Science, Radiation Protection and the NCRP: Building on the Past, Looking to the Future
Eleventh Annual Warren K. Sinclair Keynote Address

Jerrold Bushberg Ph.D., DABMP, FAAPM
Clinical Professor Radiology & Radiation Oncology
Senior Vice-President NCRP
Dr. Warren Sinclair

- An Extraordinary Scientist, Teacher and Administrator
- Invaluable scientific contributions
  Radiation Biology & Protection
during a career of more than four decades

- Positions Held
  - Medical physicist - Royal Cancer Hospital & lecturer U of London
  - 1954 Head Physics Department -- M.D. Anderson Hospital
  - 1960 -- Argonne National Laboratory -- Director of the Division of Biological and Medical Research & Associate Laboratory Director for Biomedical and Environmental Research
  - 1977 Follows Dr. Taylor as 2nd President of NCRP (1977 – 1991)

- Other Notable Appointments
  - Chairman of ICRP Committee I
  - Member U.S. delegation at UNSCEAR
  - Taylor lecturer in 1997
Dr. Warren Sinclair’s 1997 Taylor Lecture

Dr. Michael Fry’s Introduction of Dr. Sinclair—the 1997 Taylor Lecturer Commenting on Dr. Sinclair’s strongly held and any even more strongly defended scientific opinions

“I often wondered whether, Warren, you knew the old Scottish-Irish prayer…”

"Lord, grant that I may always be right, for Thou knowest I am hard to turn."
Why Was the NCRP and Similar Organizations Created?

Historical Context

- **Discovery of Ionizing Radiation**
  - Discovery of X rays: Roentgen (1895) 1st Nobel Prize (1901)
  - Discovery of Radioactivity: Becquerel (1896)

- **First Reports on Harmful Effects**
  - Radiation-induced alopecia and skin burn (1896)
  - Radiation-induced skin cancer (1902)
  - Clarence Dally, Thomas Edison’s assistant died in 1903 following several skin grafts and amputations. He was 39 years old. Edison abandoned his research on X-rays.
  - Many other acute and chronic effects of radiation were reported over the decades

- **No Standard Procedures for Measuring Radiation Exposure**
  - Few Safety Precautions
  - Not Well Known
Before Radiation Protection

If I could just remember how to turn this thing off!!

God I hope he knows what he's doing.

tube
Drs. Edwin and Gilman Frost: Brothers- Physicist and Physician perform the First American Medical X-ray in Reed Hall, Dartmouth College on 2/3/1896

15 min Exposure
Unshielded X-Ray Tube

Exposure ~ 3 x's Greater

Shielding

PhD

MD
Abuse of these discoveries by pseudoscientists and hucksters lead to unnecessary (and often harmful) uses of radiation sources which were guaranteed by their purveyors to cure everything from lethargy to erectile dysfunction.

The Radiation Craze of the Early 1900’s

- Many Commercial Products were developed and sold to the public.

- Radium emanation activators, apparatuses that would “apply radium emanation to water overnight”, started being produced and marketed in the early 1900’s

Advertisement: "Fill jar every night. Drink freely . . . when thirsty and upon arising and retiring, average six or more glasses daily."

- 1916: The AMA Comes to the Rescue—but not the way you think

Abuse of these discoveries by pseudoscientists and hucksters lead to unnecessary (and often harmful) uses of radiation sources which were guaranteed by their purveyors to cure everything from lethargy to erectile dysfunction.
Vita Radium Suppositories (ca.1930)
“For Restoring Sex Power”

From the Company’s Brochure:
“Weak Discourage Men!
Now Bubble Over With Joyous Vitality
Through the Use of Vita Radium Suppositories
15 day Course Guaranteed to Contain Real Refined Radium & to be Perfectly Harmless
…properly functioning glands make themselves known in a quick, brisk step, mental alertness and the ability to live and love in the fullest sense of the word….A man must be in a bad way indeed to sit back and be satisfied without the pleasures that are his birthright!......Try them to see what good results you get.”

All Home Products customer orders will be shipped in a plain paper wrapper
Show Mom How You Really Feel About Her…… Give Her a Total Body CT!!

More Meaningful than Flowers….

Eff. Dose $\approx 15$-$20$ mSv

Show her you want to love her forever ….
Occurred at Several Hospitals—Was the Problem the Operators or the Equipment?
Why Was the NCRP and Similar Organizations Created?

Because there was... as still is a need for radiation protection of workers, patients and the public.
Great Presidents

Charles B. Meinhold
1991 – 2002
11 years

Lauriston S. Taylor
1929 – 1977
48 years

Warren K. Sinclair
1977 – 1991
14 years

Lauriston S. Taylor
1929 – 1977
48 years

John D. Boice, Jr.
2012 –

Lauriston S. Taylor
1929 – 1977
48 years

Warren K. Sinclair
1977 – 1991
14 years

Charles B. Meinhold
1991 – 2002
11 years

Thomas S. Tenforde
2002 – 2012
10 years

Great Presidents

NCRP
HISTORY

International X-ray and Radium Protection Committee
2nd International Congress of Radiology in Stockholm

U.S. Advisory Committee on X-ray and Radium Protection

U.S. National Committee on Radiation Protection

National Council on Radiation Protection and Measurements chartered by U.S. Congress (Public Law 88-376 )

1928

1929

1946

1964
AN ACT
To incorporate the National Committee on Radiation Protection and Measurements.

BE IT ENACTED by the Senate and House of Representatives of the United States of America in Congress assembled, That—

C. M. Barnes, Rockville, Maryland;
E. C. Barnes, Edgewood, Pennsylvania;
Y. P. Bond, Setters, Long Island, New York;
C. B. Braestrup, New York, New York;
J. T. Brown, Bethesda, Maryland;
L. T. Brown, Bethesda, Maryland;
R. F. Brown, San Francisco, California;
R. R. Brooks, Oak Ridge, Tennessee;
J. C. Buehler, Rio Piedras, Puerto Rico;
D. R. Chadwick, Upper Marlboro, Maryland;
R. H. Chamberlain, Philadelphia, Pennsylvania;
J. F. Crow, Madison, Wisconsin;
R. L. Davis, Idaho Falls, Idaho;
C. L. Durham, Washington, District of Columbia;
T. C. Evans, Iowa City, Iowa;
E. G. Faller, Bethesda, Maryland;
K. O. Gerson, Philadelphia, Pennsylvania;
J. W. Healy, Chappaqua, New York;
P. C. Hodges, Chicago, Illinois;
A. R. Keene, Richland, Washington;
M. Klenck, Brooklyn, New York;
H. W. Koch, Silver Spring, Maryland;

and their successors, are hereby created and declared to be a body corporate, by name of the National Council on Radiation Protection and Measurements (hereinafter called the corporation), and by such name shall be known, and have perpetual succession and the powers, limitations, and restrictions contained in this Act.

COMPLETION OF ORGANIZATION

Sec. 2. The persons named in the first section of this Act are authorized to complete the organization of the corporation by the selection of officers and employees, the adoption of bylaws, not inconsistent with this Act, and the doing of such other acts as may be necessary for such purpose.

OBJECTS AND PURPOSES OF CORPORATION

Sec. 3. The objects and purposes of the corporation shall be—
(1) to collect, analyze, develop, and disseminate in the public interest information and recommendations about (a) protection against radiation (referred to herein as “radiation protection”), and (b) radiation measurements, quantities, and units, particularly those concerned with radiation protection;
(2) to provide a means by which organizations concerned with the scientific and related aspects of radiation protection and of radiation quantities, units, and measurements may cooperate for the effective utilization of their combined resources, and to stimulate the work of such organizations;
(3) to develop basic concepts about radiation quantities, units, and measurements, about the application of these concepts, and about radiation protection;
(4) to establish and maintain an International Committee on Radiological Protection;
NCRP was chartered by the U.S. Congress as a nonprofit organization to address the radiation protection needs of the nation.

Other organizations with similar congressional charters include:

The American Red Cross

The Boy Scouts of America

The National Academy of Sciences.
First Formal Meeting of Congressionally Charted National Council on Radiation Protection and Measurements

31 of the 49 Council Members, were present for this photograph

August 3, 1964
Mayflower Hotel
Washington, DC
Special Liaison Organizations: 23
Collaborating Organizations: 80

Financial Support:
- Grants & Contracts: 70%
- Publication Sales: 16%
- Societal Contributions: 8%
- Corporate Sponsors: 3%
- Payment for Services: 3%

Members of Council: 100
NCRP Staff and Consultants: 20
Distinguished Emeritus: 65
Consociate: 115

Scientific Committees: 11
Board of Directors: 13
Program Area Committees: 7
Administrative Committees: 3
## Council Areas of Expertise

- Accelerators
- Behavioral effects
- Biodosimetry
- Cancer biology
- Dentistry
- Dose Reconstruction
- Dosimetry
- Embryology and Teratology
- Environment
- Epidemiology
- Epigenetics
- Ethics
- Nuclear Fuel cycle
- Genetics
- Genetic susceptibility
- Health physics
- Interventional medical procedures
- Late tissue reactions
- Medical physics (Nuc Med/Dx/Therapy)
- Molecular biology
- Noncancer effects
- Nonionizing radiation
- NORM
- Nuclear engineering
- Nuclear medicine
- Occupational medicine
- Physics
- Public health
- Public policy
- Radiation measurements
- Radiation oncology
- Reactor technology
- Regulations/regulatory
- Radiobiology
- Radiological emergency response
- Radiology
- Risk analysis/assessment
- Risk Communications
- Safety analysis
- Statistics
- Nuclear medicine
- Toxicology
- Ultrasound
- Waste management (nuclear & mixed)
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larly those concerned with radiation protection;
(2) to provide a means by which organizations concerned with the
scientific and related aspects of radiation protection and of
radiation quantities, units, and measurements may cooperate for
effective utilization of their combined resources, and to stimu-
late the work of such organizations;
(3) to develop basic concepts about radiation quantities, units,
and measurements, about the application of these concepts, and
about radiation protection;
(4) to cooperate with the International Commission on Radi-
ological Protection, the Federal Radiation Council, the Inter-
national Commission on Radiological Units and Measurements,
and other national and international organizations, governmental
and private, concerned with radiation quantities, units, and mea-
surements and with radiation protection.

POWERS OF CORPORATION

Sec. 4. The corporation shall have power—
(1) To sue and be sued, complain and defend in any court of com-
petent jurisdiction.
(2) To adopt, alter, and use a corporate seal.
(3) To elect, remove, and fix the compensation of the directors,
departments, employees, or agents of the corporation, and any one
of such officers, directors, trustees, managers, agents, or other
employees of the corporation, subject, however, to applicable pro-
visions of law of any State or the District of Columbia (a) governing
the amount or kind of such property which may be held by, or
(b) otherwise limiting or controlling the ownership of any such
property by a corporation operating in such State or the District of
Columbia.
Key Elements of NCRP’s Charter
U.S. Public Law 88-376:

Objective & Purpose

I. Collect
II. Analyze
III. Develop
IV. Disseminate

Information and recommendations *in the public interest* about:

- Protection Against Radiation
- Radiation Measurements, Quantities and Units
Objective & Purpose

- Facilitate effective use of combined resources of organizations concerned with radiation protection; and
- Cooperate with national and international governmental and private organizations; and

Additional Roles

- General scientific services such as conducting scientific symposia, performing independent technical reviews, development of training materials, and performing/overseeing scientific research.
Key Elements of NCRP’s Charter
U.S. Public Law 88-376

Collect / Analyze / Develop

• NCRP Scientific Committees
• The NCRP Council

OUR MISSION
To support radiation protection by providing independent scientific analysis, information, and recommendations that represent the consensus of leading scientists.
Key Elements of NCRP’s Charter
U.S. Public Law 88-376

Traditional Dissemination Approaches

- **NCRP Publications:**
  (e.g., Reports—Commentaries—Statements
   Presidential Letter Reports, Annual Scientific Meetings &
   Published Proceedings)

- **Government & Public Consultation:**
  (e.g., Formal Testimony or Informal Opinion in Response to
   Governmental Inquiry & Response to the Media and Individual
   Citizens that have questions related to some
   aspect of RP&M)
Recent NCRP Reports

NCRP REPORT No. 169
DESIGN OF EFFECTIVE RADIOLOGICAL EFFLUENT MONITORING AND ENVIRONMENTAL SURVEILLANCE PROGRAMS

NCRP REPORT No. 170
SECOND PRIMARY CANCERS AND CARDIOVASCULAR DISEASE AFTER RADIATION THERAPY

NCRP REPORT No. 171
UNCERTAINTIES IN THE ESTIMATION OF RADIATION RISKS AND PROBABILITY OF DISEASE CAUSATION

NCRP REPORT No. 172
REFERENCE LEVELS AND ACHIEVABLE DOSES IN MEDICAL AND DENTAL IMAGING: RECOMMENDATIONS FOR THE UNITED STATES

NCRP REPORT No. 173
INVESTIGATION OF RADIOLOGICAL INCIDENTS

NCRP REPORT No. 174
PRECONCEPTION AND PRENATAL RADIATION EXPOSURE: HEALTH EFFECTS AND PROTECTIVE GUIDANCE
Commentaries, Statements and Letter Reports

- More concise than NCRP reports, up to four pages
- Equivalent to NCRP Reports

Notes:
- Preliminary evaluations, critiques, reviews of specific topics
- Extensions of previously published NCRP reports on an accelerated schedule
- Approval is by the Board of Directors

Statements

- Developed by a scientific committee
- Reviewed by Council
- Approved for publication by the President.
Proceedings of Annual Meeting

2008-2014 Peer Review & Published in Health Physics
Radiological Emergency Management
NCRP Reports 138, 165, 165 & 166
Commentary 19

NCRP REPORT No. 138
MANAGEMENT OF TERRORIST EVENTS INVOLVING RADIOACTIVE MATERIAL

NCRP REPORT No. 161
MANAGEMENT OF PERSONS CONTAMINATED WITH RADIONUCLIDES: HANDBOOK

NCRP REPORT No. 165
RESPONDING TO A RADIOLOGICAL OR NUCLEAR TERRORISM INCIDENT: A GUIDE FOR DECISION MAKERS

NCRP REPORT No. 166
POPULATION MONITORING AND RADIONUCLIDE DECORPORATION FOLLOWING A RADIOLOGICAL OR NUCLEAR INCIDENT

2001
2005
2008
2010
2010
NCRP Report 165

• Fills a gap in earlier NCRP reports by addressing Public Health (PH) response

• Comprehensive guidance for PH & medical response preparations
  – triage, treatment, decontamination contaminated deceased
  – population monitoring,
  – staffing & facility preparations
  – facility recovery rad waste

• Describes a scalable approach to response activities
Persistent Problems

Decon Prior to Transport

- Current practice of responding and treating victims of a radiation incident falls within the response to generalized hazardous materials.

- Hazardous material policy in the most regions (1st responders, EMS Transport and Hospitals) requires all contaminated victims of a hazardous materials incident to be decontaminated prior to medical treatment or transport.
Detonation of RDD can result in microshrapnel (mm) with GBq to TBq
Extraordinarily high exposure rates
Staff dose 0.1-1 Sv/hr at 0.5 m (Co-60)
GM & Ion Chamber Useless in Localization of Source
Rapidly locating and removing these radioactive sources, will be an essential part of the emergency medical management of these patients.
In a mass causality event it is vital that critical assets are not taken out of service due to low levels of radioactive contamination.

- Critical assets such as EMS patient transport vehicles, life flight, trauma rooms, etc. should not be taken out of service if there is a critical need to use them.

- The risks to the patients and staff are minimal.

- Restricting these resources may result in unnecessary loss of life.

- Dose to Staff & patient from contamination is typically low and relatively easy to detect and remove.
Persistent Problems
Care of Psychological Casualties

• Terrorist acts involving toxic agents (especially radiation) are perceived as very threatening

• Mass casualty incidents caused by nuclear terrorism will create large numbers of worried people who may not be injured or contaminated

• Providing psychological support on this scale is challenging
Effective Crisis Communications

Rudolph Giuliani responding to a question shortly after 9/11 about how many people lost their lives.
Effective Crisis Communications

“...more than any of us can bear”

Empathy Before Facts
People Need to Know you Care
Before they Care about what you Know
Key Elements of NCRP’s Charter

U.S. Public Law 88-376: Objective & Purpose:

New Initiatives In Dissemination

- Enhanced Web Presence
- Social Media (e.g., Twitter/Facebook)

Nobody cares that you have the answer if you're not there, when and where they are asking the question.
People Often Don’t Make it Past the First Page

We Could & Should Do Better
Key Elements of NCRP’s Charter
U.S. Public Law 88-376: Objective & Purpose:
**New Initiatives In Dissemination**

How Would You Characterize Impact of Dr. Boice’s Leadership?
Boiceinium ($^{211m}_{68.6}\text{Bc}$)

I. It would have an **Atomic Number** of 68.6 (yes I know it’s a little unusual).

II. **Atomic Mass** of 211 (sometimes more sometimes less).
Similar Radionuclidic Characteristics

- There would be multiple forms of energy emissions which are capable of Depositing Energy both Locally & at a Distance
- Can exist in both Stable & Metastable Forms
- When handled properly there are many societal benefits from its use.
Dismilar Radionuclidic Characteristics

- Its composed of many dissimilar atoms (some of which are radioactive while others are not)
- To this point IARC has not classified the energy emitted to be a Group I carcinogen
- It periodically (an often unexpectedly) undergoes transformation w/o decay into many other forms each with their own unique properties and applications
- Finally, it can be used safely without a dosimeter or protective clothing but clothing is definitely recommended
The Boice Report #17

John D. Boice, Jr., NCRP President
ICRP Main Commissioner, UNSCEAR Delegation
Veterans’ Advisory Board on Dose Reconstruction Board Member
Vanderbilt Professor of Medicine

2014 NCRP Annual Meeting—Bethesda, Maryland
Celebrating 50 Years Since Congressional Charter in 1964

The year of the great stock market crash—1929—was also the year that the U.S. Advisory Committee on X-Ray and Radium Protection, the predecessor organization to the National Council on Radiation Protection and Measurements (NCRP), was founded. In 1946 it morphed into the U.S. National Committee on Radiation Protection and then in 1964 NCRP was chartered by the U.S. Congress as a nonprofit organization to address the radiation protection needs of the nation. NCRP is in good company in that organizations with similar congressional charters include the American Red Cross, the Boy Scouts of America, and the National Academy of Sciences. Next year NCRP will celebrate the 50th year since its congressional charter (Sinclair 1988; Taylor 2002; Meinhold 2004; Tenforde 2004; Boice 2014). So save the date for a celebration that will recall past achievements with a view to addressing the needs for the future!
The Omnipresent President

• ICRP Main Commission
• UNSCEAR Delegate
• Senior Editor Radiation Research
• Countless Invited Speaking Engagements and Media Interviews
• Congressional Testimony
• Consultations & Briefings: IAEA, WHO, CDC, FDA, NRC, DOE, EPA, DOD, etc
Communication of Radiation Benefits and Risks in Decision Making

Proceedings of 2010 Annual Meeting to be published in Health Physics, 2011
The magnitude of this uncertainty pales in comparison to our uncertainty of how best to communicate what we do know.
Guidance in Emergency Medicine Partnership with American College of Emergency Physicians

Published in JACR and Annuals of EM in 2014

Applications of Justification and Optimization in Medical Imaging:

Examples of Clinical Guidance for Computed Tomography Use in Emergency Medicine

Paul R. Sierzenski, MD, RDMS; Otho W. Linton, MS; E. Stephen Amis Jr, MD; D. Mark Courtney, MD; Paul A. Larson, MD; Mahadevappa Mahesh, MS, PhD; Robert A. Novelline, MD; Donald P. Frush, MD; Fred A. Metter, MD; Julie K. Timins, MD; Thomas S. Tenforde, MD; John D. Boice Jr., ScD; James A. Brink, MD; Jerrold T. Bushberg, MD; David A. Schauer, ScD

Applications of Justification and Optimization in Medical Imaging: Examples of Clinical Guidance for Computed Tomography Use in Emergency Medicine

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Availability, reliability, and technical improvements have led to continued expansion of computed tomography (CT) imaging. During a CT scan, there is substantially more exposure to ionizing radiation than with conventional radiography. This has led to questions and critical conclusions about whether the continuous growth of CT scans should be subjected to review and potentially restrained or, at a minimum, closer investigation. This is particularly pertinent to populations in emergency departments, such as children and patients who receive repeated CT scans for benign diagnoses. During the last several decades, among national medical specialty organizations, the American College of Emergency Physicians and the American College of Radiology have each formed membership working groups to consider value, access, and experience and to promote broad acceptance of CT protocols and procedures within their disciplines. Those efforts have had positive effects on the use criteria for CT by other physician groups, health insurance carriers, regulators, and legislators. [Ann Emerg Med. 2014;63:253-2529]

A podcast for this article is available at www.annemergmed.com.

NCRP is grateful to the EPA for financial support.

62 Million in 2006
85 Million in 2011
While many lives have been saved by advancements in imaging technology.

Radiation used in Medical Imaging, is now the single most controllable source of radiation exposure.

Continued improvement in justification and optimization are important to keep these exposures As Low as Diagnostically Acceptable (ALADA).

ALADA is proposed as a variation of the acronym ALARA to emphasize the importance of optimization in medical imaging (lower is not always better).
After a pelvic CT scan of a pregnant woman, which statement delivers the most appropriate message about risk?

A. “The study that you had two weeks ago has perhaps doubled the risk that your child will develop cancer before age 19. [0.6% vs 0.3%]”

B. “The risk of adverse outcome is very small and the likelihood of normal development is nearly the same as it is for any child. [96.7% vs 96.4%]”
HPA: Risk information for patients

X-rays
How safe are they?

T

irly, X-rays were the only way to see what was going on inside your body. Now other methods of medical imaging are available, some using different types of radiation from X-rays. They are briefly described on the next two pages. Patients are sometimes concerned about the possible harmful effects of radiation, so this leaflet goes on to explain the risks and to put them into perspective.

Radiation risks for older and younger patients

A

s you get older you are more likely to need an X-ray examination. Fortunately, radiation risks for older people are lower than those shown in the table on page 5. This is because there is less time for a radiation-induced cancer to develop, so the chances of it happening are greatly reduced.

Children, however, with most of their life still ahead of them, may be at twice the risk of middle-aged people from the same X-ray examination. This is why particular attention is paid to ensuring that there is a clear medical benefit for every child who is X-rayed. The radiation dose is also kept as low as possible without detracting from the information the examination can provide.

A baby in the womb may also be more sensitive to radiation than an adult, so we are particularly careful about X-rays during pregnancy. There is no problem with something like an X-ray of the hand or the chest because the radiation does not go anywhere near the baby. However, special precautions are required for examinations where the womb is in, or near, the beam of radiation, or for isotope scans where the radioactive material could reach the baby through the mother’s circulating blood.

If you are about to have such an examination and are a woman of childbearing age, the radiographer or radiologist (see definitions on the last page) will ask you if there is any chance of your being pregnant.

If this is a possibility, your case will be discussed with the doctors looking after you to decide whether or not to recommend postponing the investigation. There will be occasions when diagnosing and treating your illness is essential for your health and your unborn child. When this health benefit clearly outweighs the small radiation risks, the X-ray or scan may go ahead after discussing all the options with you.

Radiation risks for future generations

If the reproductive organs (ovaries or testes) are exposed to radiation there is a possibility that hereditary diseases or abnormalities may be passed on to future generations. Although the effect has never been seen in humans, lead-rubber shields can be placed over the ovaries or testes during some X-ray examinations, as a precaution. They are only necessary for examinations of the lower abdomen and thighs on patients who are young enough to have children. Even then, there are some examinations where it is not practicable to use gonad shields since they will obscure important diagnostic information.
We Are Giving Ourselves Cancer

By RITA F. REDBERG and REBECCA SMITH-BINDMAN  JAN. 30, 2014

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.

Neither doctors nor patients want to return to the days before CT scans. But we need to find ways to use them without killing people in the process.
Other Projects Planned for 2014

- Study of Possible Alterations in the Dose Limits for the Lens of the Eye
- Evaluating and Communicating Radiation Risks for Studies Involving Human Subjects: Guidance for Researchers and Reviewing Bodies
- Improving Patient Dose Utilization in CT
- Policies for Managing High Dose Procedures and Deterministic Injuries Associated with Fluoroscopically Guided Interventions (FGI)
What does the future hold for the NCRP?

- While many advances have been made, there are still many questions of importance to radiation protection that have not been fully resolved.

- NCRP will play an important role in helping to develop a consensus view regarding complex radiation protection issues well into the 21st Century.

- Reducing these uncertainties will continue to influence the cost and benefits derived from the ever expanding use of radiation in everything from medical imaging to homeland security.
What does the future hold for the NCRP?

- The unique and invaluable resource that is the NCRP is in large part due to the selfless dedication and numerous contributions of its Council and scientific committee members.

- The multidisciplinary composition of these leading experts’ and their collective input on complex questions provides a unique synergy that results in a comprehensive and well balanced approach to addressing radiation protection challenges today and in the future.
What does the future hold for the NCRP?

- There will be a continuing need for the NCRP to identify the principles upon which radiation protection is based and to provide guidance on best practices for the many beneficial uses of radiation in society.

- Subsequent presentations covering a broad range of relevant topics will review sentinel accomplishments of the past as well as current work and future challenges that are in keeping with NCRP’s mission to advance the science of radiation protection in the public interest.
Thank You For Your Attention