



Fifty-Fifth Annual Meeting Program

NCRP Meeting the Challenge at 90: Providing Best Answers to Your Most Pressing Questions About Radiation

April 1–2, 2019

Hyatt Regency Bethesda
One Bethesda Metro Center
7400 Wisconsin Avenue
Bethesda, MD 20814



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NCRP Mission:

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



@NCRP2019



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NCRP Meeting the Challenge at 90: Providing Best Answers to Your Most Pressing Questions About Radiation

Fifty-Fifth Annual Meeting of the National Council on Radiation Protection and Measurements (NCRP)

Well before its Congressional charter was approved in 1964, NCRP devoted itself to collecting, analyzing, developing and disseminating in the public interest information and recommendations about radiation protection. For 90 y, NCRP has been fulfilling its mission to support radiation protection by providing independent scientific analysis, information and recommendations that represent the consensus of leading experts. The Council and its Program Area Committees have addressed questions in virtually every industrial, scientific and medical endeavor that utilizes sources of radiation. Over those 90 y, the societal uses of radiation have increased significantly, both in terms of the variety of radiation uses and frequency of use. During the same period, scientific studies have revealed many details of radiation interactions within the human body at the cellular and molecular levels, which have led to more applications in science, industry and medicine. These increased uses and expanding knowledge continue to generate questions about promising new applications and potential consequences of radiation, which lead to discussions of the benefits and risks to society from the uses of various radiation sources.


NCRP has responded to these questions principally through the generation of consensus NCRP reports, commentaries and statements to educate the public and professional communities. These documents have received extensive review by the Council and NCRP leadership and represent the consensus recommendations of leading scientists in the field to protect workers, patients, the public, and the environment from the risks of radiation exposure. Despite the fact that the biological effects of radiation have been studied for longer and more thoroughly than almost any other physical or chemical agent, the perceived, theoretical and known risks associated with exposure to various radiation sources continues to raise public and professional concerns and generate controversies about the continued and increasing uses of radiation sources.

The meeting has been divided into several topical sessions to explore important and relevant areas of inquiries associated with use of ionizing radiation.

NCRP has published several reports and commentaries on radiation effects and protection in low-Earth orbit and is now giving advanced thought to the consequences of long-duration exposure to the complex radiation environment of outer space. With the heightened interest in travel to Mars, NCRP Commentary No. 25, *Potential for Central Nervous System Effects from Radiation Exposure During Space Activities Phase I: Overview* (2016) attracted considerable attention and the follow-on report will be available soon. The first session of this meeting, “Exploring the Red Planet: A Focus on the Radiation Environment and Crew Health,” examines the challenges to human health associated with long-duration, manned space missions.

NCRP recently published Commentary No. 27, *Implications of Recent Epidemiologic Studies for the Linear-Nonthreshold Model and Radiation Protection* (2018), in which studies from the last few decades of the health risk associated with exposure to low levels of ionizing radiation were reviewed to determine whether human epidemiologic data on cancer induction have become any more reliable in the low-dose region. The second session of the meeting “Low-Dose Epidemiology and Regulatory Issues” examines fundamental questions on the relationship of dose to risk and the meaning of “reasonable” in the phrase “as low as reasonably achievable.” This session also explores epidemiologic areas of importance for the radiation protection community and implications of alternative models for radiation protection recommendations and regulations.

The third session, “Tissue Reactions,” examines compelling epidemiological data that suggest risks of cataracts and circulatory diseases may be higher at low radiation levels than previously thought and considers the possible mechanisms of biological effects of ionizing radiation in



the lens of the eye and circulatory system, especially at doses <1 Gy. The most recent NCRP published guidance in this area is Commentary No. 26, *Guidance on Radiation Dose Limits for the Lens of the Eye* (2016).

The 2017 NCRP Annual Meeting examined the importance of preparation for radiological and nuclear terrorism. The fourth session of this meeting, “Emergency Planning, Response and Communications,” examines the important role of NCRP in providing sound guidance on national preparedness for radiological or nuclear terrorism. This session reviews the challenges faced by the emergency response community and the efforts that are underway in NCRP, the federal government, and academia to address these challenges.

Associated with expanding uses of radioactive materials is the generation of radioactive waste. The fifth session examines three important aspects of radioactive waste disposal that our Nation faces: treatment of liquid high-level radioactive waste for safe disposal, recovery from the accident at the Waste Isolation Pilot Plant in New Mexico, and continuing safe disposal of low-level radioactive waste.

The final session “Frequently Asked Questions: Medical and Other Topics” reflects on the reactions of patients to their concerns about medical radiation exposure as well as other areas in which questions of radiation risk have arisen.

Questions from the audience can be submitted on cards during each session. Oral questions from the floor will not be accepted, although, as always, dialogue is both encouraged and welcomed during breaks and other times outside of the presentations. Session chairs and speakers will address as many questions as time permits. All questions and answers will be published with the video of the presentations that will be available for purchase on the NCRP website.

The Sixteenth Annual Warren K. Sinclair Keynote Address will be given by C. Norman Coleman to start off the scientific sessions. Dr. Coleman's address will provide a review of the Frontiers in Medical Radiation Science. Dr. Coleman is Associate Director, Radiation Research Program and Senior Investigator at the National Cancer Institute (NCI) and Senior Medical Advisor in the Office of the Assistant Secretary for Preparedness and Response in the U.S. Department of Health and Human Services. He is an NCRP Council member.

The Forty-Third Lauriston S. Taylor Lecture will be delivered by Dr. André Bouville. Dr. Bouville is retired from the Radiation Epidemiology Branch at NCI and is an NCRP Distinguished Emeritus Member. Dr. Bouville's lecture will provide an overview of the environmental, health, political and sociological considerations of fallout from nuclear weapons testing.

The Third Thomas S. Tenforde Topical Lecture will be delivered by Dr. Genevieve S. Roessler. Dr. Roessler is retired from the University of Florida and is an NCRP Distinguished Emeritus Member. Dr. Roessler's presentation will discuss intriguing questions and answers she and her editors have addressed in their work with the Health Physics Society's *Ask the Expert* website.

Program committee chair Dr. Fred A. Mettler, Jr. and Co-Chairs Dr. Jerrold T. Bushberg and Dr. Richard J. Vetter will wrap-up the meeting with reflections on some of the meeting highlights. NCRP President, Dr. Kathryn D. Held, will conclude the meeting by presenting a brief overview of recent NCRP activities and a vision for the future direction of NCRP.

NCRP and the Radiation Research Society (RRS) are pleased to welcome the NCRP/RRS Scholars to this year's Annual Meeting. The three young scientists below received competitive travel awards made possible by the generosity of RRS. These awards are aimed at encouraging and retaining young scientists in the field of radiation science. Eligible applicants included junior faculty or students in the radiation sciences or junior health or medical physicists:

- Ianik Plante, KBRwyle
- Nguyen (Nathan) Vo, McMaster University
- Alia Zander, Northwestern University

NCRP is grateful to:

- the Joint Armed Forces Honor Guard from the Military District of Washington D.C. who will open our Annual Meeting;
- Kimberly Gaskins of the U.S. Nuclear Regulatory Commission who will sing our National Anthem;
- SSG Erwin Arias for coordinating the military volunteers;
- Casper Sun for photography; and
- Thomas E. Johnson and students from Colorado State University for recording the presentations.

PLEASE NOTE: The technical program is being recorded, and copies of the recording, along with the Q&A from each of the sessions, can be purchased from the NCRP. In addition, all areas of the meeting are being recorded and photographed. If you wish to opt-out of videos/photos please visit the registration desk. The photographs will be posted and are publicly available on NCRP flickr account.

NCRP Meeting the Challenge at 90: Providing Best Answers to Your Most Pressing Questions About Radiation

Monday, April 1, 2019

Opening Session

- 8:10 am **Presentation of the Colors**
Joint Armed Forces Honor Guard
from the Military District of
Washington, DC
- Singing of the National Anthem**
Kimberly Gaskins
U.S. Nuclear Regulatory Commission
- 8:15 am **NCRP Welcome**
Kathryn D. Held
President, NCRP
- 8:20 am **Introduction**
Fred A. Mettler, Jr.
*University of New Mexico School of
Medicine*

Sixteenth Annual Warren K. Sinclair Keynote Address

- 8:30 am **Introduction of the Speaker**
Kathryn D. Held
- Frontiers in Medical Radiation
Science**
C. Norman Coleman

Exploring the Red Planet: A Focus on the Radiation Environment & Crew Health

Janice L. Huff, *Session Chair*

- 9:00 am **Is the Low-Earth Orbit Radiation
Environment a Good Proxy for
Mars?**
Cary J. Zeitlin
Leidos Innovations Corporation
- Overview of Health Risks
Associated with Deep Space
Exploration**
Eleanor A. Blakely
*Lawrence Berkeley National
Laboratory*

The Sky is the Limit

Mark Shavers
Wyle Laboratories

Perspectives from the Office of the Chief Health & Medical Officer

J.D. Polk
*National Aeronautics & Space
Administration*

10:30 am **Break**

Low-Dose Epidemiology & Regulatory Issues

Roy E. Shore, *Session Chair*

10:45 am **What is the Life Span Study Telling
Us About Cancer Risks at Low to
Moderate Doses?**

Eric J. Grant
*Radiation Effects Research
Foundation*

Risk Estimates from Studies of Low Doses & Low Dose Rates

Richard Wakeford
*Dalton Nuclear Institute, University of
Manchester, England*

NRC Rulemaking Process & Current Regulatory Activities

Patricia K. Holahan
U.S. Nuclear Regulatory Commission

Can Radiation Epidemiology Affect Current Radiation Standards?

Michael A. Boyd
*U.S. Environmental Protection
Agency*

Tissue Reactions

Lawrence T. Dauer, *Session Chair*

11:45 am **Low Dose Radiation & Circulatory
Diseases**

Mark P. Little
National Cancer Institute

Summary

Low Dose Radiation & Cataracts

Nobuyuki Hamada
*Central Research Institute of Electric
Power Industry*

Gamma Gear: A Video Game to Teach Radiation Detection & Protection to Members of the Public

Tristan Barr
*Canadian Nuclear Safety
Commission*

Special Presentations

12:15 pm **Portrait Unveiling &
Announcement of John D. Boice
Jr. Young Investigator Award**
Jerrold T. Bushberg, Kathryn D. Held,
& Kenneth L. Miller

Conclusions; Introduction of Q&A Panel

Brooke R. Buddemeier
*Lawrence Livermore National
Laboratory*

12:25 pm **Lunch**

3:00 pm **Break**

Emergency Planning, Response & Communications

Brooke R. Buddemeier, William E. Irwin, &
Jessica S. Wieder, *Session Co-Chairs*

1:30 pm **Response Issues Identified in 2017
NCRP Annual Meeting**
William E. Irwin
Vermont Department of Health

Don't Blame the PAGs

Sara D. DeCair
*U.S. Environmental Protection
Agency*

New Guidance & Tools for Radiological/Nuclear Response; NUSTL Support to State & Local Planning

Benjamin Stevenson
*U.S. Department of Homeland
Security*

Communication Issues Identified & Efforts to Close the Gaps

Jessica S. Wieder
*U.S. Environmental Protection
Agency*

Waste Management

William E. Kennedy, Jr., *Session Chair*

3:30 pm **High-Level Waste Tank Closure at
the Savannah River Site: What is
Being Done to Stabilize Liquid
Radioactive Waste from the Cold
War at Savannah River?**

Kent Rosenberger
Savannah River Remediation LLC

Contamination Mitigation at the Waste Isolation Pilot Plant in New Mexico: What has Been Done in the Aftermath of the Americium Accident at the Waste Isolation Pilot Plant?

Casey Gadbury
U.S. Department of Energy

Low-Level Waste Disposal: An Operator's Perspective: What is the Day-to-Day Reality of "Routine" Low-Level Radioactive Waste Operations?

Joseph J. Weismann
U.S. Ecology, Inc.

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Forty-Third Lauriston S. Taylor Lecture on Radiation Protection & Measurements

- 5:00 pm **Introduction of the Lecturer**
Harold L. Beck
- Fallout from Nuclear Weapons Tests: Environmental, Health, Political, & Sociological Considerations**
André Bouville

6:00 pm **Reception**



Tuesday, April 2

- 8:15 am **NCRP Annual Business Meeting**
- 9:30 am **Break**

Third Thomas S. Tenforde Topical Lecture

- 9:45 am **Introduction of the Lecturer**
Richard J. Vetter
- HPS Ask the Experts: Our Most Intriguing Questions & Answers**
Genevieve S. Roessler

Frequently Asked Questions: Medical & Other Topics

Jerrold T. Bushberg & Richard J. Vetter,
Session Co-Chairs

- 10:15 am **Panelist Presentation & Discussion: Answers to FAQs & Response to Often Heard Statements**
- Panel Members:
Jerrold T. Bushberg
Brooke R. Buddemeier
Raymond A. Guilmette
Randall N. Hyer
Fred A. Mettler, Jr.
Richard J. Vetter
Jessica S. Wieder

Conclusions

Jerrold T. Bushberg, Fred A. Mettler, Jr., &
Richard J. Vetter, *Session Co-Chairs*

- 12:00 pm **Wrap Up**
- 12:15 pm **NCRP Vision for the Future & PAC Activities**
Kathryn D. Held
President, NCRP
- 12:45 pm **Adjourn**



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Monday, April 1, 2019

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Kathryn D. Held, *President*
National Council on Radiation Protection and Measurements

8:20 am **Introduction**
Fred A. Mettler, Jr.
University of New Mexico School of Medicine

Sixteenth Annual Warren K. Sinclair Keynote Address

8:30 am **Introduction of the Speaker**
Kathryn D. Held

Frontiers in Medical Radiation Science
C. Norman Coleman*



At the occasion of the 90th anniversary of the National Council on Radiation Protection and Measurements (NCRP) and the 55th anniversary since being Congressionally chartered, the theme of “providing best answers to your most pressing questions about radiation” is most appropriate. Among the questions proposed here is “What are the new frontiers for the NCRP with its breath of talent and expertise in the rapidly evolving era of precision medicine?” Three closely related themes are

presented for new applications of radiation science for potential career opportunities.

Theme #1: Accurate, Precision Radiation Medicine: Accurate measurement of the physical radiation dose is necessary for assessing the biological effect. Taking the type of radiation, dose, and dose rate into account when assessing biological effect has been well done for decades. The various “omics” in biology including coding

and noncoding RNA, metabolomics, and proteomics are now used to understand cancer biology, patient prognosis, and treatment effect. In a concept proposed by our laboratory dubbed “focused biology” the aim is to consider radiation “as a drug” assessing the pharmacokinetics and pharmacodynamics as is done with systemic therapies. This utilizes the ability to focus the radiation delivery, thus adding up to “accurate, precision radiation medicine.” We have demonstrated that tumors and normal tissues adapt to radiation with the adaptation not predictable from the initial gene or miRNA expression profile. For tumors, there is both an early adaptation and a different late adaptation both of which are targetable by drugs that are more effective due to the adaptation compared to preradiation. The adaptation also impacts immunotherapy. Molecular profiling of normal tissue response is supported in a number of laboratories by both the National Institute of Allergy and Infectious Diseases and the Biomedical Advanced Research and Development Authority toward the development of biomarkers for normal tissue injury from radiological or nuclear incidents. Such biomarkers may also be useful for clinical radiation therapy.

Theme #2: CBRNE Medical Officer Science Support Expert: Applying scientific knowledge to natural and manmade disasters includes CBRNE — chemical, biological, radiological, nuclear and

explosive. Experience from nuclear- and radiological-based national exercises and international incidents and exercises demonstrated the importance of medical radiation subject matter experts with operational experience to work directly with and advise the decision makers. This is compatible with the proposed radiological operations support specialist.

Theme #3: Addressing the NCRP statement on “Where are the radiation professionals?” are potential careers for molecular radiation epidemiologists, who have the cancer biology and oncology expertise as well as epidemiology training. Consideration for MD, PhD programs for radiation oncologists is suggested.

There are remarkable opportunities for the application of emerging cancer and radiation biology to further enhance the contributions by NCRP and other radiation related societies and fields. The role of radiation in a broad range of societal needs including medical care, energy policy, terrorism, space exploration and global health provide exciting opportunities for radiation expertise.

*Disclaimer: This presentation is the personal opinion of the author and does not represent opinion or policy of the National Cancer Institute, National Institutes of Health, or U.S. Department of Health and Human Services or U.S. government.

9:00 am

Exploring the Red Planet: A Focus on the Radiation Environment & Crew Health

Janice L. Huff, *Session Chair*

The radiation environment in space poses significant challenges to human health and is a major concern for long duration, manned space missions. Outside of the Earth's protective magnetosphere, interplanetary crews will experience greater levels of radiation

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exposure from high energy protons and highly energetic atomic nuclei known as galactic cosmic rays, and from solar particle events. This session will cover key aspects of radiation protection for interplanetary space travel including characterization of the deep space radiation environment, the major health risks of concern, and strategies for risk mitigation for the astronaut crews.

Is the Low-Earth Orbit Radiation Environment a Good Proxy for Mars?

Cary J. Zeitlin
Leidos Innovations Corporation



Overview of Health Risks Associated with Deep Space Exploration

Eleanor A. Blakely
Lawrence Berkeley National Laboratory



The Sky is the Limit

Mark Shavers
Wyle Laboratories



Perspectives from the Office of the Chief Health & Medical Officer

J.D. Polk
National Aeronautics & Space Administration



10:30 am

Break

10:45 am

Low-Dose Epidemiology & Regulatory Issues

Roy E. Shore, *Session Chair*

Regulatory constructs for radiation protection began with guidelines to prevent severe tissue reactions (deterministic effects). Over time, issues of induction of cancer and genetic effects became known, and these “stochastic” effects became the driver for

Abstracts: Monday, April 1

regulatory standards. Several challenges remain including fundamental questions on the relationship of dose to risk and the question of what does *reasonable* mean in the phrase “as low as reasonably achievable.” The session will explore epidemiologic areas of importance for the radiation protection community and implications for radiation protection recommendations and regulation of alternative models.

What is the Life Span Study Telling Us About Cancer Risks at Low to Moderate Doses?

Eric J. Grant

Radiation Effects Research Foundation



Risk Estimates from Studies of Low Doses & Low Dose Rates

Richard Wakeford

Dalton Nuclear Institute, University of Manchester, England



NRC Rulemaking Process & Current Regulatory Activities

Patricia K. Holahan

U.S. Nuclear Regulatory Commission



Can Radiation Epidemiology Affect Current Radiation Standards?

Michael A. Boyd

U.S. Environmental Protection Agency



11:45 am

Tissue Reactions

Lawrence T. Dauer, *Session Chair*

Building over the last decade are compelling, although uncertain, suggestions of elevated risks of both circulatory diseases and cataracts associated with lower levels of radiation

NCRP Meeting the Challenge at 90: Providing Best Answers to Your Most Pressing Questions About Radiation

than previously understood. Several disparate populations exposed to low doses of ionizing radiation are being studied. This session will address the following questions: Do currently available data from epidemiology and the developing understanding of the mechanisms of biological effects provide new insights into effects in the lens of the eye or circulatory system, especially at doses below 1 Gy? If so, what are some of the implications?

Low Dose Radiation & Circulatory Diseases

Mark P. Little
National Cancer Institute



Low Dose Radiation & Cataracts

Nobuyuki Hamada
Central Research Institute of Electric Power Industry



12:15 pm

Special Presentation

Portrait Unveiling & Announcement of John D. Boice Jr. Young Investigator Award

Jerrold T. Bushberg, Kathryn D. Held, & Kenneth L. Miller

12:25 pm

Lunch

1:30 pm

Emergency Planning, Response & Communications

Brooke R. Buddemeier, William E. Irwin, & Jessica S. Wieder, *Session Co-Chairs*

The 2017 NCRP Annual Meeting identified critical gaps in the national preparedness for radiological or nuclear terrorism. The good news is that sound guidance exists, though

Abstracts: Monday, April 1

better ways need to be found to communicate the guidance and incentivize local level planning and support informed response decision making. The complex technical and psychosocial aspects of radiological and nuclear incidents complicate emergency response decision making and can lead to unnecessary cost and/or loss of life. NCRP can play an important role in providing sound science, but we must understand how to best temper and communicate this science to be operationally relevant and accessible to the people who need it most. This session will review the challenges faced by the emergency response community for radiological and nuclear events, including the complex needs for radiological dispersal devices and nuclear detonations, and the efforts that are underway in the NCRP, the federal government, and academia to address these challenges.

Response Issues Identified in 2017 NCRP Annual Meeting

William E. Irwin
Vermont Department of Health



Don't Blame the PAGs

Sara D. DeCair
U.S. Environmental Protection Agency



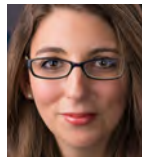
New Guidance & Tools for Radiological/Nuclear Response; NUSTL Support to State & Local Planning

Benjamin Stevenson
U.S. Department of Homeland Security



Communication Issues Identified & Efforts to Close the Gaps

Jessica S. Wieder
U.S. Environmental Protection Agency



Gamma Gear: A Video Game to Teach Radiation Detection & Protection to Members of the Public

Tristan Barr
Canadian Nuclear Safety Commission



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Conclusions; Introduction of Q&A Panel

Brooke R. Buddemeier
Lawrence Livermore National Laboratory



3:00 pm

Break

3:30 pm

Waste Management

William E. Kennedy, Jr., *Session Chair*

The generation of radioactive waste has been a routine part of industrial activities involving the use of radioactive materials for over a century. The waste classifications, disposal technologies, and regulations for radioactive waste disposal, both nationally and internationally, have changed over that time. As technology changes, new wastes are generated, and disposal methods and systems are created. This session will cover three important aspects of radioactive waste disposal that our Nation currently faces: treatment of liquid high level radioactive waste for safe disposal; recovery from the accident at the Waste Isolation Pilot Plant in New Mexico; and continuing safe disposal of low-level radioactive waste. The session will be followed by an interactive panel discussion responding to questions from the audience.

High-Level Waste Tank Closure at the Savannah River Site: What is Being Done to Stabilize Liquid Radioactive Waste from the Cold War at Savannah River?

Kent Rosenberger
Savannah River Remediation LLC



Contamination Mitigation at the Waste Isolation Pilot Plant in New Mexico: What has Been Done in the Aftermath of the Americium Accident at the Waste Isolation Pilot Plant?

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Low-Level Waste Disposal: An Operator's Perspective: What is the Day-to-Day Reality of “Routine” Low-Level Radioactive Waste Operations?

Joseph J. Weismann
U.S. Ecology, Inc.



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

5:00 pm

Introduction of the Lecturer

Harold L. Beck

Fallout from Nuclear Weapons Tests: Environmental, Health, Political, & Sociological Considerations

André Bouville



The first occurrence in the history of the world of radioactive debris falling from the atmosphere (now known as “fallout”) from a manmade event occurred in New Mexico in July of 1945 with the culmination of the Manhattan Project and the detonation of the Trinity device. It was, of course, followed just three weeks later by the bombing of Hiroshima and Nagasaki, which became one of the most significant events of the 20th century. The bombing of Japan was, in turn, followed by over 500 atmospheric nuclear weapons tests, mainly by the United States and the Soviet Union, creating conditions which are now understood to have blanketed much of the Earth with radioactive fallout debris. This continued until August 5, 1963 when both countries signed the Limited Test Ban Treaty prohibiting the testing of nuclear weapons in the atmosphere, underwater, or in outer space. However, atmospheric nuclear weapons testing by France and China continued until 1980. India and North Korea recently joined the nuclear club that also includes Pakistan and, reputedly,

Israel, although they did not conduct any test of their nuclear weapons in the atmosphere. “Fallout” was extensive and widespread: it contaminated the environment on the global scale, so that air, foods, water, and even nonliving materials (like film or building materials) contain fallout to some extent. People in all walks of life, whatever their age, ethnicity and location have been exposed to fallout via external irradiation, inhalation and ingestion. The long-lived radionuclides in fallout (mainly ^{90}Sr , ^{137}Cs , ^{241}Am , and $^{239+240}\text{Pu}$) are ubiquitous and will stay with us for a long time, so that they are now considered to be part of the background radiation environment. On the other hand, fallout-related studies helped certain areas of science to grow, like instrumentation, atmospheric transport (particles, gases), bioassay, environmental surveillance (e.g., milk monitoring), radioecology, internal dosimetry, etc.

Atmospheric nuclear weapons tests were conducted, as a rule, in areas with very small populations in the vicinity of the test sites, in order to reduce the number of

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persons with relatively high exposures to radiation in case of mishap. From the 1950s until the early 1970s, limited information was available on the radiation exposures and health effects of the local and regional populations, although environmental radiation levels both near and far away from the test sites were monitored and reported in many countries. The situation changed in the 1970s, when major studies were conducted in the United States to reconstruct the doses and estimate the related health effects to the populations affected by the tests that had been conducted at the Nevada Test Site. More recently, doses and health effects have also been estimated for local and regional populations near other test sites around the world.

Because of the devastating effects of nuclear weapons, constant efforts have been made by most governments to limit the number of countries with nuclear weapons, therefore keeping the topic of potential nuclear weapons fallout as a concern in the public and political arena. Public concern regarding past exposures also is still prevalent among the popula-

tions near the previous test sites, and monetary compensation programs have been established in some countries to compensate persons suffering from radiation-induced cancer attributable to nuclear testing.

This lecture will review and discuss available information on the doses and health and environmental effects resulting from the nuclear weapons tests that were conducted in the atmosphere. The fallout doses and effects will be compared to those from other sources of irradiation, such as natural and medical. Political and sociological considerations regarding these exposures also will be examined including the mechanisms and rationales of current compensation programs, the public's perception of risk from radiation, the public's lack of understanding that fallout radiation is the same as the radiation from other sources, etc. Finally, the "positive" aspects of fallout, notably its contribution to the development of instrumentation, atmospheric transport, environmental surveillance, radioecology, and dosimetry, will be discussed.

6:00 pm

Reception in Honor of the Lecturer



Tuesday, April 2

8:15 am **NCRP Annual Business Meeting**
9:30 am **Break**

Third Thomas S. Tenforde Topical Lecture

9:45 am **Introduction of the Lecturer**
Richard J. Vetter

HPS Ask the Experts: Our Most Intriguing Questions & Answers

Genevieve S. Roessler



The Health Physics Society (HPS) developed the idea of an online “Ask the Experts” (ATE) feature in 1999 when it created its official website (<http://hps.org>). ATE features are popular now, but at that time it was a novel idea, so there was some apprehension about its possible success. Early participation by Robert L. Brent, M.D., a National Council on Radiation Protection and Measurements (NCRP) Distinguished Emeritus Member, as an ATE expert helped set the tone for establishing a credible communication venue. Now 20 y later, HPS considers its ATE feature a success and the most valuable service the Society offers for the public. Nearly 13,000 questions have been submitted to the feature. They come both from members of the public and from health physicists. All have been answered personally by top-notch radiation safety experts.

While it is important to answer questions personally, we now recognize that the most far-reaching impact of the feature is due to the body of written material accumulated on the website. This posted material includes frequently asked questions (FAQs), summary topical papers, links to other pertinent information, and answers to questions considered to be of

general interest to the public. The catalog of answers is organized on the website in 26 radiation safety categories. Each answered question has a unique title that appears as a link to the answer in web search engine (e.g., Google) results.

The feature, managed by one lead editor, 22 topic editors, a technical editor, our webmaster, and ~300 experts, draws over one million visitors per year. This statistic indicates that a substantial number of people are finding the answers to their questions on the website and, therefore, do not need to submit a personal question.

ATE editors have learned much through the years about effective interaction with questioners, especially members of the public. Most important, answers should show compassion. We learned that “people want to know that you care before they care what you know,” as noted by the World Health Organization. We also know that we should present the bottom line first, be brief, and use plain language at the level of the questioner. Heavy reliance on NCRP reports and other peer reviewed documents add to the credibility of the information.

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Questions from the public, which have remained at a consistent level in recent years, cover a wide range of radiation safety issues; however, by far the most frequent deal with medical exposures, especially computed tomography procedures. Other questions from the public deal with a wide range of concerns including products from Japan, granite countertops, radon, smoke detectors, whole-

body scanners, and flying. Also of major concern are nonionizing radiation sources such as cell phones, radar, ultraviolet radiation, and power lines.

The talk will give examples of the most intriguing questions that have come to the ATE feature and the answers provided by the experts.

10:15 am

Frequently Asked Questions: Medical & Other Topics

Jerrold T. Bushberg & Richard J. Vetter, *Session Co-Chairs*

Exposure to ionizing radiation is a common experience during medical evaluation of patients in hospitals and clinics. While most people are not fearful or simply assume medical personnel would not expose them to harm, some patients experience a range of emotions from slight anxiety to significant fear. Some patients will research their questions by surfing the internet while others will direct their questions to reputable organizations such as the National Council of Radiation Protection and Measurements or the Health Physics Society. In this session, panel members will respond to selected frequently asked questions (FAQs) and misstatements that have appeared in the scientific literature and popular media followed by comments and discussion by other panel members.

FAQs:

- Do computed tomography (CT) exams give you cancer?
- Is the linear nonthreshold model still suitable for setting standards for protection against radiation?
- Are the health risks from exposure to internally deposited radionuclides different from those from acute external exposure?
- How much radiation is safe?

Statements:

- "Low-dose radiation exposure (<100 to 200 mSv) is likely beneficial, not harmful."
- "DESPITE great strides in prevention and treatment, cancer rates remain stubbornly high and may soon surpass heart disease as the leading cause of death in the United States. Increasingly, we and many other experts believe that an important culprit may be our own medical practices: We are silently irradiating ourselves to death."
- "A single CT scan exposes a patient to the amount of radiation that epidemiologic evidence shows can be cancer-causing."
- "Radiation safety programs must establish compliance with radiation regulations which continue to be based on the linear nonthreshold (LNT) hypothesis and the ALARA principle, despite overwhelming sound, peer-reviewed science that demonstrates the existence of a carcinogenic thresh-

Abstracts: Tuesday, April 2

old and/or hormesis at low doses ... Yet despite compelling evidence revealing LNT to be fraudulent, the consistent response taken by regulatory agencies and scientific bodies whose recommendations are cited as the basis of regulatory actions is to deflect or rationalize away the science at best or simply pretend it doesn't exist at worst so as to maintain alle-

giance to a world view of radiation safety built on ALARA and LNT.”

- “It doesn't matter, we are all dead anyway.” (The most common excuse for not preparing for the consequences of a nuclear detonation)
- “Experience has shown that most people faced with a large-scale disaster will either panic or suffer from psychological incapacitation.”

Panelist Presentation & Discussion: Answers to FAQs & Response to Often Heard Statements

Panel Members:

Jerrold T. Bushberg
Brooke R. Buddemeier
Raymond A. Guilmette
Randall N. Hyer
Fred A. Mettler, Jr.
Richard J. Vetter
Jessica S. Wieder



Conclusions

Jerrold T. Bushberg, Fred A. Mettler, Jr., & Richard J. Vetter, *Session Co-Chairs*

12:00 pm

Wrap Up

12:15 pm

NCRP Vision for the Future and Program Area Committee Activities

Kathryn D. Held
President, NCRP



12:45 pm

Adjourn

Program Committee

Fred A. Mettler, Jr., *Chair*

University of New Mexico School of Medicine

Co-Chairs

Jerrold T. Bushberg

University of California Davis
School of Medicine (retired)

Richard J. Vetter

Mayo Clinic (retired)

Members

Brooke R. Buddemeier

Lawrence Livermore National
Laboratory

Donald A. Cool

Electric Power Research Institute

Lawrence T. Dauer

Memorial Sloan-Kettering Cancer
Center

Raymond A. Guilmette

Lovelace Respiratory Research
Institute (retired)

Janice L. Huff

National Aeronautics & Space
Administration

Randall N. Hyer

Center for Risk Communication

William E. Irwin

Vermont Department of Health

William E. Kennedy, Jr.

WE Kennedy Consulting

R. Julian Preston

U.S. Environmental Protection
Agency

Roy E. Shore

New York University Langone
School of Medicine

Jessica S. Wieder

U.S. Environmental Protection
Agency

Registration

Monday, April 1, 2019

7:00 am – 5:00 pm

Tuesday, April 2, 2019

7:00 am – 11:00 am

Register online: <http://registration.ncrponline.org>



@NCRP2019

2020 Annual Meeting

Radiation & Flight:

A Down-to-Earth Look at the Risks

Jacqueline P. Williams & Cary Zeitlin, *Co-Chairs*

March 23–24, 2020

Bethesda, Maryland

Lauriston S. Taylor Lecture



Dr. André Bouville has been selected to give the 43rd Lauriston S. Taylor Lecture at the 2019 Annual Meeting of the National Council on Radiation Protection and Measurements (NCRP). The lecture, entitled “Fallout from the Nuclear Weapons Tests: Environmental, Health, Political, and Sociological Considerations,” will be the featured presentation at the 55th Annual Meeting to be held April 1-2, 2019. The Lecture will be given in the Crystal Ballroom of the Hyatt Regency Bethesda, One Bethesda Metro Center, 7400 Wisconsin Avenue, Bethesda, Maryland at 5:00 p.m. on April 1, 2019. The lecture series honors the late Dr. Lauriston S. Taylor, NCRP Founding President (1929 to 1977) and President Emeritus (1977 to 2004).

Dr. Bouville was born and educated in France. He came to the United States in 1984 to work for the National Cancer Institute (NCI). His initial assignment was to estimate the thyroid doses received by the American people from ^{131}I released by the nuclear weapons tests that were conducted at the Nevada Test Site in the 1950s. This study led to the assessment of doses from nuclear weapons tests conducted at other sites all over the world, as well as to a large number of dosimetry studies related to the Chernobyl nuclear reactor accident. He was the head of the Dosimetry Unit of the Radiation Epidemiology Branch at NCI until he retired at the end of 2010. Throughout his career, Dr. Bouville actively participated in the preparation of scientific reports under the umbrella of international organizations, notably the United Nations Scientific Committee on the Effects of Atomic Radiation, the International Commission on Radiological Protection, the International Commission on Radiation Units and Measurements, the World Health Organization, the International Atomic Energy Agency, and the Nuclear Energy Agency.

Dr. Bouville was a member of NCRP for 12 y and became a Distinguished Emeritus Member in 2011. He recently chaired Scientific Committee (SC) 6-9 that published NCRP Report No. 178 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)*. He also chaired SC 6-3 on Uncertainties in Internal Radiation Dosimetry and SC 57-16 on Uncertainties in the Application of Metabolic Models. Dr. Bouville also served as a member on several scientific committees and was a speaker at several annual meetings and served as Session Chair in 2011.

Regarding other U.S. organizations, he has served on numerous National Academy of Science committees, is a Lifetime Associate of the National Academies, and was recently a member of the committee on the analysis of cancer risks in populations near nuclear facilities. For all his achievements, Dr. Bouville was a recipient of the Presidential Rank Meritorial Award in 2003.

Annual Warren K. Sinclair Keynote Address



Dr. C. Norman Coleman has been selected to give the 16th Warren K. Sinclair Keynote Address at the 2019 Annual Meeting of the National Council on Radiation Protection and Measurements (NCRP). The Address, entitled “Frontiers in Medical Radiation Science,” will be a featured presentation at the 55th NCRP Annual Meeting to be held April 1-2, 2019. The Address will be given at 8:30 a.m. on April 1, 2019 in the Crystal Ballroom, Hyatt Regency Bethesda, One Bethesda Metro Center, 7400 Wisconsin Avenue. The keynote speaker series honors Dr. Warren K. Sinclair, NCRP’s second President (1977 to 1991).

Since 1999, Dr. Coleman has been Associate Director, Radiation Research Program and Senior Investigator, with a molecular radiation therapeutics laboratory in the Radiation Oncology Branch of NCI. Since 2004 he has also been a Senior Medical Advisor in the Office of the Assistant Secretary for Preparedness and Response in the U.S. Department of Health and Human Services. His focus is on radiological and nuclear preparedness and planning but the programs apply to all hazards. This includes the Scarce Resources for a Nuclear Detonation project and participation at the U.S. Embassy in Tokyo during the Japan disaster in March 2011.

He received his BA in mathematics, summa cum laude, from the University of Vermont in 1966 and his MD from Yale University in 1970. He is board certified in three specialties, having done residencies in internal medicine at the University of California San Francisco, medical oncology at the National Cancer Institute (NCI), and radiation oncology at Stanford University.

Dr. Coleman has been a Council member of the NCRP since 2016 and is a member of Program Area Committee 3 on Nuclear and Radiological Security and Safety. He was a Session Chair in 2017 and a speaker at the 2014 and 2017 Annual Meetings and participated in the “Where are all the Radiation Professionals?” Workshop.

Dr. Coleman was President of the Radiation Research Society in 1996 and received their Failla Award in 2016. Among his honors are the Gold Medal from the American Society for Radiation Oncology and the 2011 Samuel J. Heyman, Service to America Homeland Security Medal. During his career spanning over 40 y he has received numerous national and international fellowships, honors and awards.

Thomas S. Tenforde Topical Lecture



Dr. Genevieve Roessler has been selected to give the 3rd Thomas S. Tenforde Topical Lecture at the 2019 Annual Meeting of the National Council on Radiation Protection and Measurements (NCRP). The Address, entitled “HPS Ask the Experts: Our Most Intriguing Questions and Answers” will be a featured presentation at the 55th NCRP Annual Meeting to be held April 1-2, 2019. The Lecture will be given at 9:45 a.m. on April 2, 2019 in the Crystal Ballroom, Hyatt Regency Bethesda, One Bethesda Metro Center, 7400 Wisconsin Avenue. The topical lecture series honors Dr. Thomas S. Tenforde, NCRP's fourth President (2002 to 2012).

Dr. Roessler is the Editor-in-Chief, Health Physics Society (HPS) Ask the Experts feature. She was on the faculty, Department of Nuclear Engineering Sciences, University of Florida for 22 years as Head of Health Physics and Medical Physics and is a Life Member and Fellow of the HPS.

She currently serves on the Advisory Board on Radiation and Worker Health, National Institutes of Occupational Safety and Health, and has been on various advisory committees including the Health and Environmental Research Advisory Committee, U. S. Department of Energy (DOE) (1984 to 1988); Health and Safety Research Division Advisory Committee, Oak Ridge National Laboratory (1988 to 1995); Senior Technical Review Group for the Disposition of Weapons Grade Plutonium, DOE (1995 to 1998); Radiation Advisory Committee, Science Advisory Board, U.S. Environmental Protection Agency (1997 to 2004); Technical Steering Panel, Hanford Environmental Dose Reconstruction Project (1988 to 1996); and Bi-national Advisory Group, Chernobyl Health Effects Study, National Cancer Institute (2001 to 2016). She is a Past President of the HPS, a former editor of *Health Physics* (1982 to 1988), *Health Physics News* (1992 to 2010), and the HPS website (1999 to 2010). She has received the HPS Founders Award and Distinguished Public Service Award.

She was elected as a NCRP Council member in 1990 and became a Distinguished Emeritus Member in 2003. Dr. Roessler served on the Nominating Committee from 1993 to 1997 and was the 'official' Annual Meeting photographer for several years.

Dr. Roessler earned a BA in mathematics from Jacksonville University, and an MS in radiation biophysics and a PhD in radiological engineering from the University of Florida.

Biographies



Tristan Barr, *Presenter*, trained as a biologist and has worked in Health Physics since 2001. He was a radiation safety officer for a university teaching hospital, a consultant specializing in source characterization, waste management and decommissioning for Energy Solutions, AMEC Foster Wheeler, and Monserco Ltd, and started working for the Canadian Nuclear Safety Commission (CNSC) in 2008. At the CNSC, he manages the Licensing and Inspection of Dosimetry Services, recently published a draft “Canadian Regulatory Framework for Recovery after a Nuclear Emergency,” and delivers radiation safety training to all Canadian nuclear industry inspectors.

Mr. Barr has put together some of his experience teaching radiation safety and communicating risk to the public, as well as some of his love of video games into this communications project that he will present today.



Harold L. Beck, *Presenter*, was a physicist for the U.S. Department of Energy (DOE)/ERDA/Atomic Energy Commission for over 36 y. Mr. Beck retired in 1999 as the Director of the Environmental Science Division of the DOE Environmental Measurements Laboratory (EML) in New York City and is presently a self-employed consultant specializing in environmental radiation dose reconstructions. During his tenure at EML, he also served as Director of the EML Instrumentation Division, and as Acting Deputy Director of the Laboratory. Mr. Beck has authored well over 100 publications in the areas of radiation physics, radiation measurement, dose reconstruction, environmental radiation, and radiation dosimetry. He served as Scientific Vice President for Radiation Measurements and Dosimetry of NCRP from 1996 to 2003, and in 2004 was elected to Distinguished Emeritus membership in NCRP. From 2004 to 2006, he served as a member of the National Academy of Sciences, National Research Council (NAS/NRC) Board on Radiation Effects Research/Nuclear and Radiation Studies Board.

He currently serves as a member of the U.S. Scientific Review Group, DOE Russian Health Studies Program. He has served as an expert member on a number of NCRP and NAS/NRC scientific studies related to radiation dosimetry and as Chair of two NCRP committees and one NCRP program committee. He is a member of the American Association for the Advancement of Science, the American Nuclear Society, and a Fellow of the Health Physics Society.



Eleanor A. Blakely, *Presenter*, is a Lawrence Berkeley National Laboratory (LBNL) Senior Staff Biophysicist with more than 40 y of professional experience in molecular, cellular and animal radiobiological research directed at studying the basic mechanisms of radiation responses, with an emphasis on charged particle radiation effects. She also holds a Faculty Affiliate Appointment in the Department of Radiological Health Sciences at Colorado State University, Fort Collins, Colorado and is a Clinical Professor of Radiation Medicine (nontenured) at Loma Linda University, School of Medicine, Loma Linda, California. Dr. Blakely earned a PhD in Physiology from the University of Illinois at Champaign-Urbana as a U.S. Atomic Energy Commission Special Fellow in Radiation Science and Protection. Her professional activities have included service on advisory panels for several hospitals, universities, and numerous federal agencies including the U.S. Department of Energy (DOE), the National Institutes of Health (NIH), and the National Aeronautics and Space Administration (NASA); on Editorial Boards for several journals: *Space Power*, *Radiation Research*, *Journal of Radiation Research*, and *NPJ Microgravity*; Appointed Member, Diagnostic Radiology Study Section-Division of Research Grants, NIH; Advisory Committee Member, International Atomic Energy Agency; Scientific Director, NASA Space Research Summer School; and Elected Officer of the Radiation Research Society: Biology Councilor and Secretary-Treasurer.

In 2000 she was elected to NCRP, and has served on Scientific Committee (SC) 75 that produced NCRP Report No. 132, *Radiation Protection Guidance for Activities in Low-Earth Orbit*; and SC 1-7 that produced NCRP Report No. 153, *Information Needed to Make Radiation Protection Recommendations for Space Missions Beyond Low-Earth Orbit*. She has received several awards including the Robert Emerson Graduate Teaching Award, School of Life Sciences, University of Illinois, the Lawrence Berkeley Laboratory Outstanding Performance Award, the DOE Office of Science Outstanding Mentor Award, the Lawrence

Biographies

Berkeley Laboratory Technology Transfer Award, and an RD100 award from Research and Development Magazine. In 2011, she was named the 35th NCRP Lauriston S. Taylor Lecturer. She serves as consultant in support of clinical radiotherapy trials, and of issues pertinent to radiation protection. In 2014 she was awarded the Martin Schneider Memorial Lectureship, University of Texas Medical Branch, Galveston, Texas. In June 2015 she retired after 40 y at LBNL, but was rehired by LBNL in October 2015, and continues to work part-time. In November 2015 she received the Berkeley Laboratory Director's Award for Exceptional Achievement: the Berkeley Lab Citation Award.



Michael A. Boyd, *Presenter*, is a Senior Health Physicist in the U.S. Environmental Protection Agency (EPA) Office of Radiation and Indoor Air/Radiation Protection Division (RPD) and has been with EPA since 1988. As a member of RPD's Center for Science and Technology, Mr. Boyd manages the development of new federal guidance documents. He is also the co-chair of the Federal Guidance Subcommittee of the Interagency Steering Committee on Radiation Standards (ISCORS). Mr. Boyd is a recently elected member of the International Commission on Radiological Protection Committee 4. He chairs the Health Physics Society's International Collaboration Committee and is on the Bureau of the Organisation for Economic Co-operation and Development/Nuclear Energy Agency's Committee on Radiation Protection and Public Health. He has a BS in Biology and MS in Public Health from the University of North Carolina at Chapel Hill.



Brooke R. Buddemeier, *Program Committee, Session Chair, & Presenter*, is an Associate Program Leader in the Global Security Directorate of Lawrence Livermore National Laboratory (LLNL). He supports the Risk and Consequence Management Division in their efforts to evaluate the potential risk and consequence of radiological and nuclear terrorism. Mr. Buddemeier is a member of NCRP and served on the scientific committees which developed Commentary No. 19, *Key Elements of Preparing Emergency Responders for Nuclear and Radiological Terrorism* (2005) and NCRP Report No. 165, *Responding to a Radiological or Nuclear Terrorism Incident: A Guide for Decision Makers* (2010). From 2003 through 2007, he was on assignment with the Department of Homeland Security as the weapons of mass destruction emergency response and consequence management program manager for Science and Technology's emergency preparedness and response portfolio. He supported Federal Emergency Management Agency and the Homeland Security Operations Center as a radiological emergency response subject matter expert. He also facilitated the department's research, development, test and evaluation process to improve emergency response through better capabilities, protocols and standards. Prior to that, he was part of the LLNL Nuclear Counterterrorism Program and coordinated LLNL's involvement in the National Nuclear Security Administration's Radiological Assistance Program (RAP) for California, Nevada and Hawaii. RAP is a national emergency response resource that assists federal, state and local authorities in the event of a radiological incident. As part of RAP's outreach efforts, Mr. Buddemeier has provided radiological responder training and instrumentation workshops to police, firefighters, and members of other agencies throughout the nation and abroad. He has also provided operational health physics support for various radiochemistry, plutonium handling, accelerator and dosimetry operations. He is Certified Health Physicist who received his Master's in Radiological Health Physics from San Jose State University and a BS in Nuclear Engineering from the University of California, Santa Barbara.



Jerrold T. Bushberg, *NCRP Senior Vice President, Program Committee Co-Chair, Session Chair, & Presenter*, is a Clinical Professor of Radiology and Clinical Professor of Radiation Oncology at University of California (UC) Davis School of Medicine. He holds the title of Director Emeritus Medical/Health Physics Programs and retired as Associate Chair of the Department of Radiology in 2018. He is currently Chair of the Board of Directors and Senior Vice President of NCRP. He is an expert on the biological effects, safety and interactions of ionizing and nonionizing radiation and holds multiple radiation detection technology patents. With over 40 y of experience he has served as a subject matter expert and an advisor to government agencies and institutions throughout the nation and around the world including the U.S. Department of Homeland Security, the U.S. Food and Drug Administration's Center for Devices and Radiological Health, the World Health Organization, and the International Atomic Energy Agency in the areas of ionizing and nonionizing radiation protection, risk communication, medical physics, and radiological emergency medical

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management. In 2016, Dr. Bushberg was appointed Vice Chair of the Committee on Man and Radiation which is a Technical Committee of the Institute of Electrical and Electronics Engineers' Engineering in Medicine and Biology Society. Former Commander in the U.S. Naval Reserve, among other assignments CDR Bushberg served as Executive Officer of the Chemical/Biological/Nuclear Technical Unit 120 Pacific, a highly skilled multidisciplinary military emergency response and advisory team based out of the Alameda Naval Air Station in California. Dr. Bushberg is an elected fellow of the American Association of Physicists in Medicine and the Health Physics Society. He is certified by several national professional boards with specific subspecialty certification in radiation protection and medical physics and currently serves as a Director and Vice Chair of the American Board of Medical Physics. In 2014, Dr. Bushberg was awarded the NCRP Warren K. Sinclair Medal for Excellence in Radiation Science and received the Professor John C. Christensen Distinguished Alumnus award from Purdue University School of Health Sciences in 2016. Prior to coming to the UC Davis Health System as technical director of Nuclear Medicine, Dr. Bushberg was on the faculty of Yale University School of Medicine Department of Radiology where his research was focused on radiopharmaceutical development. Dr. Bushberg has had responsibility for medical postgraduate education in medical physics, radiation (ionizing and nonionizing) biology and protection for more than 30 y. The third edition of the textbook *The Essential Physics of Medical Imaging*, authored by Bushberg, Seibert, Leidholdt, and Boone, is used extensively by radiology residency programs throughout the United States.



Donald A. Cool, *Program Committee*, received his Masters and Doctorate degrees in Radiation Biology from the University of Rochester School of Medicine and Dentistry. He is currently the Technical Executive for Radiation Safety at the Electric Power Research Institute (EPRI), and provides advice on EPRI Low Dose Radiation research and the Radiation Safety Program. Dr. Cool retired from the U.S. Nuclear Regulatory Commission (NRC) after more than 32 y of service. At NRC, he was responsible for coordinating the wide range of international activities related to radiation protection, safety, and security of byproduct materials; decommissioning and waste management; radiation protection policy; and international standards, and had previously served in various senior management positions including Director, Division of Industrial and Medical Nuclear Safety, and other increasingly responsible positions within NRC. Dr. Cool is a member of the Main Commission of the International Commission on Radiological Protection (ICRP), and Chairman of ICRP Committee 4 on Application of the Commission's Recommendations, and is a Fellow of the Health Physics Society.



Lawrence T. Dauer, *Program Committee & Session Chair*, is Corporate Radiation Safety Officer, Associate Attending Physicist, and Associate Clinical Member in the Departments of Medical Physics and Radiology at Memorial Sloan Kettering Cancer Center (MSKCC) in New York City. He earned an MS in Health Physics and a PhD in Adult Education. He is certified in comprehensive health physics by the American Board of Health Physics and is past chair of the Radiation Safety Committee of the American Association of Physicists in Medicine (AAPM), past President of the Greater New York Chapter of the Health Physics Society (HPS), Executive Council Member of the Medical Physics Section of HPS, a Member of the Joint Safety Committee of the Society for Interventional Radiology and the American College of Radiology, past council member of the Radiological and Medical Physics chapter of AAPM, and a member of editorial and review boards of several scientific journals. He received the Elda E. Anderson Award from HPS in 2005, and was named an HPS Fellow in 2017. He is a Council member and serves on the Board of Directors of NCRP. He also served as a member of the International Commission on Radiological Protection Committee 3 on protection in medicine, a member of the science council for the International Organization for Medical Physics, and was on the program committee for the International Atomic Energy Agency's International Conference on Radiation Protection in Medicine-Setting the Scene for the Next Decade. He serves on the Radiation Advisory Committee of the U.S. Environmental Protection Agency's Science Advisory Board. He has several publications in the topical areas of radiation protection and risks in the fields of detection, radiology, interventional radiology, x-ray imaging, nuclear medicine, and radiation oncology, as well as surgery and medicine.

Biographies



Sara D. DeCair, *Presenter*, has been with the U.S. Environmental Protection Agency (EPA) Office of Radiation and Indoor Air since 2003. She has focused on radiological emergency preparedness and spent over a decade negotiating the finalization of the 2017 EPA *Protective Action Guides (PAG) Manual*. Assisting with adoption of the updated PAG Manual has continued to be a collaborative effort with the Federal Radiological Monitoring and Assessment Center (FRMAC), Advisory Team for Environment, Food and Health and the Federal Emergency Management Agency, and the U.S. Nuclear Regulatory Commission. Currently, Ms. DeCair is Associate Center Director for the EPA's radiological protection program's Center for Science and Technology, a small group of radiation experts who provide federal guidance reports and lead an in-house health physics continuing education program for the Agency.

She previously worked for 7 y with the State of Michigan's Department of Environmental Quality. Three of those years were spent in nuclear power plant emergency response and planning where she went from participating in to becoming a trainer for everything from state field team leader, dose assessor, decontamination team leader, various Emergency Operations Center positions, and eventually scenario development and exercise design.

The 3 y prior, Ms. DeCair worked as a State of Michigan inspector of radioactive materials registrants and radiation incident responder. Incident responses ranged from scrap yard portal monitor alarms to oil and gas pipe yard naturally occurring radioactive material (NORM) discoveries to medical waste from Ohio or Canada. Source identification, isolation, storage, and even disposal were among the responsibilities of the incident responder. She also led the instrument calibration efforts for materials program instruments, completed several oil and gas NORM site cleanups, and facilitated the proper disposal of numerous orphan radioactive sources in the state.

Ms. DeCair is a longtime national Health Physics Society (HPS) member and has served 4 y on the Board of the Baltimore-Washington Chapter of HPS.



Casey Gadbury, *Presenter*, came to work at the Waste Isolation Pilot Plant (WIPP) with 6 y of Naval nuclear experience as an Engineering Laboratory Technician. Mr. Gadbury was hired in 1990 by the Westinghouse Electric Corporation Waste Isolation Division (management and operating contractor for WIPP at the time). While working for Westinghouse, Mr. Gadbury attended college and received his BS in Radiation Protection in 1933, in the same year he was nationally registered as a Radiation Protection Technologist. In 2000, Mr. Gadbury became a Senior Radiological Engineer, providing radiological engineering support for the operation of WIPP. He left Westinghouse at the end of 2000 to become the Waste Operations Program Manager for the Department of Energy's Carlsbad Field Office (CBFO), where he has served several important functions. In 2010, Mr. Gadbury was assigned as the Director of the Office of Site Operations, responsible for the oversight and monitoring of the contractor that manages and operates the WIPP facility to dispose of contact handle and remote handle transuranic waste. In 2014, he was selected as the Assistant Manager of the CBFO Office of Program Management, responsible for cost, scope, and schedule management and oversight of all CBFO-funded activities. As a result of this experience, he has a thorough knowledge of CBFO, WIPP, NTP activities, and the nuclear industry in general in his career that started in health physics.



Eric J. Grant, *Presenter*, is the Associate Chief of Research at the Radiation Effects Research Foundation (RERF) in Hiroshima and Nagasaki, Japan. Dr. Grant received his BSEE from the University of Michigan and his PhD in Epidemiology from the University of Washington. He worked as a computer programmer for the University of Michigan Medical Center prior to coming to RERF where he previously served as the assistant chief of the Department of Epidemiology.

RERF's mission is to study the long-term health effects due to radiation exposure from the atomic bombings. Dr. Grant's most recent publication focused on the radiation risks of solid cancer incidence among the Life Span Study of atomic-bomb survivors. Dr. Grant has also authored manuscripts on indirect effects of radiation exposure, specifically hormonal changes among women after whole-body exposure, and on the lack of evidence of trans-generational mortality effects of radiation exposure among the children of the atomic-bomb survivors.

Biographies

Dr. Grant has recently been put in charge of developing RERF's "Research Resource Center," an institutional repository designed to safeguard RERF's varied resources (data, paper, physical artifacts, etc.) as well as integrate research data with biosample inventories. This integrated resource center along with updated policies for data sharing should facilitate RERF's own research as well as improve opportunities for collaborative research.



Raymond A. Guilmette, *Program Committee & Presenter*, received a BS in nuclear engineering from Rensselaer Polytechnic Institute and an MS in environmental health sciences and a PhD in radiological health from New York University. For almost 40 y, he has been studying the metabolism, biokinetics, dosimetry, biological effects of internally deposited radionuclides, developing methods for removing radionuclides from the body (decorporation), and studying the mechanisms of deposition, clearance and retention of inhaled materials. Most of this research was performed at the Lovelace Respiratory Research Institute (LRRRI) (formerly the Inhalation Toxicology Research Institute), where he worked for 23 y. From 2000 through 2007, he was team leader for internal dosimetry at the Los Alamos National Laboratory, assessing radiation doses for workers who were exposed to radionuclides associated with the nuclear weapons industry. In 2007, he returned to LRRRI as director of the Center for Countermeasures Against Radiation where he evaluated the efficacy of chemical compounds designed to decorporate radionuclides as well as drugs designed to ameliorate the effects of acute radiation syndrome from large external radiation doses in small and large animal models. He is a past president of the Health Physics Society, received its Distinguished Scientific Achievement Award in 2002, and has given several honorary lectures (Newell Stannard Memorial Lecture, 2006; G. William Morgan Lecture, HPS, 2009; inaugural Patricia W. Durbin Memorial Lecture, Lawrence Berkeley National Laboratory, 2010). He is a member of scientific committees of the International Commission on Radiological Protection, NCRP (a past board member), the International Agency for Research on Cancer, U.S. Environmental Protection Agency, and the U.S. National Academies of Science.



Nobuyuki Hamada, *Presenter*, received a BSc in radiological sciences from Ibaraki Prefectural University of Health Sciences, and became a registered radiological technologist, both in 1999. He earned his MSc and PhD in pharmaceutical sciences from Nagasaki University in 2001 and 2004, respectively. He has been involved in various radiation effect studies over the last two decades, his current focus being placed on tissue reactions (e.g., ocular and circulatory disease). He has published >100 papers in peer-reviewed international journals and received 18 awards including the Michael Fry Research Award from the U.S. Radiation Research Society. He is currently a corresponding member of the International Commission on Radiological Protection (ICRP) Task Groups 102 and 111, a member of NCRP PAC 1, Chair of Scientific Advisory Board for LDLensRad (European CONCERT-funded project), a member of the International Radiation Protection Association Task Group Phase 3 on lens dose limits, Associate Editor for International Journal of Radiation Biology, Editorial Board Member for Mutation Research/Reviews in Mutation Research, PLOS ONE, Radioprotection (French SFRP's), and Radiation Protection and Environment (Indian Association for Radiation and Protection). He was ICRP Assistant Scientific Secretary, Associate Editor for ICRP Publications 126 to 132, a Consultant to NCRP Scientific Committee 1-23 that produced NCRP Commentary No. 26, and a member of the Organization for Economic Co-operation and Development, Nuclear Energy Agency (NEA), Committee on Radiation Protection and Public Health, Expert Group on Radiation Protection Science that produced NEA No. 7265 report.



Kathryn D. Held, *NCRP President & Presenter*, became President of the NCRP in January 2019. She held the position of Executive Director and Chief Science Officer from 2016 to 2018. She was first elected to the Council in 2006 and served on the NCRP Board of Directors from 2008 to 2014. She was Vice President from 2011 to 2016 of Program Area Committee 1 on Basic Criteria, Epidemiology, Radiobiology, and Risk. She also served as Chair of the Program Committee for the 2011 Annual Meeting on "Scientific and Policy Challenges of Particle Radiations in Medical Therapy and Space Missions." Dr. Held was a member of Scientific Committee (SC) 1-22 on Radiation Protection for Astronauts in Short-Term Missions and Phase I of SC 1-24 on Radiation Exposures in Space and the Potential of Central Nervous System Effects and an advisor to several NCRP committees.

Biographies

Dr. Held is an Associate Radiation Biologist in the Department of Radiation Oncology, Massachusetts General Hospital (MGH) and Associate Professor of Radiation Oncology (Radiation Biology) at Harvard Medical School (HMS). At MGH, Dr. Held leads a team that is involved in research on molecular mechanisms for the induction of bystander effects by high energy particles in cells and tissues, characterization of charged particle beam induced DNA damage responses and cell killing, development of a cancer screening platform for personalized radiation medicine, and mechanisms for regulation of DNA damage response by cell-cell communication. Dr. Held also teaches radiation biology to radiation oncology medical and physics residents and graduate students at MGH/HMS and the Massachusetts Institute of Technology.

Dr. Held earned her PhD in biology from the University of Texas, Austin. She has served on review panels for numerous federal agencies including the National Institutes of Health, the National Aeronautics and Space Administration (NASA), and the U.S. Army Medical Research and Material Command programs and other organizations such as the Radiological Society of North America. She is on the Editorial Boards of Radiation Research and the International Journal of Radiation Biology, and has served on committees for the National Academy of Science/National Research Council, NASA, and the American Society of Radiation Oncology. She is a past President of the Radiation Research Society.



Patricia K. Holahan, *Presenter*, has served as the Director of Rulemaking in the Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission (NRC) since October 2017. She leads the NRC's core function of rulemaking for the reactor and materials programs and the development, documentation, tracking and reporting of rulemaking activities, as well as the regulatory analysis that supports agency decision making for both rulemaking and other activities. From October 2014 to October 2017, Dr. Holahan served as the Director of the Office of Enforcement where she oversaw enforcement issues and allegations for the agency, safety culture at regulated facilities and differing views programs within the agency. From August 2008 to October 2014, she served as the Director of the Division of Security Operations in the Office of Nuclear Security and Incident Response (NSIR) where she oversaw security at all commercial nuclear power plants and Category I fuel cycle facilities as well as oversight of intelligence information and classified and safeguards information systems at NRC. Prior to that, she was Director of the Division of Security Policy in NSIR since October 2006. Before joining NSIR, she was Deputy Director of the Division of Industrial and Medical Nuclear Safety in NRC's Office of Nuclear Material Safety and Safeguards (NMSS). She has been with NRC since 1991 and has held a variety of staff and management positions in NMSS, and served as an Assistant to former Chairman Meserve, with a primary focus on the nuclear materials program, health physics issues, and related rulemaking and guidance activities.

Before joining NRC, Dr. Holahan worked as a Consultant Radiation Biologist and an Assistant Professor for the University of Texas' Health Science Center, in San Antonio. In the mid-1980s, she did research work at the Armed Forces Radiobiology Research Institute in Bethesda, Maryland, and at the University of California. She received her PhD in Radiation Biology from Colorado State University. She earned a BS (Honours) and MS Degree in Biophysics from the University of Western Ontario.



Janice L. Huff, *Program Committee & Session Chair*, is employed by MEI Technologies, Inc. Houston, Texas. She serves as the Deputy Element Scientist for the National Aeronautics and Space Administration (NASA) Human Research Program, Space Radiation Element at the Johnson Space Center. In this capacity, Dr. Huff is responsible for scientific management and strategic planning, ensuring that the Element's research portfolio is organized to understand and mitigate radiation health risks, and to develop countermeasures and technologies supporting space exploration missions. Previously, she held the positions of research assistant professor at the University of Nevada, Las Vegas, and was a research scientist at Bioforce Nanosciences, Inc., a bio-nanotechnology company specializing in development of ultraminiaturized biodiagnostic tools and technologies. She joined NASA in 2004 as the lead scientist for the Advanced Technology Development Laboratory in the Cell Science Program.

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Dr. Huff received a BS in Microbiology and a BA in Psychology from the University of Rochester. She earned a PhD in Microbiology from the University of Virginia studying molecular biology, oncogenes, and signal transduction in the laboratory of J. Thomas Parsons. She was elected to the NCRP in 2017, and currently serves on Scientific Committee 1-24 (Phase II).



Randall N. Hyer, *Program Committee & Presenter*, is Deputy Director, Center for Risk Communication and a leading global expert on risk and crisis communication. Together with Dr. Vincent T. Covello, he Co-Founded CrisisCommunication.net, a crisis communication and management consultation network. The network provides evidence-based strategic crisis and management support and advice for numerous private and public organizations in the health and medical sectors.

Some of their effective interventions include: helping a biotechnology company present clinical data to investors resulting in a \$400 million market increase, helping swing a re-election campaign in a recent close gubernatorial race, helping State Health Directors explain Ebola that resulted in polls showing a substantial increase in public understanding, providing key messages and intervention strategy to top policy-makers to help mitigate the Fukushima nuclear disaster, and producing a key media guide on Ebola described by a leading journal as a “Communicator’s Dream.” Dr. Hyer also teaches risk and crisis communication at Harvard’s Kennedy School of Government Executive Education program.

Board-certified in public health and general preventive medicine, Dr. Hyer earned his MD from Duke and trained at Walter Reed Hospital and Harvard. He was awarded his PhD from the University of Oxford where he studied the genetics of juvenile diabetes. His studies won him the National Institutes of Health “Outstanding Research Award for Clinical Trainees” and are widely cited.

At Oxford University, Dr. Hyer founded the biotechnology company, Alpha-Plus DNA. He also served as a U.S. Congressional Fellow for Senator Pete V. Domenici (R.-NM). Dr. Hyer helped introduce legislation to safeguard genetic privacy that eventually became the Genetic Information Non-discrimination Act (GINA) of 2008.

Dr. Hyer graduated with Distinction from the U.S. Naval Academy. Rising to the rank of Commander, he served 12 y naval service supporting four major military combat operations. His humanitarian service includes being Chief Public Health Advisor for the Kosovo relief operations and the Deputy Surgeon for the Mozambique flood relief effort. Dr. Hyer also served as the Winter-Over Medical Officer at the McMurdo and South Pole Stations, Antarctica.

From 2001 to 2005, Dr. Hyer was a World Health Organization (WHO) Medical Officer and Military Liaison in Geneva. Among other duties, he facilitated the WHO respond to various crisis such as anthrax, Ebola, SARS, tsunamis, earthquakes, and pandemic influenza.

Dr. Hyer’s perspective and contributions span seven continents and 100 plus countries in diverse positions across the public and private sectors.



William E. Irwin, *Program Committee, Session Chair, & Presenter*, leads the Radiological and Toxicological Sciences Program at the Vermont Department of Health and is responsible for radiation protection in medicine and other applications, nuclear facility environmental surveillance, preventive radiological/nuclear detection and emergency preparedness. He is a member of NCRP Council Committee 1 which produced Report No. 180, *Management of Exposure to Ionizing Radiation: Radiation Protection Guidance for the United States (2018)*; Program Area Committee 3, Scientific Committee (SC) 3-1 which wrote Report No. 179, *Guidance for Emergency Response Dosimetry*; and SC 3-1P2 which is preparing the commentary on “Implementation of Guidance for Emergency Response Dosimetry.” He was on the 2017 NCRP Annual Meeting Program Committee and presented on the gaps filled in emergency response by the Radiological Operations Support Specialist (ROSS). He helped lead the NCRP Special Session on Radioactive Waste Management at the 2018 Health Physics Society (HPS) Mid-Year Meeting and serves on the 2019 NCRP Annual Meeting Program Committee. Dr. Irwin represents the Conference of Radiation Control Program Directors (CRCPD) on the ROSS Steering Committee leading efforts to train and certify hundreds of ROSS to bolster national radiological and nuclear preparedness. He is a ROSS instructor for Counter Terrorism

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Operations Support and reinforces his responder capabilities as a Chief Officer of the Vermont Hazardous Materials Response Team, and as a Chief Officer and Emergency Medical Technician for the Bakersfield Volunteer Fire Department. He is a Certified Health Physicist, long-time member of HPS and was previously on the American Board of Health Physics Part II Panel of Examiners. He serves the CRCPD in numerous committees, was on its Board of Directors and served as the Board Chair. Prior to government service, Dr. Irwin worked as Laser Safety Officer and Radiation Safety Officer at Harvard University and the Massachusetts Institute of Technology. He is a consultant on radiofrequency radiation (RFR), laser radiation, extremely low frequency electromagnetic fields, nuclear magnetic resonance fields, and ionizing radiations. He volunteers for Interpol in its international efforts to prevent and detect the smuggling of radiological and nuclear materials. Both his Doctor of Science and Master of Science were earned at the University of Massachusetts Lowell with his dissertation on the health effects of wireless telecommunications RFR exposure. Dr. Irwin started in nuclear power, first as a radiation protection technician on U.S. Navy submarines, guided missile cruisers, and aircraft carriers at Newport News Shipbuilding and Dry Dock Company and then as an instructor and supervisor in radiation protection, chemistry, and nuclear power plant systems and operations training at commercial facilities.



William E. Kennedy, Jr., *Program Committee & Session Chair*, has extensive experience as a project manager, task leader, and individual contributor covering a broad range of health physics and nuclear engineering topics. He received his BS and MS degrees in Nuclear Engineering from Kansas State University. Mr. Kennedy has been involved in the development of environmental pathway and radiation dosimetry models used to assess potential health and environmental impacts that resulted from releases of radionuclides to the environment. He specializes in the use of these models in environmental dose reconstruction, radioactive materials transport, radioactive waste disposal, and evaluation of nuclear facility operating practices. Over the past 37 y, Mr. Kennedy has led and contributed to a variety of projects for the U.S. Nuclear Regulatory Commission, the U.S. Department of Energy, the Electric Power Research Institute, and private industry. He has been involved with development of the technical basis for revised standards and regulations, and serves as the chair of ANSI/HPS N13.12, *Surface and volume Radioactivity Standards for Clearance*. He served as a consultant to the International Atomic Energy Agency (IAEA), Vienna, Austria, and was a member of the IAEA Advisory Groups to evaluate the Derivation of Exempt Quantities for Application to Terrestrial Waste Disposal and Derivation of Exempt Quantities for Recycle of Materials from Nuclear Facilities. He was an invited lecturer for IAEA training courses on Management of Radioactive Waste from Nuclear Power Plants at Argonne National Laboratory; on Safety Assessment Modeling for Low and Intermediate Radwastes in Rio de Janeiro, Brazil and in Cairo, Egypt; and on Environmental Monitoring in Kiev, Ukraine. In 1990, he received the Health Physics Society's (HPS) prestigious Elda E. Anderson Award. He served as a member of the HPS Board of Directors from 1998 through 2001 and was selected as a fellow of the society in 2002. He was a member of the U.S. delegation to the 10th Congress of the International Radiation Protection Association in Hiroshima, Japan.



Mark P. Little, *Presenter*, joined the National Cancer Institute, Radiation Epidemiology Branch (REB) in 2010 as a Senior Investigator. He studied mathematics at Trinity College, Cambridge and obtained his doctorate in mathematics at New College, Oxford. Over the last two decades he has been analyzing cancer and cardiovascular disease risks in the Japanese atomic-bomb survivors, and in other irradiated populations and offspring. Previously (2000 to 2010), he worked in Imperial College London, and before that (1992 to 2000) at U.K. National Radiological Protection Board (now part of Public Health England). He is a member of NCRP, and has served as consultant to the United Nations Scientific Committee on the Effects of Atomic Radiation, to the International Atomic Energy Agency, to the International Committee on Radiological Protection (ICRP) (in particular as member of ICRP Task Group 91), to the U.K. Committee on the Medical Aspects of Radiation in the Environment, and to a recently formed NCRP committee (SC 1-26). In REB, Dr. Little is working on assessment of leukemia risk in persons exposed at low doses and dose rates, cancer risk in various cohorts of persons exposed as result of the Chernobyl accident, on risks of various health endpoints in the U.S. cohort of radiologic technologists, and on treatment-related second cancer risks in various populations. He has particular interests in dose measurement error models, with application to assessment of low-dose and low-dose-rate risk of childhood leukemia and circulatory disease.

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Fred A. Mettler, Jr., *Program Committee Chair, Session Chair, & Presenter*, is currently Professor Emeritus and Clinical Professor at the Department of Radiology at the University of New Mexico School of Medicine. He was chairman of the department for 18 y from 1994 to 2003. He is currently in the Radiology and Nuclear Medicine Service at the New Mexico Federal Regional Medical Center.

He graduated with a BA in Mathematics from Columbia University and in 1970 he received his MD from Thomas Jefferson University. He performed a rotating internship at the University of Chicago and subsequently completed a Radiology and Nuclear Medicine Residency at Massachusetts General Hospital. He received an MS in Public Health from Harvard University in 1975. He is a fellow of both the American College of Radiology and the American College of Nuclear Physicians. He is board certified in both radiology and nuclear medicine.

Dr. Mettler has authored over 360 scientific publications including 20 textbooks, and holds four patents. The books are on *Medical Management of Radiation Accidents*, *Medical Effects of Ionizing Radiation and Radiology*, and *Nuclear Medicine*. He was a Scientific Vice President of NCRP and remains a member. He has chaired several committees for the Institute of Medicine/National Research Council and is a member of the Nuclear and Radiation Studies Board of the National Academies. He is also an academician of the Russian Academy of Medical Sciences. Dr. Mettler has been listed in "The Best Doctors in America" since 1994 as an expert in both nuclear medicine and radiation injury. He has been a certifying examiner for the American Board of Radiology for 30 y.

He was the United States Representative to the United Nations Scientific Committee on the Effects of Atomic Radiation 28 y. He is an Emeritus Commissioner of the International Commission on Radiation Protection (ICRP). He was the Health Effects Team Leader of the International Chernobyl Project. He has served as an expert on radiation effects and accidents for the Centers for Disease Control and Prevention, the World Health Organization, the International Atomic Energy Agency, the International Agency on Research on Cancer, and for the Costa Rican, Peruvian, Panamanian, Polish governments. He was a co-author of the NCRP and ICRP reports on radiation protection during radiological terrorism and has been a member of multiple subgroups on radiological terrorism for the U.S. Department of Homeland Security. He is currently a health advisor to the Japanese Cabinet for the Fukushima nuclear disaster.



Kenneth L. Miller, *Presenter*, is Emeritus Professor of Radiology and former Director, Division of Health Physics at the Milton S. Hershey Medical Center of the Pennsylvania State University in Hershey, Pennsylvania.

During his career, Mr. Miller authored over 600 presentations, scientific exhibits, and publications (including 18 books). In 1995 he was elected to NCRP. In 2007 he was named a Distinguished Emeritus Member of the Council. He served on Scientific Committee (SC) 46 and then Program Area Committee 2 from 1995 to 2013. He participated in the writing on nine NCRP reports (chaired two committees) and two commentaries (chaired both committees).

Mr. Miller served on numerous federal, state and local advisory committees and held membership in various professional societies. He was an International Radiation Protection Association Delegate and, served on the Board of Directors and as Parliamentarian of the Health Physics Society. He served as a member of the American Board of Health Physics, the American Board of Medical Physics (ABMP), and as a member of the Panel of Examiners for ABMP (Medical Health Physics). In 1982 he received the Elda E. Anderson Award; in 1998, the Fellow Award; in 2004, the Founders Award from the Health Physics Society. From 1994 to 2000 he was Editor-in-Chief of *Health Physics*. From 1998 to 2005 he was Editor-in-Chief of *Operational Radiation Safety*. The University of Pittsburgh, Graduate School of Public Health named him a Distinguished Alumni and the Delaware Valley Society for Radiation Safety of the Health Physics Society presented him with their Meritorious Achievement Award. Upon his retirement from the Penn State Hershey Medical Center the Chair of Radiology was endowed in his name. He currently lives in Hershey, Pennsylvania with his wife Carole and their three dogs, Breeze, Breena and Angel.

Biographies



J.D. Polk, *Presenter*, is the agency Chief Health and Medical Officer of the National Aeronautics and Space Administration (NASA) located in Washington, D.C. He began serving in this position in November of 2016.

Dr. Polk is the former Dean of Medicine for Des Moines University's College of Osteopathic Medicine. Prior to his work at Des Moines University, Dr. Polk was the Assistant Secretary (Acting) for Health Affairs and Chief Medical Officer of the U.S. Department of Homeland Security (DHS), assuming this post after serving as the Principal Deputy Assistant Secretary for Health Affairs and Deputy Chief Medical Officer. Before coming to DHS, Dr. Polk was the Chief of Space Medicine for NASA's Johnson Space Center in Houston, Texas. He is the former State Emergency Medical Services Medical Director for the State of Ohio, and former Chief of Metro Life Flight in Cleveland, Ohio. He has served on the board of directors for the Red Cross of Greater Iowa, the board of directors of ChildServe of Iowa, the board of trustees for the American Public University System, the board of directors of the American Association for Physician Leadership, and served as a member of the American Osteopathic Association's Commission on Osteopathic College Accreditation. He is a Fellow of the American College of Osteopathic Emergency Physicians, and a Fellow of the Aerospace Medicine Association.

Dr. Polk received his degree in Osteopathic Medicine from the A.T. Still University in Kirksville, Missouri. He completed his residency in emergency medicine with the Mt. Sinai hospitals via Ohio University and completed his training in aerospace medicine at the University of Texas Medical Branch. He is board certified in both emergency medicine and aerospace medicine. Dr. Polk holds an MS in Space Studies from the American Military University, a Master in Medical Management from the University of Southern California's Marshall School of Business, and a Masters Certificate in Public Health from the University of New England.

Dr. Polk is well published in the fields of emergency medicine, disaster medicine, space medicine, and medical management. He is a Clinical Associate Professor of Emergency Medicine at the Edward Via College of Osteopathic Medicine, and Affiliate Associate Professor and Senior Fellow in the School of Public Policy at the George Mason University. He has received numerous awards and commendations including citations from the Federal Bureau of Investigations, White House Medical Unit, Association of Air Medical Services, U.S. Air Force, and has received the NASA Center Director's Commendation, the NASA Exceptional Service Medal, the National Security and International Affairs Medal and the NASA Exceptional Achievement Medal.



R. Julian Preston, *Program Committee*, recently retired as the Associate Director for Health for the National Health and Environmental Effects Research Laboratory of the U.S. Environmental Protection Agency (EPA). He is currently a Special Government Employee (Expert) with the US EPA's Radiation Protection Division in the Office of Radiation and Indoor Air. He also served as Director of the Environmental Carcinogenesis Division at EPA and as senior science adviser at the Chemical Industry Institute of Toxicology. He has been employed at the Biology Division of the Oak Ridge National Laboratory and has served as associate director for the Oak Ridge-University of Tennessee Graduate School for Biomedical Sciences. Dr. Preston's research and current activities have focused on the mechanisms of radiation and chemical carcinogenesis and the approaches for incorporating these types of data into cancer risk assessments. Dr. Preston was chair of Committee 1 of the International Commission on Radiological Protection (ICRP), a member of the ICRP Main Commission, and a member of the U.S. delegation to the United Nations Scientific Committee on the Effects of Atomic Radiation. He is an associate editor of *Environmental and Molecular Mutagenesis*, *Mutation Research*, *Chemico-Biological Interactions*, and *Health Physics*. Dr. Preston has had more than 200 peer-reviewed papers and chapters published. He received his BA and MA from Peterhouse, Cambridge University, England, in genetics and his PhD from Reading University, England, in radiation genetics. He has served on the National Research Council's Committee to Assess the Scientific Information for the Radiation Exposure Screening and Education Program and the Task Group on the Biological Effects of Space Radiation.

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Kent Rosenberger, *Presenter*, is the Manager of Closure and Disposal Assessment for Savannah River Remediation at the U.S. Department of Energy's Savannah River Site (SRS) near Aiken, South Carolina responsible for the Liquid Waste System Performance Assessment Program. He has a BS in Nuclear Engineering from the Pennsylvania State University and has spent the last 28 y at SRS. The first 14 y were within the Radiological Protection Department supporting facility design/modifications and existing operating facility health physics technical support. The last 14 y have been spent supporting the development of closure and disposal regulatory documents including environmental Performance Assessments for SRS tank closures and the Saltstone Disposal Facility. In this position, he regularly interacts with the U.S. Department of Energy (DOE), U.S. Nuclear Regulatory Commission, U.S. Environmental Protection Agency, and the South Carolina Department of Health and Environmental Control. He supports the DOE Low Level Waste Disposal Facility Federal Review Group and is on the Steering Committee for the Inter-agency Performance and Risk Assessment Community of Practice. Mr. Rosenberger also supports the Waste Management Symposium as a member of the Program Advisory Committee.



Mark Shavers, *Presenter*, is a Senior Scientist on the National Aeronautics and Space Administration (NASA) KBRwyle Human Health and Performance Contract and supports the NASA Radiation Health Officer in the Space Radiation Analysis Group (SRAG) at the Johnson Space Center (JSC) in Houston, Texas. He leads the SRAG development and implementation team for cancer risk analysis and is a member of a medical operations radiation health working group and a radiation discipline systems maturation team for the partner agencies of the International Space Station. Over the past two decades, his responsibilities in the Space Medicine Group, Habitability and Human Factors, and Biomedical Research Groups at JSC include the assessment and protection of astronauts from ionizing and nonionizing radiations, various aspects of protection for human spaceflight, including evaluating radiation shielding effectiveness, and other aspects of the cancer risk analysis of the exposures of astronauts to various sources of ionizing and nonionizing radiations. Earlier work includes transport modeling of accelerated proton (Loma Linda University Medical Center) and heavy ion (Lawrence Berkeley National Laboratory) beam interacting in thick absorbers, quantitative modeling of the biological effectiveness of cosmic ions at space-like energies. His education includes degrees in environmental engineering sciences, radiological sciences, and nuclear engineering.



Roy E. Shore, *Program Committee & Session Chair*, was a Professor and Chief of the Epidemiology Division at New York University School of Medicine before going to the Radiation Effects Research Foundation (RERF) in Hiroshima-Nagasaki as Vice Chairman and Chief of Research. He is an author of ~100 radiation-related publications and is currently working with other RERF investigators on studies of radiation and various diseases. He has served on numerous governmental and scholarly committees, including as a long-time member of the International Commission on Radiological Protection and NCRP, and has served on various committees or task groups for the United Nations Scientific Committee on the Effects of Atomic Radiation, the World Health Organization, the National Academy of Sciences, the National Cancer Institute, and the U.S. Environmental Protection Agency, among others. His interests include the effects of radiation on both cancer and noncancer disease incidence, and understanding the epidemiologic and biological modification of radiation effects by various environmental, genetic and age factors.



Benjamin Stevenson, *Presenter*, is the Program Manager of the Radiological/Nuclear Response and Recovery Research and Development Portfolio at the National Urban Security Technology Laboratory (NUSTL), a government-owned and -operated laboratory of the U.S. Department of Homeland Security (DHS) Science and Technology (S&T) Directorate.

Mr. Stevenson's work on the Radiological/Nuclear Response and Recovery Research and Development Portfolio is focused on increasing local and state capability during a radiological emergency. Because of the "no-notice" nature of a radiological/nuclear incident, federal support would not be immediately available, and there will be a period of time early in a radiological response when first responders would have to rely on their own technical resources to perform critical missions and operations. Through research and

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development, DHS S&T seeks to increase capability to manage complex incident data, save lives through mitigating the hazard of radiation, and minimize the impact of the incident on individuals, families and businesses.

Previously, Mr. Stevenson served as a Commissioned Officer in the U.S. Coast Guard, and has held positions at the Domestic Nuclear Detection Office and DHS Headquarters, and the Regional Catastrophic Grant Program, supporting the States of New York, New Jersey, Connecticut, and Pennsylvania in regional preparedness and planning for radiological and nuclear incidents.

Mr. Stevenson is originally from Washington State and is a graduate of the U.S. Coast Guard Academy.



Richard J. Vetter, *Program Committee Co-Chair, Session Chair, & Presenter*, is Professor Emeritus and former Radiation Safety Officer at the Mayo Clinic in Rochester, Minnesota. He received his BS and MS degrees in Biology from South Dakota State University and his PhD in Health Physics from Purdue University. He is board certified by the American Board of Health Physics and the American Board of Medical Physics. He served on the Purdue University faculty from 1970 to 1980 and the Mayo Clinic staff and faculty from 1980 to 2010. Dr. Vetter is a member of the National Academies Nuclear and Radiation Studies Board, the Government Liaison for the Health Physics Society (HPS), and a member of the Executive Council of the International Radiation Protection Association. He is a Fellow of HPS and the American Association of Physicists in Medicine and received the HPS Founders Award. He is past Editor-in-Chief of *Health Physics*, past president of HPS, past president of the American Academy of Health Physics, and author or coauthor of more than 220 publications, books, book chapters, and other articles. He served as Vice Chair of the U.S. Nuclear Regulatory Commission Advisory Committee for Medical Uses of Isotopes and member of the Radiation Advisory Committee of the U.S. Environmental Protection Agency Science Advisory Board. He served on the Board of Directors of NCRP, Chair of the NCRP Nominating Committee, and Chair of three and member of two NCRP scientific committees resulting in four NCRP reports and one NCRP statement. Dr. Vetter has received outstanding alumnus awards from South Dakota State University, the Purdue School of Pharmacy and Pharmacal Sciences, the Purdue School of Health Sciences, and the Purdue College of Health and Human Sciences.



Richard Wakeford, *Presenter*, is Professor in Epidemiology in the Centre for Occupational and Environmental Health at The University of Manchester, United Kingdom, where he specializes in radiation epidemiology.

He graduated with a BSc in Physics, and then received a PhD in High Energy Physics, from the University of Liverpool before joining British Nuclear Fuels Ltd (BNFL) in 1977. He worked for BNFL for nearly 30 y, most of the time advising on the risks to health from exposure to radiation, before taking early retirement in 2006 and joining the academic staff of The University of Manchester. In 1994 he received the Founder's Prize of the U.K. Society for Radiological Protection for "contributions of distinction to radiological protection."

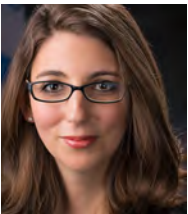
Dr. Wakeford has worked on many research projects involving exposure to radiation and has published and lectured extensively in the field of radiation epidemiology and risk assessment. He has been Editor-in-Chief of *Journal of Radiological Protection* since 1997 and is a member of the Editorial Board of *British Journal of Cancer*. He has been a member of a number of U.K., European Union, and international expert groups, including Committee 1 of the International Commission on Radiological Protection, the United Nations Scientific Committee on the Effects of Atomic Radiation, and the U.K. Committee on Medical Aspects of Radiation in the Environment. Following the 2011 Fukushima nuclear accident, he was a member of the U.K. Government's Scientific Advice Group for Emergencies and the World Health Organization's Health Risk Assessment Expert Working Group on the Fukushima accident.

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Joseph J. Weismann, *Presenter*, is Vice President of Government and Radiological Affairs for US Ecology. He has over 24 y of experience building and managing successful programs in the areas of Radioactive Waste Management, Environmental Remediation, and Facility Decommissioning. Mr. Weismann is responsible for all aspects of US Ecology's radiological programs nationwide; including radioactive waste disposal operations at the low-level radioactive waste facility in Richland, Washington and at US Ecology's Resource Conservation and Recovery Act Subtitle-C low-activity disposal facilities in Idaho, Michigan, and Texas.

Mr. Weismann received his Bachelor of Nuclear Engineering degree from Georgia Tech, an Executive MBA from Boise State University, and is a Certified Health Physicist. He lives in Boise, Idaho.



Jessica S. Wieder, *Program Committee, Session Chair, & Presenter*, is the Associate Director of the U.S. Environmental Protection Agency's (EPA) Center for Radiation Information and Outreach. Ms. Wieder was the EPA's radiation communication lead during the response to the 2011 Fukushima Daiichi nuclear accident. She has facilitated international panels on radiation risk public communication and was part of the contingency planning team for the 2011 launch of the Mars Science Laboratory. In 2010, Ms. Wieder was detailed to Federal Emergency Management Agency's (FEMA) Chemical, Biological, Radiological, Nuclear and Explosives Branch, where she helped establish FEMA's Improvised Nuclear Device Response and Recovery Program and created the intergovernmental Nuclear/Radiological Communications Working Group. With her guidance, the working group developed the nuclear detonation messaging document *Improvised Nuclear Device Response and Recovery: Communicating in the Immediate Aftermath*.

Ms. Wieder was also the lead author for the communications chapter for the second edition of the White House's Planning Guidance for Response to a Nuclear Detonation. In 2013, Ms. Wieder was awarded EPA's Exemplary Customer Service Award for her leadership in enabling all levels of government to provide quick, effective communications to the American people in response to large-scale radiological emergencies.



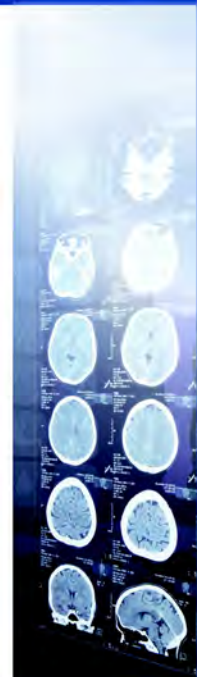
Cary J. Zeitlin, *Presenter*, is a Senior Research Scientist with Leidos Innovations Corporation, working for the National Aeronautics and Space Administration (NASA) Johnson Space Center Space Radiation Analysis Group to assess exposures and risks to astronauts in current and future mission scenarios. He began his career in particle physics in the early 1980s, scanning nuclear emulsion that had been exposed to a beam of high-energy iron ions at the Lawrence Berkeley Laboratory (LBL) Bevalac. As this is one of the most tedious jobs imaginable, greener pastures soon beckoned, leading him to join the TPC/Two-Gamma Collaboration at the Stanford Linear Accelerator Center. After receiving his PhD in experimental high-energy physics and spending another 3 y at the Stanford Linear Accelerator Center as a post-doc studying the decays of the Z boson, Dr. Zeitlin returned to LBL and to nuclear physics in 1991 to work on a long-term project measuring the fragmentation cross sections most pertinent to NASA's space radiation transport codes. This experience led to his taking over as Principal Investigator of the Martian Radiation Environment Experiment (MARIE) aboard the Mars Odyssey orbiter following the untimely passing of Dr. Gautam Badhwar. This led subsequently to his role as Co-Investigator with the Radiation Assessment Detector (RAD) project starting in 2008, as the instrument was being prepared for integration into the Curiosity Rover. After the successful transit and spectacular landing of Curiosity on Mars in 2012, RAD has been operating almost without interruption on the surface, sending back the first detailed radiation environment measurements from another planet. A second RAD was built for the International Space Station and began flight operations in early 2016. Dr. Zeitlin has received two Outstanding Performance awards from LBL and has received three awards from NASA for his work on the MARIE, RAD, and CRaTER projects. He was elected to the NCRP in 2014.

What is **MEDICAL PHYSICS?**



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Word cloud containing terms such as: radiation, diagnostic, therapy, safety, accuracy, precision, data, analysis, modeling, beam, external, simulation, algorithm, PET, clinical, advancement, ultrasonic, delivery, health, testing, shielding, computational, protect, assurance, provider, accuracy, science, output, health, care, safety, equipment, patients, monitor, MRI, brachytherapy, compliance, bioengineering, measurement, consulting, therapeutic, magnetic, image, quality, therapeutic, image, nuclear, energy, physics, medical, modeling, beam, simulation, algorithm, PET, clinical, advancement, ultrasonic, delivery, health, testing, shielding, computational, protect, assurance, provider, accuracy, science, output, health, care, safety, equipment, patients, monitor, MRI, brachytherapy, compliance, bioengineering, measurement, consulting, therapeutic, magnetic, image, quality, therapeutic, image, nuclear, energy, physics, medical, modeling.





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Memorial Sloan Kettering Cancer Center recognizes and thanks John D. Boice, Jr. for his distinguished tenure as the 5th President of the National Council on Radiation Protection and Measurements, and congratulates Kathryn D. Held as she begins to serve as the Council's sixth President. The NCRP mission is an essential one for the nation: to support radiation protection by providing independent scientific analysis, information, and recommendations that represent the consensus of leading scientists.



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