(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. **93**(5), 345–595 (2007)	__i	__i	__i		__i

No.	Title and Year of Publication	Number of Copies Distributed				
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27	Managing the Disposition of Low-Activity Radioactive Materials, Proceedings of the Forty-First Annual Meeting held March 30–31, 2005. Health Phys. **91**(5), 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. **89**(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, 2003. Health Phys. **87**(3), 249–318 (2004)	__i	__i	__i		__i
24	Where the New Biology Meets Epidemiology: Impact on Radiation Risk Estimates, Proceedings of the Thirty-eighth Annual Meeting held April 10–11, 2002. Health Phys. **85**(1), 1–108 (2003)	__i	__i	__i		__i
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. **82**(5), 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. **80**(4), 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	0	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. **79**(5), 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 **59**(4), 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	0	__ 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

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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
11	Radiation Protection Today—The NCRP at Sixty Years, Proceedings of the Twenty-Fifth Annual Meeting held April 4–5, 1989 (1990)	__d	0	0	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

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	Total Proceedings Distributed	0	0	0	22,025	22,025
NCRP Commentaries						
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24	Health Effects of Low Doses of Radiation: Perspectives on Integrating Radiation Biology and Epidemiology (2015)	__d	7	6	91	91
23	Radiation Protection for Space Activities: Supplement to Previous Recommendations (2014)	__d	3	4	67	67
22	Radiological Health Protection Issues Associated With Use of Active Detection Technology Systems for Detection of Radioactive Threat Materials (2011)	__d	1	0	74	74
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19	Key Elements of Preparing Emergency Responders for Nuclear and Radiological Terrorism (2005)	__d	18	2	1,349	1,349
18	Biological Effects of Modulated Radiofrequency Fields (2003)	__d	1	2	459	459
17	Pulsed Fast Neutron Analysis System Used in Security Surveillance (2003)	__d	1	0	488	488
16	Screening of Humans for Security Purposes Using Ionizing Radiation Scanning Systems (2003)	__d	17	1	659	659
15	Evaluating the Reliability of Biokinetic and Dosimetric Models and Parameters Used to Assess Individual Doses for Risk Assessment Purposes (1998)	__d	16	0	677	677
14	A Guide for Uncertainty Analysis in Dose and Risk Assessments Related to Environmental Contamination (1996)	__d	1	1	1,668	1,668
13	An Introduction to Efficacy in Diagnostic Radiology and Nuclear Medicine (Justification of Medical Radiation Exposure) (1995)	__d	1	0	1,401	1,401
12	Radiation Exposure and High-Altitude Flight (1995)	__d	1	2	565	565

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10	Advising the Public about Radiation Emergencies: A Document for Public Comment (1994)	__d	0	0	1,175	1,175
9	Considerations Regarding the Unintended Radiation Exposure of the Embryo, Fetus or Nursing Child (1994)	__d	0	2	1,397	1,397
8	Uncertainty in NCRP Screening Models Relating to Atmospheric Transport, Deposition and Uptake by Humans (1993)	__d	0	0	918	918
7	Misadministration of Radioactive Material in Medicine—Scientific Background (1991)	__d	0	0	1,088	1,088
6	Radon Exposure of the U.S. Population—Status of the Problem (1991)	__d	0	0	1,105	1,105
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	862	862
3	Screening Techniques for Determining Compliance with Environmental Standards—Releases of Radionuclides to the Atmosphere (1986)	__d	0	0	3,603	3,603
2	Preliminary Evaluation of Criteria for the Disposal of Transuranic Contaminated Waste (1982)	__d	0	0	292	292
1	Krypton-85 in the Atmosphere—with Specific Reference to the Public Health Significance of the Proposed Controlled Release at Three Mile Island (1980)	__d	0	0	697	697
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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
1	The Control of Exposure of the Public to Ionizing Radiation in the Event of Accident or Attack, Proceedings of a Symposium held April 27-28, 1981 (1982)	__d	0	0	1,849	1,849
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