



7-10 NOV 2022 • VANCOUVER

6th International Symposium
on the System of Radiological
Protection



icrp2021.com

FULL SYMPOSIUM PROGRAM

Brought to you by



Canadian Nuclear
Safety Commission

Commission canadienne
de sûreté nucléaire

ICRP



Health
Canada

Santé
Canada

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Symposium Partners

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Welcome Message

Friends and Colleagues,

Welcome to ICRP 2021+1, the 6th International Symposium on the System of Radiological Protection. We are excited to welcome delegates, sponsors, and exhibitors from around the world to beautiful Vancouver, Canada, following previous symposia in the United States, the United Arab Emirates, South Korea, France, and Australia.

Our first event, ICRP 2011, took place only 11 short years ago in Bethesda, Maryland. Ever since, we have taken feedback from the attendees, our own experiences, and the latest trends and technology in conference management to bring you an up-to-date, world-class programme and experience.

The overarching theme for ICRP 2021+1 is Radiological Protection – The Next Generation, and the presentations, posters, and exhibitions will reflect just that. Over the next decade, ICRP will concentrate its efforts on reviewing the System of Radiological Protection to produce the next set of fundamental recommendations that will guide legislation, practice, and policy around the globe.

During this process, ICRP will be engaging with many professionals and organisations, and will require unprecedented resources to ensure the System of Radiological Protection is fit for purpose for many years to come. Following the success of our Digital Workshop on The Future of Radiological Protection (October 2021), ICRP 2021+1 will provide the opportunity for delegates, organisations, and ICRP membership to continue the discussion, relationships, and planning that will guide this important work for the next 10+ years.

The last few years have been fraught with challenges, dealing with a pandemic that continues to present both similar and unique difficulties to all of us wherever we are. Despite these challenges, ICRP has been able to keep pushing forward thanks to the dedication of our volunteers and staff. We cannot wait for you to experience ICRP 2021+1, where we will combine the best of in-person gatherings and digital platforms to maximize access, equity, inclusivity, and participation from around the world.

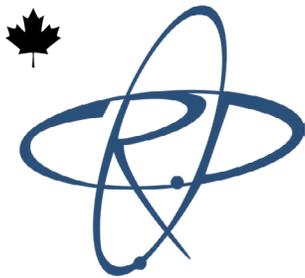
Yours sincerely,

Werner Rühm

ICRP Chair



Host Organizations



The Canadian Radiation Protection Association (CRPA)

The objective of the Canadian Radiation Protection Association (CRPA) is to advance the development and communication of scientific knowledge and practical means for protecting people and their environment from the harmful effects of radiation consistent with the optimal use of radiation for the benefit of society.

<https://www.crpa-acrp.ca>



The Canadian Nuclear Safety Commission (CNSC)

The Canadian Nuclear Safety Commission (CNSC) regulates the use of nuclear energy and materials to protect health, safety, security and the environment; to implement Canada's international commitments on the peaceful use of nuclear energy; and to disseminate objective scientific, technical and regulatory information to the public.

<http://nuclearsafety.gc.ca>



The International Commission on Radiological Protection (ICRP)

The International Commission on Radiological Protection (ICRP) was established in 1928 at the second International Congress of Radiology to respond to growing concerns about the effects of ionizing radiation being observed in the medical community. At the time it was called the International X-ray and Radium Protection Committee (IXRPC) but was restructured to better take account of uses of radiation outside the medical area and given its present name in 1950.

<https://icrp.org>



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<https://icrp.org>

Association and Committee

ICRP 2021+1 Joint Organising Committee



Jeff Dovyak
(Symposium Chair)
CRPA



Joseph Cortese
CRPA



**Christopher
Clement**
ICRP



Kelsey Cloutier
ICRP



Caroline Purvis
CNSC

ICRP 2021+1 Joint Programme Committee

Chair: Christopher Clement (ICRP)

Brian Ahier (HC)

Donata Chaulk (CRPA)

Claire Cousins (ICRP)

Jeff Dovyak (CRPA)

Joseph Cortese (CRPA)

Samy El-Jaby (CNL)

Dave Niven (CRPA)

Caroline Purvis (CNSC)

Michael Rinker (CNSC)

Leah Shuparski-Miller (CRPA)

Ed Waller (CRPA)

Haidy Tadros (CNSC)

Takashi Yasmune (ICRP)



General Symposium Information



Venue Information

📍 1601 Bayshore Dr.,
Vancouver, BC
V6G 2V4

☎ (604) 682-3377

Access / Security

Name badges will be provided to all attendees, sponsors, and exhibitors and will be available for pick up at the Registration Desk (see venue map). Please wear your badge at all times as it is your admission to all symposium sessions, Exhibit & ePoster Hall, and non-ticketed social events. There is a 50 CAD reprint fee for all lost badges.

Language

The official language of ICRP 2021+1 is English. All sessions will be conducted in English.

Parking

The Westin Bayshore Hotel offers onsite parking and valet services. Daily Parking is available for 45 CAD or 55 CAD for valet. Hourly parking is available for 8 CAD.

Photography

An official photographer is present during the symposium. By registering and attending ICRP 2021+1, you agree to have your photo taken.

Photography may be used for marketing purposes for future ICRP events.

Lost Property

Please report any lost or unattended items immediately to the ICRP+1 Registration Desk. Should you lose anything while at the ICRP 2021+1 please enquire at the Registration Desk where any recovered lost property will be held. At the end of the symposium, all unclaimed lost and found items will be given to The Westin Bayshore Hotel.

Registration Desk Hours

📍 Westin Bayshore Foyer

5 November	14:00 - 18:00
6 November	07:30 - 20:00
7 November	08:30 - 16:30
8 November	08:30 - 17:00
9 November	08:30 - 18:00
10 November	08:30 - 16:00

Exhibit & ePoster Hall Hours

📍 Grand Ballroom DEF

7 November	11:00 - 17:00
8 November	11:00 - 17:00
9 November *ePoster Hall Only	08:45 - 17:30
10 November *ePoster Hall Only	08:45 - 16:00

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General Symposium Information

Food and Beverage

 Served in the Exhibit & ePoster Hall
(Grand Ballroom DEF)

7 - 10 November

Morning Coffee Break	11:00 - 11:30
Lunch	13:00 - 14:00
Afternoon Coffee Break	15:30 - 16:00

Mobile App

Download the ICRP 2021+1 Mobile App to access the most up-to-date scientific program, contact fellow delegates, build a personalized agenda for the symposium, and increase your onsite engagement and participation amongst colleagues and friends.

Download the app from the Apple Store or Google Play:



You are also able to search for “EventsAIR” in your respective App Store.

The first time you open the app, you will need to enter this event code: **icrp** (all lower-case letters).

Login with the email and password/pin sent to you in your final confirmation email

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Onsite Health & Safety

The health and safety of all our stakeholders is of the utmost importance!

We will be following and enforcing the current local restrictions and requirements as outlined by the Province of British Columbia’s Public Health Authority.

For the latest Health and Safety Measures put in place, please visit the symposium website:
<https://icrp2021.com/onsite-health-safety>

For The Westin Bayshore’s commitment to clean, please visit: <https://whattoexpect.marriott.com/yvrwi>



Wireless Internet Available

Network Name: **Westin_CONFERENCE**
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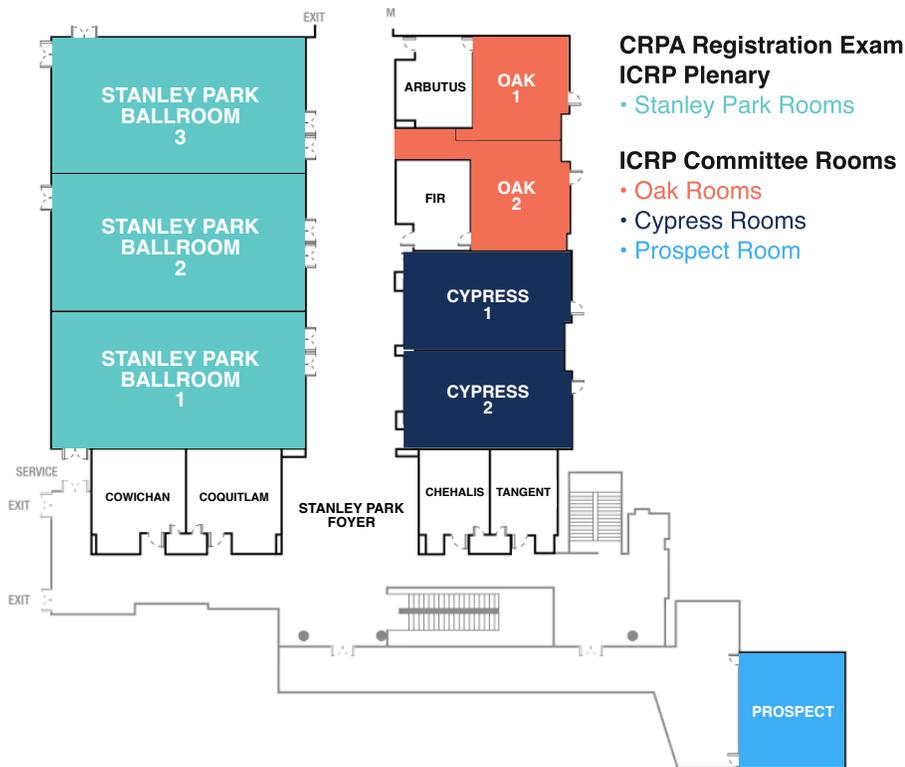


Venue Floorplan

Lobby Level



Second Level



Venue Floorplan

Main Level

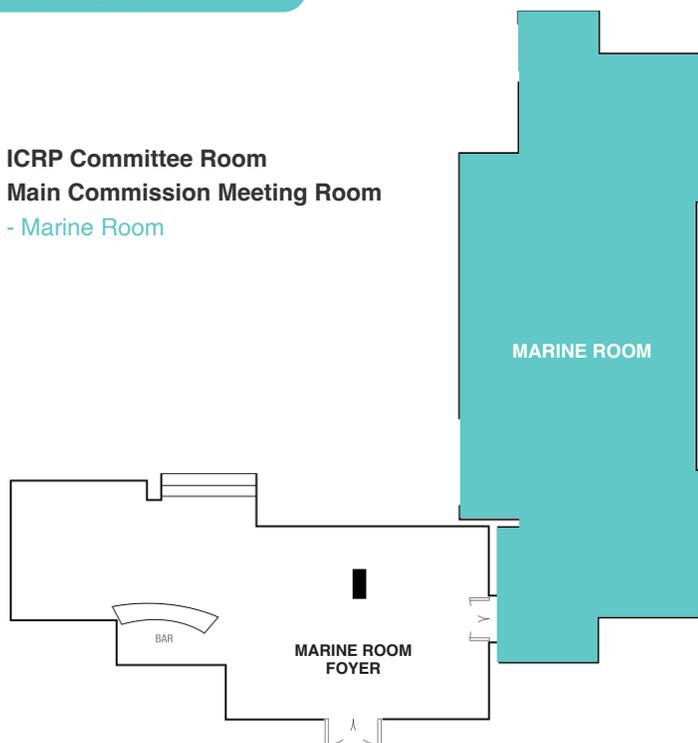
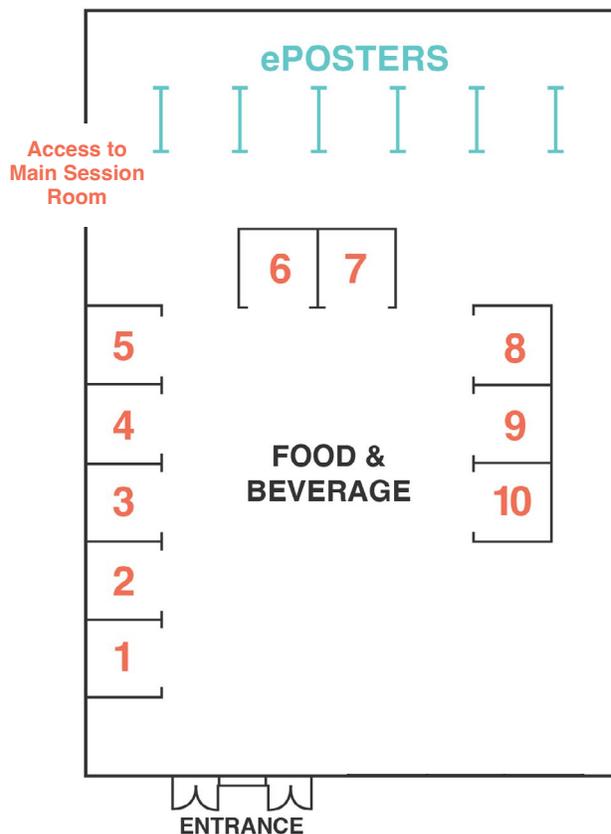


Exhibit & ePoster Hall

- British Columbia Institute of Technology (BCIT) #1
- Canadian Nuclear Safety Commission (CNSC) - Commission canadienne de sûreté nucléaire (CCSN) #4
- Canadian Radiation Protection Association (CRPA) #7
- Dosel Australasia Pty Ltd #9
- Eckert & Ziegler Isotope Products #5
- Environmental Instruments Canada Inc. #8
- General Fusion #2
- International Commission on Radiological Protection (ICRP) #3
- Mirion Technologies #6
- Radiation Safety Institute of Canada #10



Exhibitor Listing

British Columbia Institute of Technology | Booth #1



BCIT is one of British Columbia's largest post-secondary institutes. Nearly 50,000 students enrol each year, attending the five main campuses as well as more locations province-wide.

Established in 1964, BCIT now has over 185,000 alumni throughout Canada and around the world. The School of Health Sciences at BCIT provides industry-leading education for essential, in-demand careers in the healthcare field.

CNSC | Booth #11



The Canadian Nuclear Safety Commission (CNSC) regulates the use of nuclear energy and

materials to protect health, safety, security and the environment; to implement Canada's international commitments on the peaceful use of nuclear energy; and to disseminate objective scientific, technical and regulatory information to the public.

CRPA | Booth #12



The objective of the Canadian Radiation Protection Association (CRPA) is to advance the development and communication of scientific knowledge and practical means for protecting people and their environment from

the harmful effects of radiation consistent with the optimal use of radiation for the benefit of society.

Dosel Australasia Pty Ltd | Booth #9



Dosel is an Australian technology company dedicated to enabling hospitals and medical institutions ensure regulatory compliance for their radiation protection programs. It uses the secure interactive cloud base platform called MyRSO. Awarded an accelerating commercialisation grant by the Australian Government in 2019, MyRSO acts as is your own personal Radiation Safety Officer, providing integrated governance across all sites and departments, increasing efficiency and saving valuable time and money while minimizing your risk of noncompliance with governmental (ie State/Provincial and Federal) regulatory authorities.

Eckert & Ziegler Isotope Products | Booth #5



Eckert & Ziegler Isotrak supports laboratory quality management, radiation protection, research, security, and operations across the nuclear industry. Our high-quality, traceable radioactive calibration sources are manufactured in ISO17025 accredited laboratories in the US and Germany. We are an ISO17043 accredited Proficiency Testing Provider offering a variety of sample types.

Environmental Instruments Canada Inc. | Booth #8



Environmental Instruments Canada (EIC) produces innovative, high performance and cost effective radiation

measurement instruments for Uranium Mines, First Responders and Homeland Security, and Radon Mitigation Professionals.

Exhibitor Listing

General Fusion | Booth #2



General Fusion pursues a fast, efficient, and collaborative path to practical fusion power. The company is completing an aggressive development plan to deliver economical carbon-free fusion energy with its proprietary Magnetized Target Fusion technology by the 2030s.

Mirion Technologies | Booth #6



Mirion Technologies is comprised of over 2500 talented professionals, passionate about delivering world class products, services, and solutions in the world of radiation detection, measurement and protection.

ICRP | Booth #13



The International Commission on Radiological Protection (ICRP) was established in 1928 at the second International Congress of

Radiology to respond to growing concerns about the effects of ionizing radiation being observed in the medical community. At the time it was called the International X-ray and Radium Protection Committee (IXRPC) but was restructured to better take account of uses of radiation outside the medical area and given its present name in 1950.

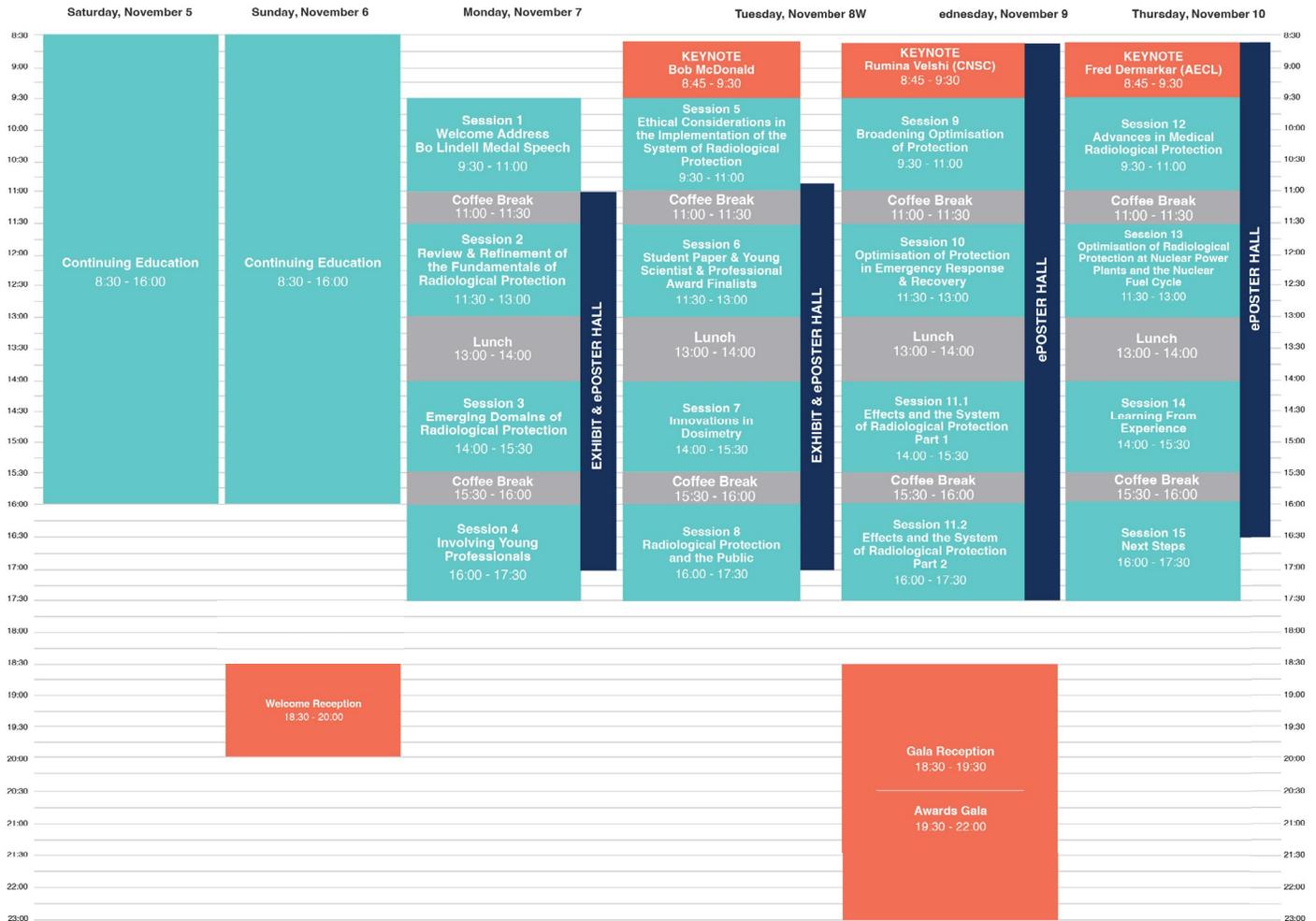
Radiation Safety Institute of Canada | Booth #10



The Radiation Safety Institute of Canada is focused on enhancing radiation awareness and safety in workplaces and communities by sharing science and best practices using Good Science in Plain Language®

Program at a Glance

The overarching theme of ICRP2021+1 is Radiological Protection – The Next Generation. The theme reflects the need to review and refine the System of Radiological Protection over the coming decade to ensure it remains fit for purpose for the next generation and highlights the importance of innovation and involving the next generation in this pursuit.



Vancouver observes Daylight Savings Time. On Sunday, November 6 at 2:00am, clocks move back one hour.

Full Symposium Program

📍 All sessions will take place in Grand Ballrooms ABC

MONDAY NOVEMBER 7

09:30 – 11:00 Welcome & Bo Lindell Lecture (Opening Session)

Moderator: Christopher Clement (ICRP, Canada)

09:30–10:00 Welcome Addresses

Speakers from Health Canada

Peter Elder (CNSC, Canada), Diana Moscu (CRPA, Canada), Ali Shoustarian (CRPA, Canada).

Michael Rinker (Bruce Power, Canada)

10:00–10:20 Welcome & Introduction

Werner Rühm (ICRP & Helmholtz Zentrum, Germany)

10:20–10:30 Presentation of the Bo Lindell Medal for the Promotion of Radiological Protection

Werner Rühm (ICRP & Helmholtz Zentrum, Germany)

10:30–11:00 Bo Lindell Lecture

Haruyuki Ogino (NRA, Japan)

11:00 – 11:30 Break 📍 Exhibit & ePoster Hall (Grand Ballroom DEF)

11:30 – 13:00 Review and Refinement of the Fundamentals of Radiological Protection

Co-chairs: Christopher Clement (ICRP, Canada), Karla Petrova (HERCA, Czech Republic)

11:30–11:45 Plans for Review and Revision of the System of Radiological Protection

Werner Rühm (ICRP & Helmholtz Zentrum, Germany)

11:45–11:55 Views of the RP Profession on Refinement of the System

Sigurður M Magnússon (IRPA, Iceland), Bernard le Guen (IRPA, France)

11:55–12:05 A European Reflection on the Revision of the System of Radiological Protection

Nina Cromnier (HERCA, Sweden)

12:05–12:15 Proposals for the Revision of the ICRP Recommendation 103 by the German Commission on Radiological Protection (SSK, Germany)

Andreas Maier (SSK, Germany)

12:15–12:25 Communication of Radiation Protection Issues

Juan-Carlos Lentijo (CSN, Spain)

12:25–12:35 Need for Stability of Radiation Protection System: Feedback from the Application of IAEA Safety Standards

Peter Johnston or Miroslav Pinak (IAEA, Austria)

12:35–13:00 Q&A

13:00–14:00 Lunch 📍 Exhibit & ePoster Hall (Grand Ballroom DEF)



14:00 – 15:30 Emerging Domains of Radiological Protection

Co-chairs: Marie-Claude Gregoire (CNL, Canada), Nicole Martinez (ICRP & Clemson U, USA)

14:00–14:10 **New Methods to Enhance the Strength of Evidence in Demonstrating Protection of the Environment from Exposure to Ionising Radiation**

Jacqueline Garnier-Laplace (OECD NEA, France)

14:10–14:20 **Augmented Intelligence in Radiation Protection: Opportunities and Challenges**

Mario E. Gomez Fernandez (Oregon State U, USA)

14:20–14:30 **Advanced Reactors - Designs and Deployment in the Canadian Landscape**

Ali Siddiqui (remote), (CNL, Canada)

14:30–14:40 **NORM Management in Decommissioning Offshore Petroleum Infrastructures**

Gillian Hirth (ARPANSA)

14:40–14:50 **Comparison of Veterinary Medicine Radiation Safety Programs Across the US**

Rachel Pope-Nichols (U Missouri, USA)

14:50–15:00 **Issues that Need to be Addressed with Respect to Including the Protection of Animals within a Revised Radiological Protection Framework**

Richard John Pentreath (PML, UK)

15:00–15:30 **Q&A**

15:30–16:00 **Break** 📍 Exhibit & ePoster Hall (Grand Ballroom DEF)

16:00 – 17:30 Involving Young Professionals

Co-chairs: Mike Boyd (ICRP), Omar Nusrat (OTU, Canada)

16:00–16:12 **Experiences of One Mentee – the ICRP Mentorship Program and Beyond**

Julie LeBlanc (CNSC, Canada)

16:12–16:24 **How to Start a Network? Experience in Networking and Achievements of the IRPA Young Generation Network**

Sylvain Andresz (CEPN, France)

16:24–16:36 **Radiation Safety Program for Hybrid Modalities in Canada**

Ali Shoushtarian (TOH, Canada)

16:36–16:48 **Contributing as a Mentee: Diverse Operational Environments within Veterinary Practice and their Challenges for Radiological Protection**

Anthony Davila (Tulane U, USA)

16:48–17:00 **Perspectives from a First-generation Graduate Student and Researcher in Canada: Surprises, Obstacles, and Other Considerations**

Marta Kocemba (OTU, Canada)

17:00–17:30 **Q&A**

TUESDAY NOVEMBER 8

08:45 – 9:30

Keynote

Moderator: Christopher Clement (ICRP, Canada)

08:45–09:30

The Future is Now: Solving the Climate Crisis with Existing Technology

Bob McDonald

09:30 – 11:00

Ethical Considerations in the Implementation of the System of Radiological Protection

Co-chairs: Kun-Woo Cho (ICRP & KINS, Korea), Emilie Van Deventer (WHO, Switzerland)

09:30–09:40

Ethical Foundations of the Radiological Protection System

Kun-Woo Cho (ICRP & KINS, Korea)

09:40–09:50

Ethical Dimension of Reasonableness and Tolerability in the Radiation Protection System

Thierry Schneider (ICRP & CEPN, France)

09:50–10:00

Ethical Aspects in the Use of Radiation in Medicine: Public consultation of the Report from Group 109

François Bochud (ICRP & IRA CHUV, Switzerland)

10:00–10:10

Ethics of (Radiological) Protection of the Environment

Friedo Zolzer (U South Bohemia, Czech Republic)

10:10–10:20

Ethical Considerations in Nuclear Waste Management

Bob Watts (NWMO, Canada)

10:20–10:30

Applying a Public Health Ethics Framework to Radiation Protection

Sandor Demeter (U Manitoba, Canada)

10:30–11:00

Q&A

11:00 – 11:30

Break 📍 Exhibit & ePoster Hall (Grand Ballroom DEF)

11:30 – 13:10

Student Paper Contest Winners & Cousins Award Finalists

Co-chairs: Claire Cousins (ICRP, UK), Leah Shuparski-Miller (CNSC & CRPA, Canada)

11:30-11:40

Introduction by the Co-Chairs

CRPA Student Paper Contest Winners

11:40-11:51

Electron Paramagnetic Resonance (EPR) Measurements of Background Doses in Teeth of Durham Region Residents, Ontario

Lekhanth Ghimire (OTU, Canada)

11:51-12:02

Visible Monkey Implemented in Monte Carlo Codes for Radiation Dosimetry

Jiye Lee (Yonsei U, Korea)

12:02-12:13

Development and Evaluation of Overscan Detection Algorithm for AI-Augmented Auditing of Low-Dose Chest CT: Experience of Korea Institute for Accreditation of Medical Imaging (KIAMI)

Sihwan Kim (Seoul National U, Korea)

12:13-12:24 **Single-cell DNA Sequencing – a Potential Dosimetric Tool**
F. Mathew (McGill U, Canada)

Cousins Award for Young Scientists and Professionals Finalists

12:24-12:35 **Tools for Effective Communication with Radiation Workers Improving How to Listen, Relate, Empathize, and Communicate Internal Doses**
Sara Dumit (LANL, USA)

12:35-12:46 **The Impact of Different Neutron RBEs on the all Solid Cancer Radiation Incidence Risks Obtained from the Japanese A-bomb Survivors Data**
Luana Hafner (ENSI, Switzerland)

12:46-12:57 **Comparative Time-Series Analysis and deep Learning Prediction of Innate Radon Risk in Canadian and Swedish Houses**
Selim Khan (U Calgary, Canada)

12:57-13:08 **Challenges of Communicating Radiation and Nuclear Safety Information in Partnership with Potential Interest Groups to the Public**
Awoke Shiferaw (ERPA, Ethiopia)

13:10 – 14:00 **Lunch** 📍 Exhibit & ePoster Hall (Grand Ballroom DEF)

14:00 – 15:30 **Innovations in Dosimetry**

Co-chairs: François Bochud (ICRP & IRA CHUV, Switzerland, Switzerland), Vincent Gregoire (ICRU/UCLB)

14:00–14:20 **ICRU Report 95: New Operational Quantities for External Radiation Exposure**
Thomas Otto (ICRU)

14:20–14:40 **Case Study on Occupational Exposures Radiation with Possible Co-exposure to Heavy Metals**
Ruth Wilkins (HC, Canada)

14:40–14:50 **Adult and Paediatric Mesh-type ICRP Reference Computational Phantoms**
Chan Hyeong KIM (Hanyang U, Korea)

14:50–15:00 **Ultra-high Dose-rate (FLASH) Dosimetry in Radiation Therapy**
François Bochud (ICRP & IRA CHUV, Switzerland, Switzerland)

15:00–15:10 **The Operational Quantity for Eye Lens Neutron Dosimetry Considering ICRU 95 Report**
Salah Djeflal (CNSC, Canada)

15:10–15:30 **Q&A**

15:30–16:00 **Break** 📍 Exhibit & ePoster Hall (Grand Ballroom DEF)

16:00 – 17:30 **Radiological Protection and the Public**

Co-chairs: Nobuhiko Ban (ICRP& NRA, Japan), Bernard le Guen (IRPA, France)

16:00–16:10 **Nuclear Industry Experiences in Radiation Exposures**
Peter Bryant (WNA / Sizewell C, UK)

16:10–16:20 **Communication with Patients on Radiological Procedures**
Jin Chul Paeng (SNUH, Korea)

16:20–16:30 **NORM and Communicating the Risks**
Jim Hondros (JRHC Enterprises, Australia)

16:30–16:40	Engagement with the Public on Radiation and Risk <i>Hiroko Yoshida (Tohoku U, Japan)</i>
16:40–16:50	Developing the System of Radiological Protection to Enhance its Contribution to Sustainable Development <i>Andy Mayall (EA, UK)</i>
16:50–17:00	Reframing the Inadvertent Human Intrusion Scenario to Improve Public Understanding of Repository Safety <i>Chantal Medri (NWMO, Canada)</i>
17:00–17:30	Q&A

WEDNESDAY NOVEMBER 9

08:45 – 9:30

Keynote

Moderator: Werner Rühm (ICRP & Helmholtz Zentrum, Germany)

08:45–09:30

(Un)stated Assumptions: Values, Ethics, and the System of Radiological Protection
Rumina Velshi (CNSC, Canada)

09:30–11:00

Broadening Optimisation of Protection (Panel Discussion)

Co-chairs: Pippa Feinstein (Nuclear Transparency Project), Thierry Schneider (ICRP & CEPN, France)

09:30–09:35

ALARA Practices in the Nuclear Industry
John Takala (ICRP)

09:35–09:40

Regulatory Expectation of Optimization in Radiation Protection
Gillian Hirth (ICRP)

09:40–09:45

Beyond Radiation Anxiety and Country Borders: Applying Health Literacy in the Field After the Fukushima Nuclear Accident
Aya Goto (Fukushima Medical U, Japan)

09:45–09:50

NTW's Role in Nuclear Safety and Transparency
Nadja Zeleznik (NTW, France)

09:50–09:55

CIRPDose: A 3D ALARA Planning Tool Based on the Virtual Reality Technology
Yuan Zhao (CIRP, China)

09:55–10:00

Don't Throw Out Too Many Babies with the Bathwater, and Remember Old Ideas!
Jack Valentin (Jack Valentin RP, Sweden)

10:00–10:30

Discussion with Co-chairs

10:30–11:00

Moderated Q + A

11:00 – 11:30

Break 📍 Exhibit & ePoster Hall (Grand Ballroom DEF)

11:30–13:00 **Optimisation of Protection in Emergency Response and Recovery**

Co-chairs: Michiaki Kai (ICRP & Nippon Bunri U, Japan), Ed Waller (OTU, Canada)

11:30–11:40 **ICRP Recommendations on Workers and Responders**

JF Lecomte (IRSN, France)

11:40–11:50 **Preparedness for Post-Nuclear Accident Recovery: NEA Radiological Protection Guidance Applicable at National Level**

Chris Mogg (OECD NEA, France)

11:50–12:00 **Overviews of Secondary Health Issues After the Fukushima Incident**

Masaharu Tsubokura (Fukushima Medical U, Japan)

12:00–12:10 **Adapting to Prevailing Circumstances: Thoughts on Modifying Protection Strategies During COVID-19**

Deb Quayle (HC, Canada)

12:10–12:20 **Nuclear Emergency Management and Preparedness in Canada - Optimization through Resilience**

Kathleen Heppell-Masys (CNSC)

12:20–12:30 **Impacts of Decontamination in Farmlands and Forests on Rebuilding Returnees' Lives After the Fukushima Accident**

Momo Takada (AIST, Japan)

12:30–12:40 **Radiological Training for the Defence Sciences: A Unique Playing Field**

Helen Moise (DRDC, Canada)

12:40–13:00 **Q&A**

13:00 – 14:00 **Lunch** 📍 Exhibit & ePoster Hall (Grand Ballroom DEF)

14:00 – 17:00 **Joint Session: Science and Implications**

14:00 – 15:15 **Effects and the System of Radiological Protection**

Co-chairs: Debora Quayle (HC, Canada), Werner Rühm (ICRP & Helmholtz Zentrum, Germany)

14:00–14:15 **The Radiation and Chemical (Rad/Chem) Adverse Outcome Pathway (AOP) Joint Topical Group**

Danielle Beaton (CNL, Canada)

14:15–14:30 **UNSCEAR 2020/2021 Report on Biological Mechanisms Relevant for the Inference of Cancer Risks from Low-dose and Low-dose-rate Radiation**

Simon Bouffler (UNSCEAR, UK)

14:30–14:45 **Radiation Epidemiology – Where do We Stand Now?**

Richard Wakeford, U of Manchester (UK)

14:45–15:00 **Individual Response of Humans to Ionising Radiation**

Andrzej Wojcik (Stockholm U.)

15:00–15:15 **Significance of Stem Cell Competition in the Dose-rate Effects**

Masanori Tomita (CRIEPI, Japan)

15:30 – 16:00 **Break** 📍 Exhibit & ePoster Hall (Grand Ballroom DEF)

16:00 – 17:30 **Effects and the System of Radiological Protection
Part 2: Transfer / Incorporation of Science into the RP System**

Co-chairs: Borislava Batandjieva-Metcalf (UNSCEAR, Austria), Dominique Laurier (ICRP & IRSN, France)

16:00–16:15 **Classification of Harmful Radiation-induced Effects on Human Health for Radiological Protection Purposes**

Ludovic Vaillant (CEPN, France)

16:15–16:30 **RBE for Reference Animals and Plants**

Christelle Adam Guillermin (IRSN, France)

16:30–16:45 **Evolution of Detriment**

Nobuhiko Ban (ICRP & NRA, Japan)

16:45–17:00 **Canadian Organization on Health Effects from Radiation Exposure (COHERE) - Strengthening Cooperation within the Canadian**

Kristi Randhawa (CNSC, Canada) / Kristi Randhawa (CNSC, Canada)

17:00–17:15 **Ecosystem Services in Environmental Radiological Protection**

Nicole Martinez (ICRP & Clemson U, USA)

17:15–17:30 **Joint Panel Discussion: Implications of New Science on Updates to the System of Radiological Protection**

THURSDAY NOVEMBER 10

08:45 – 9:30 **Keynote**

Moderator: Werner Rühm (ICRP & Helmholtz Zentrum, Germany)

08:45–09:30 **Radiation Science and Communications for Future Nuclear**

Fred Dermarkar (AECL, Canada)

09:30 – 11:00 **Advances in Medical Radiological Protection**

Co-chairs: Kimberly Applegate (ICRP, USA), Michèle Légaré (TOH, Canada)

09:30–09:35 **Introduction of the Slate of Speakers and Session Goals**

09:35–09:45 **TG108a and Next Steps in Optimisation of Imaging (Not Including Nuc Med) / Integration, Continuous Improvement, and Teamwork of Imaging Optimisation Process in Complex HC Systems**

Mika Kortensniemi (STUK, Finland)

09:45–09:55 **The Role of AI/ML in Radiotherapy TPS / Optimisation/Decreased Variation in Dose: Increase Standardization Needed**

Lydia Wilson

09:55–10:05 **Radiation Safety Program for Hybrid Modalities in Canada**

Ali Shoushtarian (TOH, Canada)

10:05–10:15 **ICRP Task Group 116: Radiological Protection Aspects of Imaging in Radiotherapy**

Colin Martin (Recorded)

10:20–10:30 Exposure of Volunteers in Medical Research – Justified and Optimized?

Anja Almén (SSM, Sweden)

10:30–11:00 Q&A

11:00 – 11:30 Break 📍 Exhibit & ePoster Hall (Grand Ballroom DEF)

11:30 – 13:00 Optimisation of Radiological Protection at Nuclear Power Plants and the Nuclear Fuel Cycle

Co-chairs: John Takala (ICRP & Cameco Corp., Canada), Josip Zic (McMaster U & CRPA)

11:30–11:50 Results of Radiation Safety Optimization at the Darlington NPP Four-Unit Refurbishment Project

Scott Stafford (Ontario Power Generation, Canada)

11:50–12:05 Radiation Safety Challenges with High Grade Uranium Mining & Milling

Kari Towes (Cameco, Canada)

12:05–12:20 Findings from a Large Volume Sorting, Segregation and Source Term Characterization Project on Low Level Waste from CANDU NPPs

Ryan Cooke (Laurentis Energy Partners, Canada)

12:20–12:35 TG 97 - Radiological Protection in Surface and Near Surface Disposal of Solid Radioactive Waste

John Takala (ICRP)

12:35–12:50 Revision of ICRP's General Recommendations - A Chance for Some Reconsiderations from an Industry Perspective

Marcel Lips (Kernkraftwerk Gösgen-Däniken AG, Germany)

12:50–13:00 Q&A

13:00 – 14:00 Lunch 📍 Exhibit & ePoster Hall (Grand Ballroom DEF)

14:00 – 15:30 Learning from Experience (Panel Discussion)

Co-chairs: Donald Cool (ICRP, USA), Peter Johnston (IAEA, Austria)s

14:00–14:10 ICRP Dialogue and Publication 146

Jean Francois Lecomte (Institut de radioprotection et de sûreté nucléaire, France)

14:10–14:20 In the Eleventh Year of the Accident at TEPCO's Fukushima Daiichi Nuclear Power Station

Toshikazu Suzuki (Chiyoda Technol Corp., Japan)

14:20–14:30 The ICRP Publication 103 Recommendations and Translating Them to the BSS, and Thence to the National implementation

Peter Johnston (IAEA, Austria)

14:30–14:40 Implementation of a New Equivalent Dose Limit for the Lens of the Eye in Canada

Christina Dodkin (CNSC, Canada)

14:40–14:50 Radiological Protection and Naturally Occurring Radioactive Material (NORM) – How it Really Works!

Frank Harris (Rio Tinto, Australia)

14:50–15:00 How Do You Solve A Problem Like Conservatism?

Cameron Jeffries (FMC, Australia)

15:00–15:10 **Future Application of the ICRP System of Radiological Protection: Piews from UK Professionals**

Peter Bryant (SRP / Sizewell C, UK)

15:10–15:30 **Q&A**

15:30 – 16:00 **Break** 📍 Exhibit & ePoster Hall (Grand Ballroom DEF)

16:00 – 17:30 **Next Steps (Closing Session)**

Moderator: Donald Cool (ICRP, USA)

16:00–16:30 **Next Steps in Advancing the System of Radiological Protection**

Werner Rühm (ICRP & Helmholtz Zentrum, Germany)

16:30–16:45 **Message from CRPA**

Diana Moscu or Ali Shoushtarian

16:45–17:00 **Invitation to ICRP 2023 Tokyo**

Reiko Kanda (QST, Japan)

17:00–17:30 **Closing**

Werner Rühm (ICRP & Helmholtz Zentrum, Germany)

Keynote Speakers

We are thrilled to present our Keynote speakers for ICRP 2021+1



Bob McDonald

TUESDAY, NOVEMBER 6, 2022

Bob McDonald is one of Canada's best-known science journalists, bringing science to the public for more than 40 years. In addition to hosting *Quirks & Quarks*, the award-winning science program with a national audience of nearly 500,000 people, McDonald is also a science correspondent for CBC Television's *The National* and Gemini-winning host and writer of the children's series *Head's Up*. He also hosted *The Great Canadian Invention*, *Wonderstruck*, and the seven-part series, *Water Under Fire*.

The host and writer of numerous television documentaries and more than 100 educational videos in Canada and the United States, McDonald has also authored five bestselling science books, with his latest being *An Earthling's Guide to Space*. He has also contributed to numerous textbooks, magazines, and newspapers, including *The Globe and Mail*.

An Officer of the Order of Canada and a recipient of the Queen's Jubilee Medal, McDonald has been honoured for his outstanding contribution to the promotion of science with the Michael Smith Award from the Natural Sciences and Engineering Research Council, the Sir Sanford Fleming Medal from the Royal Canadian Institute, and the McNeil Medal from The Royal Society of Canada. In 2008, he won a Gemini Award for best host in a pre-school, children's or youth program or series.

McDonald holds twelve honorary doctorates from Canadian universities and two honorary College degrees. He also currently sits on the board of Friends of the Dominion Astrophysical Observatory. In 2014, asteroid 2006 XN67 was officially named "bobmcdonald" in his honour.



Rumina Velshi

WEDNESDAY, NOVEMBER 9, 2022

Ms. Velshi has had a long association with the CNSC, having been a Commission member from 2011 until her appointment as President and CEO.

Ms. Velshi has extensive technical, regulatory and adjudication expertise in the energy industry. Throughout her career, she has worked in various capacities at Ontario Hydro and Ontario Power Generation, the electrical utilities in the province. Ms. Velshi also previously served as a part-time Board member of the Ontario Energy Board, the economic regulator of the province's electricity and natural gas sectors. In February 2020, Ms. Velshi was appointed Chairperson of the Commission on Safety Standards (CSS), established by the International Atomic Energy Agency (IAEA), for a four-year term.

Ms. Velshi very actively promotes careers in science, technology, engineering and mathematics (STEM), especially for young women. Since joining the CNSC as President and CEO, she has launched a women-in-STEM initiative to consider ways to support women in STEM careers at the CNSC and elsewhere, and to further STEM education by working with interested partners. She has also delivered several international keynote addresses about breaking down barriers for women in STEM.

Ms. Velshi was one of the founding members of Canada's Women in Science and Engineering and currently serves on the Board of Directors of the Canadian Institute for Women in Engineering and Science (CIWES), an institute that advances education in the STEM fields worldwide through an international network of organizations, foundations and experts.



Fred Dermarkar

THURSDAY, NOVEMBER 10, 2022

Fred Dermarkar is AECL's President and CEO. He was appointed in February 2021 for a term of three years. Prior to joining AECL, Fred was President and CEO of the CANDU Owners Group, where he led the not-for-profit organization to advance collaboration between CANDU nuclear reactor operators worldwide.

Fred has been working in the Canadian nuclear industry for close to 40 years. Throughout his career, he has occupied a variety of key technical and senior leadership positions at Ontario Power Generation in support of the design, commissioning, operation and refurbishment of its CANDU reactors.

Fred has received the Canadian Nuclear Association's Ian McRae award in recognition of his substantive engineering contributions, leadership and positive influence on the Canadian nuclear industry and the advancement of nuclear energy in Canada, and the Nuclear Excellence Award from the World Association of Nuclear Operators (WANO) in recognition of his contributions to Ontario Power Generation's overall post-Fukushima response.

As President and CEO of AECL, Fred is leading the organization in its oversight role, seeing that the priorities of Government are delivered safely and efficiently under the Government-owned, Contractor-operated model.

Fred holds a bachelor's degree in mechanical engineering from the University of Toronto and is a registered professional engineer in the Province of Ontario.



Official Networking Events

Welcome Reception

Kick off ICRP 2021+1 with a time of networking over drinks and passed canapes. Join fellow symposium delegates as we welcome the next few days of exciting presentations, posters, and exhibition.

**Symposium badge or event ticket required for entry*

Generously supported by: an anonymous ICRP member



6 November, 2022



Exhibit & ePoster Hall (Grand Ballroom DEF)



18:30 - 20:00

Gala Reception and Awards Gala

Celebrate ICRP 2021+1 with an evening of Canadian entertainment and cuisine against the backdrop of Vancouver's waterfront and majestic mountains. During the awards gala, we will recognize our colleagues making notable contributions in the field of Radiological Protection.

Supported by: **BrucePower**

**Event ticket required for entry*



9 November, 2022



**Vancouver Convention Centre,
West Building, Ballroom CD**

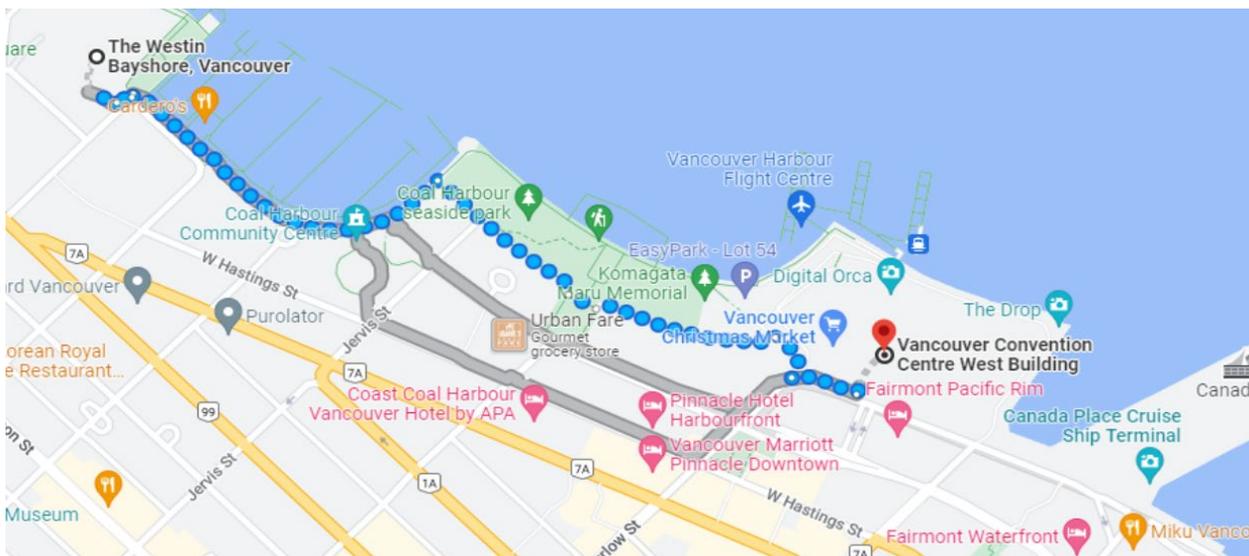


**Gala Reception:
18:30 - 19:30**

**Awards Gala:
19:30 - 22:00**

Walking Instructions:

[CLICK HERE FOR WALKING DIRECTIONS](#)



Continuing Education Courses

**pre registration and payment required*

SATURDAY 5 NOVEMBER 2022

Time: 8:30 - 10:30

PDC-SA-1

Room: Seymour

Speaker: Nina Petoussi-Henss

Title: External Dosimetry

The lecture will be a refresher on external dosimetry covering problems of radiation dose calculations from common diagnostic X-ray imaging examinations, reference computational phantoms and uncertainties of reference dose coefficients.

Time: 8:30 - 10:30

PDC-SA-2

Room: Mackenzie

Speaker: Don Cool

Title: RP Fundamentals and Innovation

The lecture will be a refresher on fundamentals of the current system of radiological protection, its application and on ideas and progress of work aiming at updating the system.

Time: 11:00 - 13:00

PDC-SA-3

Room: Seymour

Speaker: François Paquet

Title: Internal Dosimetry

The lecture will be a refresher on internal dosimetry covering problems of modelling doses following inhalation and ingestion of radioisotopes by workers and doses to patients from nuclear medicine procedures.

Time: 11:00 - 13:00

PDC-SA-4

Room: Mackenzie

Speaker: Andy Mayall

Title: Environmental Radiological Protection

The lecture will be a refresher on environmental radiological protection covering considerations of environmental protection in the context of 'sustainable development' and concerns about the 'quality of life', including services provided by the environment and ecosystems.

Time: 14:00 - 16:00

PDC-SA-5

Room: Seymour

Speakers: Gayle Woloschak: on RBE - Andrzej Wojcik: on Q and W factors

Title: RBE, Quality Factor, and Radiation Weighting Factor

The lecture will be a refresher on relative biological effectiveness covering problems of estimating radiation weighting factors, low-dose limiting RBEm, dose-response curves for multiple endpoints (cancer, others) and dose-rate effects including DDREF.

Time: 14:00 - 16:00

PDC-SA-6

Room: Mackenzie

Speaker: François Bochud

Title: Dose Quantities

The lecture will be a refresher on basic radiation dosimetry and on ideas and progress of work aiming at adapting dose quantities to the planned, updated system of radiological protection.

SUNDAY 6 NOVEMBER 2022

Time: 8:30 -10:30

PDC-SU-1

Room: Seymour

Speaker: Megan Tougas-Cooke

Title: Examining Safety Culture in the Nuclear Industry

Objectives:

- Participants will be able to describe safety culture characteristics and the importance of safety culture in the nuclear industry.
- Participants will identify safety culture, and human, technology, and organizational (HTO) factors in high reliability organizations and in their own environments
- Participants will gain awareness of the requirements and guidance in REGDOC 2.1.2 and how to apply the safety culture maturity model to their own organizations

Time: 8:30 - 10:30

PDC-SU-2

Room: Mackenzie

Speaker: Billy Cox

Title: Decommissioning Survey Methods Incorporating Scanning Measurement Data

When decommissioning scanning surveys are used in decision making; the uncertainties associated with scanning statistics, and the dominant decay emissions for the survey method(s) must be corrected for.

This PD session will largely focus on scintillation detectors, their optimization, and use in decommissioning surveys. The basic set-up of a gross gamma scintillation ratemeter will be discussed; its uses and applications. A brief refresher on the differences between particle and photon radiation interactions and detection will be presented. The main topic of ratemeter scanning statistics, the two stages of scanning, the application of; source, surface and surveyor efficiencies, and incorporation of all these variables into decommissioning surveys. The variables associated with the two stages of scanning and the concept of minimum detectable count rate will be demonstrated to participants via a dynamic learning exercise (assuming ~1 uCi or greater EQ gamma sources available), participants will need their own mini jack headphones to participate in the exercise as covid-19 precaution.

A summary of the bases documentation in this session will be discussed and the possibilities for further integration into decommissioning practices.

Time: 11:00 - 13:00

PDC-SU-3

Room: Seymour

Speakers: Corie Houldsworth and Jeff Fleming

Title: Radiation Safety Training in the New Reality

This course is intended for those currently involved in delivering radiation safety training who are looking to bring it into the future.

The course will introduce students to:

- How to bring your content into the virtual world
- Advanced development course concepts
- Innovative delivery methods (e.g. Augmented and Virtual Reality)
- Practical training limitations and considerations

Time: 11:00 - 13:00

PDC-SU-4

Room: Mackenzie

Speaker: Steve Sugarman

Title: The Importance of Effective Communications during a Radiological Incident

When a radiation incident occurs one of the response challenges is to effectively communicate the situation to varying audiences. Radiation professionals may be called upon to provide information in a variety of ways during and after a radiation emergency. It is often necessary for someone with radiological expertise to assist those individuals/groups forming public messages create a clear and accurate message. The ability to successfully integrate radiation-related expertise into a response and communication scenario requires someone with an ability to break down complicated concepts into an understandable manner for a broad – if sometimes not overly large – audience. Many radiological specialists think that because they are experts on radiation it makes them experts on communications relating to radiation. However, this is oftentimes not the case. It is worth keeping in mind that the techniques that one may use to communicate to the public in the wake of a radiological incident may not be optimal for smaller group discussions. One must remember that responders – be they law enforcement personnel, firefighters, medical care providers, etc. – need to understand the situation they are facing and be confident going forward with their public protection and other response duties.

Radiological assistance, just-in-time training, or assistance with other communication needs may be required. Direct interactions with the victims may be needed. It is possible to envision a multitude of other scenarios where an effective communicator could play an invaluable role in emergency response. Not every radiological incident rises to a level of large-scale interest. Smaller-scale incidents such as an accidental exposure to an orphaned source, isolated contamination events, or even perceived radiation-related events are more frequent and require communications on a more micro level in order to inform victims and those providing assistance.

When speaking to individuals or small groups, one must be able to interpret the audience's interest and understanding by taking cues from verbal and non-verbal indicators. Effective communication is a skill set developed with years of experience and practice along with a willingness to change one's approach based on feedback from target audiences. Successful communications can greatly affect the outcome of a variety of radiation emergency situations, so it is important that the proper subject matter experts are identified and integrated into emergency response plans and operations.

Time: 14:00 - 16:30

PDC-SU-5

Room: Seymour

Speakers: John Harrison (PHE) - Anne-Marie Nicol (SFU) - Jeff Trieu (BC CDC) - Brian Bjorndal (Radiation Safety Institute of Canada) - Yalda Yavari (Health Canada)

Title: Radon: Foundational Science and Advancing Policy

Radon is a radioactive gas that is produced naturally from the breakdown of uranium in soil and rock. It is invisible, odourless and tasteless. When radon is released from the ground into the outdoor air, it is diluted and therefore is not a concern. However, in enclosed spaces it can accumulate to high levels and become a health risk. The World Health Organization recognizes radon as a significant cause of lung cancer [1]. In fact, radon is the leading cause of lung cancer in non-smokers.

This session will provide an overview of what radon is, where it is found, why it could be a health risk and what mitigation measures are available to reduce exposure to this gas.

International recommendations for radon from the ICRP and the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) will also be presented.

Furthermore, radon scientists in Canada will present on radon policy in practice, as well as radon measurement data and radon mapping in the province of British Columbia.

Finally, attendees will have the opportunity to participate in a virtual tour of Canada's first certified radon chamber.

Time: 14:00 - 16:00

PDC-SU-6

Room: Mackenzie

Speaker: Mark Breitingger

Title: Radiation Protection for Emergencies during the Transport of Radioactive Material

The session will refresh participants on the principles, technical basis, and requirements for emergencies during the transport of nuclear and other radioactive material with an emphasis on the recently published IAEA safety guide Preparedness and Response for a Nuclear or Radiological Emergency Involving the Transport of Radioactive Material.

The session will focus on reviewing the roles and responsibilities of technical experts working with all-hazards emergency response organizations to conduct package assessments and technical response actions

Cousins Awards

Newly established by former ICRP Chair Dr. Claire Cousins, this award recognises the best presentation by a young scientist or professional at an ICRP International Symposium on the System of Radiological Protection. Eligibility is restricted to those within 5 years of having been awarded a postgraduate degree.

The Cousins award finalists are:

Tools for Effective Communication with Radiation Workers Improving how to Listen, Relate, Empathize, and Communicate Internal Doses

Author: [S. Dumit](#)

The Impact of Different Neutron RBEs on the all Solid Cancer Radiation Incidence Risks Obtained from the Japanese A-bomb Survivors Data

Author: [L. Hafner](#)

Comparative Time-series Analysis and Deep Learning Prediction of Innate Radon Risk in Canadian and Swedish Houses

Author: [S. Khan](#)

Challenges of Communicating Radiation and Nuclear Safety Information in Partnership With Potential Interest Groups To The Public

Author: [A. Shiferaw](#)

2022 Student Paper Contest

In conjunction with the ICRP 2021+1, the Canadian Radiation Protection Association provides an opportunity for full time students to share their work in radiation protection. Winners will be selected at ICRP 2021+1 in the following categories:

The Canadian winner will be awarded the Anthony J. MacKay trophy. Anthony J. MacKay served as the CRPA archivist for many years and this annual award is named in his honor.

The international winner will be awarded the ICRP student contest trophy.

Our 2022 student award finalists are:

Electron Paramagnetic Resonance (EPR) Measurements of Background Doses in Teeth of Durham Region Residents, Ontario

Author: [L. Ghimire](#)

Visible Monkey Implemented in Monte Carlo Codes for Radiation Dosimetry

Author: [J. Lee](#)

Development and Evaluation of Overscan Detection Algorithm for AI-augmented Auditing of Low-dose Chest CT: Experience of Korea Institute for Accreditation of Medical Imaging (KIAMI)

Author: [S. Kim](#)

Single-cell DNA Sequencing—a Potential Dosimetric Tool

Author: [F. Matthew](#)

ePosters

To view the individual ePosters, visit the ePoster hall at Grand Ballroom DEF. The ePoster library will also be available online on the symposium mobile app.

Radiation Effects

- P12** Cohort Profile Korean Radiation Workers Study (KRWS)
Author: D. Lee
- P17** Effect of GSM 900-Mhz Mobile Phone Radiation on Circulating Microparticles in Rats
Author: G. Al Massarani
- P20** Morphological Disorders of The Skeletal in Juvenile Fish Exposed to Long-Term Ionizing Radiation
Author: Ch.D. Ganzha
- P33** Outcomes of Collaborative Radiation Effect Researches Conducted Using The J-SHARE Data Archive Constructed by QST-NIRS
Author: T. Morioka
- P34** Reanalysis of Archival Experimental Data of Rats Reveals Modification of Radiation Associated Breast Cancer Risk by Age and Various Lifestyle-Related Factors
Author: T. Imaoka
- P35** Pax5 and Jak3 Are Paired Driver Genes of Radiation-induced Mouse Precursor B-Cell Lymphomas—A Candidate indicator to Distinguish Radiation-induced and Spontaneous B-Cell Leukaemia
Author: H. Tachibana
- P37** Effect of Age at Exposure on RBE of Carbon Ions and Neutrons Regarding Tumor Induction in Experimental Animals
Author: S. Kakinuma
- P43** Development of An Adverse Outcome Pathway to Radiation induced Leukaemia
Author: D. Klokov
- P47** Experimental Study on Organ-Specific Tumorigenic Effects of Childhood Exposure from Low-Dose-Rate Radiation
Author: Y. Yamada
- P67** Patterns of Mortality and Cancer Incidence Among Adults Who Live Near Canadian Nuclear Power Plants
Author: P.J. Villeneuve
- P79** Inter and Intraindividual Response to Alphas, X-Rays and Mixed Beams Analysed at Exon-Level Gene Expression and Chromosomal Aberrations
Author: M. López-Riego
- P80** Effects of Long-Term Radiation Exposure on Aquatic Biota within the Chernobyl Exclusion Zone
Author: D.I. Gudkov
- P95** Profound Differences in Both the Methylome and Hydroxymethylome of the Lung Fibroblast Cells Following Acute and Chronic Irradiations to Alpha Particles
Author: M.N. Vera-Chang
- P106** Radioadaptive Responses induced by Chronic Low Dose Radiation in Human Lymphocytes
Author: H.W. Tan
- P115** Lack of Adverse Health Effects in Rats Chronically Exposed to Natural Uranium in Drinking Water
Author: B.B. Sadi
- P121** Comparing the Effects of Ultraviolet and Ionizing Radiation on The Eye-Lens of Rainbow Trout
Author: M. Kocemba
- P124** Beta and Gamma Low Dose Radiation Alters Survival and Cancer Progression in Murine Models
Author: H. Laakso

- P130** **Monitoring of Age Wise Radiological Risk Due to Radon in Water Using Indigenous Developed Scintillation Based Smart Rnduo in Churu District, Northern Rajasthan, Thar Desert, India**
Author: A.K Singla
- P131** **Radiological Risk Assessment Due to Uranium Contamination in Drinking Water for The Local Population of Barnala District in Malwa Belt of Punjab (High Cancer Pron Area), India**
Author: S. Rani
- P140** **Proposal of Sea-Saw Model - Overcoming LQM Difficulty**
Author: M. Bando
- P147** **Bone Marrow-Derived Mesenchymal Stem Cells Pretreated with Rosehip (Rosa Canina L.) Extract Alleviate Testicular Damage induced by Radiation Stress in Rats**
Author: E. M. Moustafa
- P190** **The Novel Terminology “Discernible Undiscerned Conclusions: A Critical Review of UNSCEAR 202021 Fukushima Report”**
Author: Y. Hamaoka
- P193** **Carcinogenic Effect of Tritiated Water on Mice: A Systematic Review and Meta Analysis of Dose-Response Relationship**
Author: K. Xu
- P196** **Mortality Among Uranium Workers at The Middlesex Sampling Plant in New Jersey 1943-2014**
Author: C.M. Milder
- P217** **Interpretation of Radiation-induced Life-Shortening in Mice Using A Mathematical Model**
Author: T. Kinugawa
- P220** **Estimating the Impact of indirect Action in Neutron-induced DNA Damage Clusters and Neutron RBE**
Author: J. Manalad

Radiation Doses

- P4** **Estimation of Annual Committed Effective Dose of Radioactive Cesium in Japan After the Fukushima Daiichi Nuclear Power Plant Accident: Market Basket Study From 2013 to 2019**
Author: H. Nabeshi
- P5** **Assessment of The Radiation Absorbed Dose Produced by Lu-177, Ra-223, Ac-225 for Metastatic Prostate Cancer in A Bone Model**
Author: M. Tajadod
- P7** **A Study on The Hp(3,A) Dose Response of Direct Reading Survey Meters**
Author: J. Dubeau
- P8** **Primary Research on the atmospheric Neutron Based on Single Sphere Neutron Spectrometer**
Author: W. Zhang
- P16** **A New Public Research Building – Total Radiological Characterization of Building Materials and Estimation of Non-ionizing Exposure at Future Workplaces**
Author: I. Prlic
- P23** **Thyroid and Lens Absorbed Dose Assessment During Different interventional and Surgery Procedures a Multicentre Study**
Author: L. Fedeli
- P25** **Lifetime of Dicentric Chromosomes for Biodosimetry Applications**
Author: Y. Dutil
- P31** **Gamma Spectrometry Analytical Determination of Terrestrial Radiation Level in Kuruwita Area, Rathnapura District, Sri Lanka**
Author: T. Weerakkody
- P32** **Automated Dicentric Chromosome Discrimination with Deep Convolutional Neural Networks for Cytogenetic Biodosimetry**
Author: S. W. Kwon

- P45 Individual Occupational Radiation Dose Monitoring at Multiple Facilities**
Author: A.M. Castillo
- P69 External Exposure of Public to Radionuclides Deposited in The Terrestrial Environments After the Accident at The Fukushima Daiichi Nuclear Power Station: The UNSCEAR Model 2020**
Author: A. Ulanowski
- P72 Eye-Lens Dose Assessment Methods for The Various CNSC Regulated Activities**
Author: S. Djeflal
- P82 Human Respiratory Tract Model to Describe Long-Term Retention of Plutonium Using Scar Tissue Compartments**
Author: M. Avtandilashvili
- P84 Low Dose Studies of Non-Human Biota Using EPR Spectroscopy: Manganese Interferences in Mollusc and Crustacean Shells**
Author: E. Gough
- P89 Experimental Validation of Simulations Confirm that the Local Environment in A Yeast Based Impedance Biodosimeter Strongly influences The Measurable Dose**
Author: A. Hassan
- P97 Population-Scale Biodosimetry for Management of Ionizing Radiation incidents**
Author: P.K. Rogan
- P109 Proposal of New Mathematical Models with Potential to Contribute to Rational Radiation Protection**
Author: Y. Tsunoyama
- P113 The First Application of MRCP and 4D Dose Calculation in China**
Author: R. Zhao
- P116 Realising Accurate Low Dose Dosimetry in Medical Radiation Practices**
Author: G.P. McGill
- P118 Modeling of Heavy Charged Particle Tracks Overlap by Pair of Al₂O₃:C, Mg Dosimeters**
Author: S. Elshiekh
- P126 Radiological Risk Assessment of Radon inhalation in offices of Selected institutions in Southwestern Nigeria**
Author: A.A. Adewale
- P139 A Comprehensive Biokinetic Model for The Dose to Embryo and Fetus Due to Radon Intakes by the Mother**
Author: Å. L Degenhardt
- P141 Development of Artificial intelligence Based Technology for Bio-Dosimetry**
Author: in Kyung Lee
- P157 Dose and Dose-Rate Dependence of Biological Effects of Long-Term Radiation Exposure**
Author: T. Wada
- P165 Pitfalls of Using Various Sets of Dose Coefficients and Radionuclide Decay Data**
Author: C. Yu
- P166 ³H and ¹⁴C from Soil in Terrestrial Lower Trophic Biota Species, an Alternative to Airborne Concentration Ratios in the Absence of a Chronic Release to Air**
Author: B. Cox
- P167 Equivalent Dose Reading for Unregistered TLD Card with Calibration Curve**
Author: W. Yessi
- P174 Estimation of Background Counts for Derivation of Mobile Detector Scan MDC in Radiation Emergency**
Author: H. Lee
- P177 A Bayesian Hierarchical Model to Account for Lung Dose Uncertainty**
Author: S. Ancelet
- P185 Dosimetry of Small Fields of Radiation Using Thermoluminescent Dosimeters**
Author: I. Gamboa-Debuen

- P194** **Design of Avalanche-Confinement Tissue Equivalent Proportional Counters (ACTEPCS) for Nanometric Sites**
Author: N.Z. Ndum
- P195** **Monte Carlo Design of a Spherical Long Counter**
Author: G. Jiang
- P200** **Korean-Specific Dose Coefficients for Photon Soil Contamination**
Author: J.W. Choi
- P201** **Chinese-Specific Dose Coefficients for Photon External Exposures**
Author: Y. Lee
- P209** **Effect of Turbulence on ²²²Rn Progeny Deposition in A Walk-in Type ²²²Rn Calibration Chamber**
Author: A. P. Vijith

RP Medicine

- P9** **Size Specific Dose Estimates of Selected Computed Tomography Examinations in Six Clinical Practices in South Africa**
Author: I. Sebelego
- P13** **Measurement of Ozone Level in Radiation Therapy Treatment Bunker Under Near FLASH Beam Conditions**
Author: G. K. Sandhu
- P19** **Regulatory Considerations for Radiation Protection in Ion Beam Radiotherapy**
Author: J.Y. Kim
- P29** **Lead-Composite-Based Materials with Reduced Weight and Wide X-Ray Protection Range**
Author: A.T. Broach
- P46** **Use of Gamma Cameras in Nuclear Medicine Departments to Image and Quantify Accidental Radioactive Contamination**
Author: M.E. Gonzalez
- P50** **Strengthening Justification of Medical Exposures: A Multicenter Study of Adequacy of Clinical Information and Vetting of Paper-Based CT Requisitions for Children and Young Adults in Sub-Saharan Africa**
Author: H.N. Kisembo
- P51** **Radiation Protection in interventional Radiology**
Author: M.A. Habouchi
- P54** **Assessment of Shielding Material Thickness in External Radiation Therapy Facilities**
Author: C. Uwizeyimana
- P56** **Radiation Protection in he Department of Medical Imaging: State of Art**
Author: R.A Chalal
- P58** **Regulatory Requirements of Quality Assurance Program in Nuclear Medicine – Review of The Procedures**
Author: R. Hallab
- P59** **Strides that Zimbabwe Had Taken for Improving Radiation Protection of Patients**
Author: N.Ncube
- P60** **Effective Radiation Dose Monitoring Software**
Author: O.S.Hanafy
- P62** **Evaluation X-Ray Shielding in Radiography Rooms at The Maputo Central Hospital**
Author: T.S. Mabote
- P63** **Drawbacks of The Current NCRP Models on Shielding Calculations: Development of A New Methodology for The Gamma Knife**
Author: L.D S. Matias

- P64** **Radiation Protection of The Public and The Patient's Immediate Family Following Iodine-131 Therapy**
Author: Y. Ech-Chaykehy
- P65** **Application of The Basic Optimization tools of Occupational Radiological Protection During Interventional Procedures**
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ICRP

- MC** **ICRP Main Commission**
- SS** **ICRP Scientific Secretariat**
- HIS** **ICRP History**
- C1** **Committee 1: Radiation Effects**
- C2** **Committee 2: Doses from Radiation Exposure**
- C3** **Committee 3: Radiological Protection in Medicine**
- C4** **Committee 4: Application of the Commission's Recommendations**
- TG36** **Task Group 36: Radiation Dose to Patients in Diagnostic Nuclear Medicine**
- TG91** **Task Group 91: Radiation Risk inference at Low-Dose and Low-Dose Rate Exposure for Radiological Protection Purposes**
- TG95** **Task Group 95: Internal Dose Coefficients**
- TG96** **Task Group 96: Computational Phantoms and Radiation Transport**
- TG97** **Task Group 97: Application of the Commission's Recommendations for Surface and Near Surface Disposal of Solid Radioactive Waste**
- TG98** **Task Group 98: Application of the Commission's Recommendations to Exposures Resulting from Contaminated Sites from Past industrial, Military and Nuclear Activities**
- TG99** **Task Group 99: Reference Animal and Plant (RAP) Monographs**
- TG102** **Task Group 102: Detriment Calculation Methodology**
- TG103** **Task Group 103: Mesh-Type Reference Computational Phantoms (MRCP)**
- TG105** **Task Group 105: Considering the Environment When Applying The System of Radiological Protection**
- TG106** **Task Group 106: Application of The Commission's Recommendations to Activities Involving Mobile High Activity Sources**
- TG108** **Task Group 108: Optimisation of Radiological Protection in Digital Radiography, Fluoroscopy, and CT in Medical Imaging**
- TG109** **Task Group 109: Ethics in Radiological Protection for Medical Diagnosis and Treatment**
- TG110** **Task Group 110: Radiological Protection in Veterinary Practice**
- TG111** **Task Group 111: Factors Governing The Individual Response of Humans to Ionising Radiation**
- TG112** **Task Group 112: Emergency Dosimetry**
- TG113** **Task Group 113: Reference Organ and Effective Dose Coefficients for Common Diagnostic X-Ray Imaging Examinations**
- TG114** **Task Group 114: Reasonableness and Tolerability in The System of Radiological Protection**
- TG115** **Task Group 115: Risk and Dose Assessment for Radiological Protection of Astronauts**
- TG116** **Task Group 116: Radiological Protection Aspects of Imaging in Radiotherapy**
- TG117** **Task Group 117: Radiological Protection in PET and PET/CT**
- TG118** **Task Group 118: Relative Biological Effectiveness (RBE), Quality Factor (Q), and Radiation Weighting Factor (Wr)**
- TG119** **Task Group 119: Effects of Ionising Radiation on Diseases of the Circulatory System and their Consideration in the System of Radiological Protection**
- TG120** **Task Group 120: Radiological Protection for Radiation Emergencies and Malicious Events**
- TG121** **Task Group 121: Effects of Ionising Radiation Exposure in Offspring and Next Generations**
- TG122** **Task Group 122: Update of Detriment Calculation for Cancer**

- TG123** **Task Group 123: Classification of Harmful Radiation-induced Effects on Human Health for Radiological Protection Purposes**
- TG124** **Task Group 124: Application of the Principle of Justification**
- TG125** **Task Group 125: Ecosystem Services in Environmental Radiological Protection**
- TG126** **Task Group 126: Radiological Protection in Human Biomedical Research**
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Clean Energy – Clean Air – Modern Medicine – Great Jobs

Workers have a right to understand the hazards they could encounter in their workplace.

This includes the following:

- The nature of the hazard
- The source of the hazard
- The health effects of exposure
- How they are being protected
- The potential for changing circumstances

The 'Linear No Threshold' Hypothesis (LNT) and the Principle of 'As Low As Reasonably Achievable' (ALARA) are catalysts for improvements in occupational health and safety. ALARA requires an interpretation of what is reasonable.

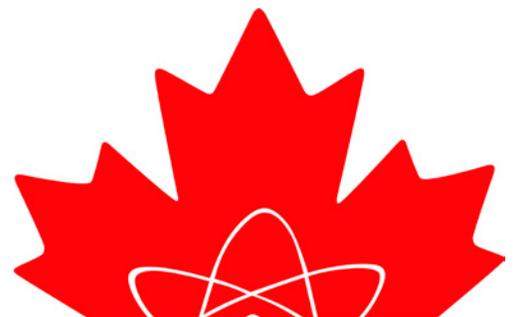
Knowledgeable Workers make that determination more meaningful and more acceptable.



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