THE SKY’S THE LIMIT
FROM SPACE EXPLORATIONS TO DEEP GEOLOGICAL REPOSITORIES
Welcome to the CRPA Conference

SANS LIMITES
DE L’EXPLORATION SPATIALE AUX DÉPÔTS GÉOLOGIQUES EN PROFONDEUR
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On the Cover: The 2016 conference is planned around the theme “The Sky’s the Limit—From Space Exploration to Deep Geological Repositories.”

Sur la couverture : Le thème du congrès 2016 est « Sans limites : de l’exploration spatiale aux dépôts géologiques en profondeur ». 
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. To this end, CRPA will:

1. further the exchange of scientific and technical information relating to the science and practice of radiation protection,
2. encourage research and scientific publications dedicated to the science and practice of radiation protection,
3. promote educational opportunities in those disciplines that support the science and practice of radiation protection,
4. assist in the development of professional standards in the discipline of radiation protection, and
5. support the activities of other societies, associations, and organizations, both national and international, having any activities relevant to the foregoing.

The association publishes the Bulletin four times a year and distributes it to all members. Subscription rates for non-members, such as libraries, may be obtained from the secretariat.

Members of the association are drawn from all areas of radiation protection, including hospitals, universities, the nuclear power industry, and all levels of government.

Membership is divided into five categories: full members (includes retired members), with all privileges; associate and student members, with all privileges except voting rights; honorary members, with all privileges; and corporate members. Corporate membership is open to organizations with interests in radiation protection. Corporate members are entitled to have their name and address listed in each Bulletin, a complimentary copy of each Bulletin, a copy of the Membership Handbook containing the names and addresses of all CRPA members, reduced booth rental rates at the annual meeting, and reduced advertising rates in the Bulletin.

Application forms are available on the CRPA website or from the secretariat.
Chers membres de l’ACRP,

Comme j’écris ici mon dernier message en tant que présidente, je tiens tout d’abord à remercier celles et ceux qui m’ont fait confiance en m’électrant présidente pour le mandat 2015-2016. Il fut un peu temps, encore pas si lointain, où le président était élu pour un mandat de trois ans au conseil d’administration (CA) mais cette période a été réduite à deux ans en 2014. Par conséquent, lorsque vous lirez ces lignes, je serai à notre congrès annuel à Toronto, savourant mes derniers moments à titre de membre du CA et disant au revoir à une équipe incroyable.

Je voudrais en profiter pour contempler notre situation aujourd’hui en tant qu’association. Il y a maintenant trois ans, sous la houlette de Gary Kramer, le CA fixait des objectifs aux futurs CA : utiliser la technologie pour 1) simplifier les processus et accélérer la prise de décision au sein du CA, 2) diffuser rapidement l’information aux membres et 3) faire des économies. Le CA a su atteindre ses objectifs et aujourd’hui, le partage et la conservation de tous les documents se font avec Dropbox ou Google Docs. L’envoi de courriels aux membres est plus efficace que jamais grâce à notre logiciel de gestion des membres, et les réunions par vidéoconférence sont possibles depuis l’automne 2014. Les réunions mensuelles du CA n’ont donc rien coûté depuis deux ans.

En 2014, les visées de Chunsheng Li pour l’Association étaient non seulement d’en rétablir le nombre de membres mais aussi d’accroître celui-ci en rendant l’ACRP plus visible et en lui donnant un caractère plus scientifique. À cette même époque, le CA avait pour but de communiquer avec tous les membres de l’ACRP qui n’avaient pas renouvelé leur adhésion pendant au moins deux ans, ce qui représentait environ le quart de tous nos membres. Une révision complète de l’adhésion s’est achevée en 2015. Certains anciens membres sont revenus, tandis que d’autres ne se sont pas réinscrits pour diverses raisons. Le travail mené par les comités du recrutement et de l’enrôlement, ainsi que par le secrétariat, a été de taille. Ces efforts de recrutement en 2015 ont abouti à l’adhésion de 30 nouveaux membres à la fin de l’année, un accroissement de près de 10 %, ce qui est un véritable tour de force pour une petite organisation.

Sur le volet scientifique, les membres de l’ACRP se sont investis dans des comités et des groupes de travail techniques sur la radioprotection à l’échelle nationale et internationale. L’ACRP a aussi joué un rôle plus important en soutenant ses membres qui tentaient de s’intégrer

suite à la page 30 . . .

Dear CRPA members,

As this is my outgoing president’s message, I want to firstly thank everyone who entrusted me with the challenge of being president for the 2015–2016 term. Once upon a not-too-distant time past, the president held a three-year term on the Board of Directors. In 2014, that term was reduced to two years, and therefore by the time you are reading this message, I will be enjoying my final days as a member of the board and saying goodbye to an incredible team during our annual general meeting in Toronto. I would like to take this opportunity to reflect on where we are today as an association.

Three years ago, the board under Dr. Gary Kramer set goals for future boards and encouraged the use of technology to (1) streamline processes and speed up decision making by the board, (2) disseminate information quickly to the members, and (3) save the association money. The board has lived up to that challenge, and today all document retention and sharing is done through Dropbox and Google docs. Email “blasts” are more efficient than ever, thanks to our membership management software, and video conferencing has been implemented since fall 2014. The regular board monthly meetings have not been a cost to the association in over two years.

Two years ago, Dr. Chunsheng Li’s vision for the association was to rebuild and grow our membership, make CRPA more visible and more scientific. In 2014, the board set a goal to contact every CRPA member who had lapsed in paying their dues for two or more consecutive years but had been retained in our books, skewing the numbers. They represented roughly one-quarter of our membership. A complete restructuring of how the membership is tracked and how applications are processed was concluded in 2015. Some past members returned, while others did not for various reasons. This was a huge undertaking by our membership and recruitment committees, and by our secretariat. Recruitment efforts in 2015 yielded 30 new members by year’s end, an amazing accomplishment for a small organization to grow nearly 10% in one calendar year.

To be more scientific, CRPA members have expanded into the national and international radiological protection technical committees and task groups. CRPA has also played a greater role in supporting our members in their endeavours to become executive members of international commissions and promoted our scholars and their

continued on page 34 . . .
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Editor’s Note / Message du rédacteur en chef

Bienvenue à Toronto!

Profițezen, car ce n’est pas tous les jours qu’un Montréalais souhaite la bienvenue aux visiteurs de la Ville Reine. Qui est responsable de ce petit miracle? Le congrès 2016 de l’ACRP, une activité incontournable au Canada pour les professionnels de la radioprotection qui veulent échanger sur leur spécialité.

Le thème du congrès est d’ailleurs très bien choisi puisqu’on ne peut couvrir plus large éventail : « Sans limites : de l’exploration spatiale aux dépôts géologiques en profondeur ». On abordera donc des sujets qui prennent vie sous nos pieds, à -680 mètres (une distance surpassant de 130 mètres la tour du CN), et d’autres qui se trouvent à 1 000 kilomètres au-dessus de nos têtes! Le comité organisateur local voit grand, et il n’a pas tort. En effet, Toronto est un creuset fertile de la radioprotection, surtout lorsqu’on sait que 20 réacteurs nucléaires commerciaux se trouvent à moins de 250 km de cette métropole. Ce périmètre du savoir nucléaire comprend l’Université McMaster, l’Institut universitaire de technologie de l’Ontario et plusieurs grands espaces publics comme l’Université de Toronto, et la University Health Network pour ne nommer que ceux-là!

J’espère donc voir un grand nombre de membres de l’ACRP au congrès de Toronto, et surtout, y rencontrer un nombre record de futurs membres, que l’on aura su convaincre par la qualité et la nature des avantages que l’ACRP offre aux professionnels de la radioprotection. À titre de porte-parole privilégié de l’ACRP, je me dois de rappeler aux lecteurs que la concurrence est féroce pour gagner le cœur des professionnels et surtout, pour toucher aux budgets de formation qui demeurent à géométrie variable. Enfin, en 2016, l’Association internationale pour la protection contre les radiations présentait son congrès international à Cape Town au début du mois de mai. Comme vous pourrez le lire, l’ACRP y était bien représentée.

Ce Bulletin vous offre un aperçu de la qualité des membres de l’ACRP et de ce que les anime. J’espère que vous apprécierez le travail de ces personnes dévouées qui contribuent à l’épanouissement de leur association en propagant le savoir. Une exposition à la connaissance brute ou raffinée apporte toujours plus de bénéfices qu’une dose de rayonnements, n’en déplaise aux partisans de la théorie de l’hormèse !

Bonne lecture et bon congrès,

Stéphane
Rédacteur en chef

Welcome to Toronto!

It’s not every day that a Montrealer sincerely welcomes you to Toronto, so enjoy it!

What could cause such a change of heart, you ask? It’s the 2016 CRPA Conference—a can’t miss event for radiation safety professionals!

The theme of the conference, “The Sky’s the Limit—From Space Exploration to Deep Geological Repositories,” was very well chosen, since it can cover a wide range of topics. The conference will address issues that come to life more than 680 metres below ground (that’s 130 metres taller than the CN tower) to over 1,000 kilometres above our heads!

The local organizing committee has a grand vision, and for good reason. The Queen City is a hotbed of radiation safety and health physics—there are 20 commercial nuclear reactors within a 250-kilometre radius. The city’s circle of nuclear expertise includes institutions such as McMaster University, the University of Ontario Institute of Technology (UOIT), the University of Toronto, and the University Health Network, to name a few.

I hope to run into a lot of current members, but also a record number of future members who will be persuaded to join by the benefits that CRPA membership offers to radiation protection professionals. As a privileged spokesperson for CRPA, I must remember that competition is fierce to win the heart of professionals and, perhaps more important, training budgets are limited.

Finally, the International Radiation Protection Association (IRPA) held its international conference in Cape Town, South Africa, in early May. As you will read, CRPA was well represented.

This edition of the Bulletin will give you a sense of the abilities and passions of CRPA members. One can certainly appreciate the hard work of these dedicated people who want to grow the association by sharing knowledge.

Whether you are learning about a niche radiation protection topic or a broad concept, exposure to knowledge is always more beneficial than exposure to radiation (no offence to the proponents of the hormesis theory)!

Enjoy this issue and have a great conference!

Stéphane
Editor-in-chief
Both a Scholar and a Gentleman

by Anthony Waker

Note: This article was originally part of the memorial feature for Richard Osborne included in the last issue of the Bulletin (37-1). It was inadvertently left out, and we apologize to the author for the error.

If one is lucky during a career, you meet people who display all the qualities that you inwardly aspire to and who show you, through example and without being overbearing or condescending, the way to achieve something of their flair and passion. For researchers, integrity, scholarship, enthusiasm, and commitment to a chosen field are what matter, and for me one guide who played a significant role in my development as a scientist and researcher was Richard Osborne. Often a characteristic of such mentors is that their behaviour is so instinctive and natural that they are quite unaware of the influence they have on others, and they would probably be quite discomfited if they were aware. Sadly, this means that one rarely finds the moment to properly thank such people before it is too late and they are taken from you.

I first met Richard in London, England, in the fall of 1990, when he was on an Atomic Energy of Canada Ltd. (AECL) business trip to Europe. He kindly took the time to meet with me to discuss radiation protection science at Chalk River. It was clear to me then that Richard was, to use an old phrase in its true sense, both a scholar and a gentleman. His extensive knowledge of all aspects of radiation science and his worldly wisdom convinced me that I should leave what had become in Britain at that time a depressed and disheartened university sector to immigrate to Canada.

By August 1991 I was in Chalk River and working in one of the AECL's branches under Richard’s directorship. At this point, Richard already had an established international reputation for his work in tritium measurement, tritium biokinetics, and dosimetry, and he had placed AECL and Canada at the centre of such important international bodies as the International Radiation Protection Association (IRPA) and the International Commission on Radiological Protection (ICRP). At home, of course, he was a leading protagonist for radiation protection science and a founder of the Canadian Radiation Protection Association (CRPA).

For me, it was hugely instructive to see a senior figure in science at work, balancing both academic work with managerial duties, and doing this with kindness and good humour. He always did this by encouraging and bringing out the best in others,

Le gentleman érudit

par Anthony Waker

Note: Cet article faisait à l’origine partie du texte en mémoire de Richard Osborne figurant dans la dernière édition du Bulletin (37-1). Il a été omis par inadvertance et nous nous excusons de cette erreur auprès de l’auteur.

Si nous sommes chanceux au cours de notre carrière, nous rencontrons des personnes qui possèdent toutes les qualités auxquelles nous aspirons intérieurement et qui, sans être envahissantes ou condescendantes, nous montrent comment accomplir quelque chose qui nous passionne. Pour des chercheurs, l’intégrité, l’érudition, l’enthousiasme et l’engagement envers un domaine de prédilection sont des qualités importantes.

Pour ma part, si quelqu’un a joué un rôle de mentor dans mon perfectionnement professionnel comme scientifique et chercheur, c’est Richard Osborne. Souvent ces mentors agissent de façon instinctive et avec tellement de naturel qu’ils ne sont pas conscients de l’influence qu’ils ont sur les autres et qu’ils seraient probablement déroutés à l’idée de le savoir. Tristement, cela signifie que l’on trouve rarement le bon moment pour remercier convenablement ces personnes avant qu’il ne soit trop tard et qu’elles nous quittent.

Ma première rencontre avec Richard a eu lieu à l’automne 1990, à Londres, en Angleterre, alors qu’il était en voyage d’affaires pour l’Atomic Energy of Canada Ltd. (EACL). Il avait alors gentiment pris le temps de me rencontrer à Chalk River pour discuter de la radioprotection à Chalk River. Dès ce moment-là, il s’était déjà forgé une solide réputation internationale, notamment pour son travail sur la mesure, la biocinétique et la dosimétrie du tritium. Il avait également réussi à faire en sorte qu’EACL et le Canada fassent partie d’organismes internationaux comme l’Association internationale pour la protection contre les radiations (AIPR) et la Commission internationale de protection radiologique (CIPR). À domicile, il a certainement agi comme un acteur prééminent de la radioprotection, notamment en cofondant l’ACRP.
whether they were at the beginning or in the middle of their careers.

When Richard retired from AECL, the organization was embarking on one of its many crises of identity and purpose, and Richard’s intellect and wisdom were sorely missed. Fortunately, the international radiation protection community benefited from many more years of his active involvement and leadership.

Richard’s influence on me, and on others, was not confined to the work environment of Chalk River Laboratories. For those of us who lived in Deep River, it was clear that Richard and Nancy Osborne cared intensely about their local community and contributed to its well-being in many quiet ways over many decades of service. They also brought up a family of three boys, who now continue to serve the nuclear industry and their local communities well.

I have been very fortunate to have met several people at different points in my life who have helped to shape and guide my career, and I am deeply grateful to Richard Osborne for the part that he, largely unknowingly, played in my adoption of a new country and a renewed enthusiasm for science and research.

Personnellement, il me fut extrêmement instructif d’observer le travail d’une personnalité emblématique en science, réussissant à équilibrer le travail universitaire et les fonctions de gestion, toujours avec gentillesse et dans la bonne humeur, tout en encourageant les gens et en faisant ressortir le meilleur d’eux-mêmes, qu’ils soient au début de leur carrière ou plus expérimentés. Lorsque Richard a pris sa retraite d’EACL, l’organisation amorçait une autre de ses nombreuses crises identitaires, et l’intellect et la sagesse de Richard lui ont alors grandement manqué. Heureusement, la communauté internationale de radioprotection a pu bénéficier de son implication et de son leadership pendant plusieurs autres années.

L’influence de Richard sur moi et les autres ne se limitait pas à l’environnement de travail des laboratoires de Chalk River. Ceux d’entre nous qui ont vécu à Deep River savent que Richard et Nancy Osborne tenaient leur communauté locale à cœur et qu’ils ont contribué à son bien-être à bien des égards pendant plusieurs décennies. Par ailleurs, le couple a eu trois garçons qui continuent aujourd’hui de bien desservir l’industrie nucléaire et leurs collectivités.

J’ai été chanceux d’avoir rencontré plusieurs personnes qui ont contribué à me façonner et à me guider à différents moments de ma carrière, et je suis profondément reconnaissant envers Richard Osborne pour le rôle qu’il a joué, en grande partie inconsciemment, dans l’adoption de mon nouveau pays et dans mon enthousiasme toujours renouvelé pour la science et la recherche.
THE SKY’S THE LIMIT
FROM SPACE EXPLORATIONS TO DEEP GEOLOGICAL REPOSITORIES

CRPA CONFERENCE
MAY 17–20, 2016, TORONTO, ON

SANS LIMITES
DE L’EXPLORATION SPATIALE AUX DÉPÔTS GÉOLOGIQUES EN PROFONDEUR

CONGRÈS DE L’ACRP
17–20 MAI, 2016, TORONTO, ON

AT THE END OF THE UNIVERSE, LIES THE BEGINNING OF VENGEANCE....
WELCOME TO TORONTO!
WE’VE BEEN EXPECTING YOU!

The Toronto Local Organizing Committee (LOC) is delighted to welcome all conference delegates, exhibitors, guests, and companions to the 38th annual conference of the Canadian Radiation Protection Association! The committee has been working very hard for over 24 months, and we are very excited to finally present the TO2016 program to all our visitors.

The conference is planned around the theme “The Sky’s the Limit—From Space Exploration to Deep Geological Repositories.” Our goal is to think globally and holistically about how radiation affects our lives, from deep space to natural background to far below the surface. Our invited speakers will focus on these aspects of radiological protection—from cosmic, natural, and deep geological radiation. We will also welcome talks on both ionizing and non-ionizing radiation, spanning the full range of health physics and radiation protection.

While in Toronto, you will be able to network with colleagues day and night to discover ways to improve your practice or find solutions to mutual problems. Most importantly, you will be able to enjoy some good, old-fashioned local hospitality.

Our entire event is orchestrated to provide value-added opportunities for our delegates and members. This includes opening up our exhibitor floor to members, delegates, and the public for the first time, as well as providing meeting opportunities for our numerous committees and our growing partnerships between our members and regulators.

Above all, the LOC was driven to give you an opportunity to experience our fantastic city in all its grandeur by making you a Torontonian for the week. Travel the streets and enjoy the sights and sounds as you venture to our conference venue, the Allstream Centre, each day. It’s Toronto’s greenest and the first LEED (Leadership in Energy and Environmental Design) Silver conference centre in Canada.

We are excited to have you here, and we hope each and every one of you is excited to be here. Enjoy!

BIENVENUE À TORONTO!
NOUS VOUS ATTENDIONS!

Le comité organisateur local (COL) de Toronto est heureux d’accueillir tous les délégués, les exposants, les invités et leurs accompagnateurs au 38e congrès annuel de l’Association canadienne de radioprotection! Le comité a travaillé très fort depuis plus de 24 mois et nous sommes très heureux de présenter le programme de TO2016 à tous nos visiteurs.


Pendant que vous serez à Toronto, vous pourrez en profiter pour échanger du matin au soir entre collègues afin de découvrir des façons d’améliorer votre pratique et de résoudre des problèmes communs. Plus important encore, vous serez en mesure d’apprécier l’authentique accueil local.

L’ensemble de notre congrès a été orchestré afin d’offrir une valeur ajoutée à nos délégués et à nos membres. Ainsi donc, pour la toute première fois, l’espace des exposants sera ouvert aux membres, aux délégués et au public. En outre, nos nombreux comités auront l’occasion de se rencontrer et d’accroître les échanges entre nos membres et les organismes de réglementation.

Mais il y a encore mieux : le COL tient à vous offrir une expérience unique de notre ville fantastique dans toute sa splendeur en vous donnant l’occasion de devenir Torontois(e) pour la semaine. Promenez-vous dans les rues et profitez chaque jour de ce que vous entendrez et verrez en cheminant vers le lieu du congrès, le Centre Allstream de Toronto, le centre de congrès le plus vert du Canada, et le premier à y recevoir la certification argent LEED (Leadership in Energy and Environmental Design).

Nous sommes heureux de vous recevoir et espérons que chacun d’entre vous est heureux d’être parmi nous. Profitez-en!
Scientific Program

From Space Explorations to Deep Geological Repositories

How do we know that deep geological repositories are safe? What are the challenges of measuring the radiation level thousands of metres under the surface of the Earth? Is there a connection between radiation in space and radiation deep inside the Earth? Are astronauts and airplane crews exposed to high levels of radiation? All of these questions will be addressed by the keynote speakers at this year’s conference, which is built around the theme “The Sky's the Limit: From Space Explorations to Deep Geological Repositories.”

Keynote Speakers

Dr. Joseph J. Shonka

In his presentation called “The Sky's the Limit: Dose and Aviation,” Dr. Joseph J. Shonka, will talk about the exposure of airplane crews to radiation. Dr. Shonka has a PhD in health physics from the Georgia Institute of Technology. He has been involved in a number of historical environmental dose reconstructions, and he has developed highly automated radiation survey instruments that were used for decommissioning at many sites and are currently in use at Fukushima. In recent years, Dr. Shonka has turned his attention to addressing the issue of radiation exposure by aircrews. In 2015, he organized a special session on radiation in flight at the Health Physics Society's annual meeting, and he served on a committee for the US President’s Council of Advisors on Science and Technology that addressed research needs for space weather and its impact on aviation.

Dr. Nigel Smith

Dr. Nigel Smith is the director of SNOLAB, a world-class physics laboratory located 2 kilometres below the surface in the Vale Creighton nickel mine near Sudbury, Ontario. As the deepest clean room facility in the world, SNOLAB allows for extremely rare interactions and weak processes to be studied. Dr. Smith will talk about the challenges of radiation measurements in extremely low background.

Dr. Smith received both his BSc in physics and his PhD in astrophysics from Leeds University in the UK. He has worked in astrophysics studies throughout his career. His early research studied ultra-high-energy gamma rays from astrophysical sources using extensive air shower array telescopes in Harrogate, UK, and at the South Pole. In 1987 he “wintered-over” as the sole operator of the telescope at the US Amundsen-Scott station at the South Pole.

Nick Sion

Our colleague Nick Sion will talk about the radiation outside of the Earth’s atmosphere and exposure to astronauts. Nick is a consultant who focuses on enhancing the protection of astronauts
from galactic radiation via shielding and other means during prolonged stays in outer space. He graduated from London University, UK, in engineering (applied physics and mathematics), followed by post-graduate work at Birmingham University, UK. After many years working in aerospace for the military, including some non-military applications, Nick moved to Canada and joined Ontario Power Generation in 1974. His research and designs have led to improvements in the field of radiation protection and monitoring. He is the Canadian Nuclear Society’s Medical Applications and Radiation Protection (MARP) Chair and is also on their council. Nick was one CRPA's founding fathers and received our meritorious service award in 2012.

**Dr. Ian Lawson**

Dr. Ian Lawson, also from SNOLAB, will talk about neutrino mass measurements and their importance in understanding the universe. Dr. Lawson received his BSc in math–physics from the University of New Brunswick and his PhD in high-energy particle physics from the University of Victoria. He was a research associate at the University of Guelph working on the Sudbury Neutrino (SNO) Experiment from 2000 to 2005. In 2005, Dr. Lawson joined SNOLAB as part of the development team during the construction of the new laboratory. Dr. Lawson has continued his research in neutrino physics as part of the SNO+ collaboration, and also works on the PICO and DAMIC (Dark Matter in CCDs) experiments, which are searching for the weakly interacting dark matter particles left over from the Big Bang which created the universe.

**Dr. Rachid Machrafi**

On day two, Dr. Rachid Machrafi, a guest speaker from the University of Ontario Institute of Technology (UOIT), will talk about neutron detection during space missions. Dr. Machrafi is an associate professor in the Faculty of Energy Systems and Nuclear Science at UOIT. He received his BSc in physics from King M.V. University in Morocco, his MSc in nuclear physics from Voronezh State University in Russia, and his PhD in nuclear physics from the Joint Institute for Nuclear Research in Dubna, Russia. Dr. Machrafi worked for Bubble Technology Industries (BTI) in Chalk River, Ontario, and is a member of the research team that developed the bubble detector set (known as Radi-N1 and Radi-N2), which measures the neutron dose astronauts are exposed to during International Space Station missions.

**And Much More...**

As usual, our scientific sessions will cover a range of subjects in the areas of health physics and radiation protection in the nuclear industry, medical applications and research, and regulations in these areas. We have also organized discussion panels covering the Canadian perspective on deep radioactive repository solutions, student involvement in radiation protection, and medical applications. And don’t miss our traditional Canadian Nuclear Safety Commission (CNSC) licensees–regulators debate.
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Dr Rachid Machrafi

Le deuxième jour du congrès, le Dr Rachid Machrafi, conférencier principal de l’Institut universitaire de technologie de l’Ontario (UOIT), parlera de la détection de neutrons lors de missions spatiales. Le Dr Machrafi est professeur agrégé de la Faculté des systèmes énergétiques et de la science nucléaire à l’UOIT. Il a obtenu son baccalauréat ès sciences en physique de l’Université King M.V. au Maroc, sa maîtrise ès sciences en physique nucléaire de l’Université de l’État de Voronezh en Russie, et son doctorat en physique nucléaire de l’Institut de recherche nucléaire de Dubna, en Russie. Il a travaillé pour Bubble Technology Industries (BTI) à Chalk River, en Ontario, et est membre de l’équipe de recherche à l’origine de l’ensemble de détecteurs à bulles (connu sous les noms de Radi-N1 et Radi-N2) qui mesurent la dose de neutrons à laquelle sont exposés les astronautes en mission à la station spatiale internationale.

Et bien plus encore...

Comme d’habitude, nos séances scientifiques couvriront une gamme de sujets en matière de radioprotection dans l’industrie nucléaire, d’applications médicales et de recherche, ainsi que des règlements portant sur ces sujets. Nous avons également organisé des groupes de discussion portant sur la perspective canadienne des dépôts géologiques en profondeur, sur la participation des étudiants en matière de radioprotection et sur les applications médicales. Ne manquez surtout pas notre traditionnel débat avec les titulaires de permis et l’organisme de réglementation, la Commission canadienne de sûreté nucléaire (CCSN).

Kinectrics

Notre visite scientifique commencera à Kinectrics, une société de premier plan qui procède à des tests, des inspections, des certifications et des consultations avec plus de 25 laboratoires et installations d’essai (www.kinectrics.com). Kinectrics est située dans les anciens bâtiments de recherche d’Hydro Ontario. Cette société recèle de choses à voir : essais MISA, radiochimie, décontamination et installations de traitement des déchets, dosimétrie alpha, cellule tiède et laboratoires de tests de qualification environnementaux, processus de qualification de niveau nucléaire, outil circonférentiel de grattage humide (CWEST), et d’autres outils robotiques utilisés pour éliminer les particules chaudes de Pickering.

Service de radioprotection du ministère du Travail de l’Ontario

Scientific Tour

Friday, May 20, 2016

There is something of interest for everyone on this tour of three interesting sites. This tour should be exciting, and we anticipate it will book up quickly.

Kinectrics

We will start out at Kinectrics (www.kinectrics.com) in the old Ontario Hydro Research buildings. Kinectrics is a leading testing, inspection, certification, and consulting company with over 25 unique laboratory and testing facilities. The actual tour details have not been finalized, but there are an abundance of things to see at Kinectrics—MISA testing, radiochemistry, decontamination, waste processing, alpha dosimetry, warm cell, environmental qualification testing, nuclear-grade qualification, circumferential wet scrape tool (CWEST), robotic tools used to remove Pickering hot particle, etc.

Ministry of Labour Radiation Protection

The next stop will be a tour and lunch at the Ontario Ministry of Labour’s Radiation Protection Service labs (www.labour.gov.on.ca/english/hs/topics/radiation.php). The Ministry of Labour establishes, maintains, and operates an environmental radiological monitoring network to assess radiation exposure around designated nuclear installations. They also provide radio analytical and technical support to other provincial agencies involved in radiation surveillance programs and health studies related to the exposure of workers or the public to radiation.

GE Hitachi Nuclear Energy Canada (GEH-C)

Finally, we will head to the Toronto location of GE Hitachi Nuclear Energy Canada (GEH-C) (http://geh-canada.ca), where they make the uranium fuel pellets used in the Candu reactors. GEH-C has been fueling Canada since 1955.

Student and Young Professionals Committee Events

CHP Preparatory Session

Presented by the Student and Young Professionals Committee (SYPCOM), this session will feature an interactive presentation that will focus on the importance of pursuing a certified health physicist designation from the American Board of Health Physics. We will provide an overview of predominant topics to be covered in the Part I examination. Suggested resources and methods to optimize preparation will also be discussed. The session will be facilitated by a team of highly experienced certified health physicists who will provide participants with an exclusive sneak peek at introductory concepts and sample multiple-choice questions in the areas of instrumentation, as well as operational, medical, and reactor health physics. A question-and-answer period will follow.

While geared towards students and young professionals, the session is open to everyone.

First Ever Quiz Challenge

Get ready for this premier event—the first ever CRPA Quiz Challenge—to conclude the conference. Contestants will form teams and square off in a Family-Feud-style, time-sensitive game format consisting of stimulating trivia questions from a wide range of radiation protection topics. Be sure to pay attention during the conference talks, as several questions will also be drawn from the various presentations. This will be a great opportunity to test your knowledge in areas such as conceptual health physics and radiation safety, historical and recent developments in the Canadian nuclear sector, and Canadian Nuclear Safety Commission (CNSC) regulations. Students, young professionals, and esteemed industry representatives are all encouraged to participate in this thought-provoking event.

Exhibitor Open House

Wednesday, May 18, 2016, 1:00 to 3:00 pm

In an effort to give more commercial value to exhibitors who attend the conference, we will be including an Exhibitor Open House session for the first time this year.

This event will give registered exhibitors an opportunity to invite any current or potential clients who are not attending the conference as delegates to visit the trade show. Exhibitors were provided with an invitation to forward to clients or potential clients. The invitation, when filled out by the exhibitor’s client, will serve as an official entry pass that allows free entry during the two-hour open house.

Thinking of becoming a Radiation Safety Professional in Canada?

CRPA has the only national designation for registered radiation safety professionals. The CRPA(R) designation is the highest level of competency recognized by CRPA at the Canadian level.

To learn more, visit crpa-acrp.org.

Vous songez à devenir un professionnel en radioprotection au Canada ?

L’ACRP offre la seule désignation nationale pour les professionnels de la radioprotection. La désignation A(ACRP) est le plus haut niveau de compétence reconnu par l’ACRP au Canada.

Visitez crpa-acrp.org pour en savoir plus.
Session préparatoire à l’examen d’agrément CHP (Certified Health Physicist)

Comme cet agrément est américain, la session se tiendra en anglais seulement. Si vous êtes intéressé, veuillez lire la description fournie dans la section anglaise du présent document.

Notre premier jeu-questionnaire

Pour conclure le congrès, préparez-vous à mettre vos neurones en œuvre avec le premier jeu-questionnaire de l’ACRP. Les participants formeront des équipes qui s’affronteront dans un jeu-questionnaire chronométré de style « Guerre des clans » avec des questions stimulantes portant sur plusieurs domaines de la radioprotection. Demeurez à l’affût pendant les présentations du congrès, car plusieurs questions proviendront des présentations. Ce jeu constituera une excellente occasion de tester vos connaissances dans des domaines comme : la radioprotection théorique et appliquée, les transformations historiques et récentes du secteur nucléaire canadien, et la réglementation de la Commission canadienne de sûreté nucléaire (CCSN). Étudiants, jeunes professionnels et représentants estimés de l’industrie sont tous encouragés à participer à cette activité intellectuellement stimulante.

Portes ouvertes au salon des exposants

mercredi 18 mai 2016, de 13 h à 15 h

Afin de donner plus de valeur commerciale aux exposants qui participent au congrès, nous allons incorporer une séance « portes ouvertes » pour la première fois cette année.

Cette activité permettra aux exposants d’inviter des clients actuels ou potentiels, qui n’assistent pas au congrès en tant que délégués, à visiter le salon des exposants. Ces derniers ont reçu une invitation à transmettre à leurs clients ou clients potentiels. Une fois remplie par le client, cette invitation servira de carte d’entrée gratuite pendant les deux heures des portes ouvertes.
New Health Physics Solutions from CANBERRA

Federal, state and international agencies have specific regulations that must be met in order to protect the nuclear worker and the public.

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Qu’ils soient nationaux ou internationaux, les différents organismes officiels imposent des réglementations spécifiques visant à protéger à la fois le personnel du secteur nucléaire et le public.
CANBERRA, fournisseur mondial d’instruments de radioprotection et de spectrométrie, a conscience des exigences rigoureuses de sûreté et de sécurité qu’une installation doit attendre afin de déployer un programme radiologique efficace.

Selon les programmes, les besoins en matière de radioprotection s’étendent du simple instrument de contrôle portable jusqu’aux équipements plus volumineux tels que les ensembles de comptage ou spectrométriques corps entier. CANBERRA répond à ces besoins en proposant une solution globale adaptée à vos installations.

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Social Events

To make the most of your time in Toronto, join the many social events planned throughout the conference.

Monday, May 16
- The President’s Reception will take place on Monday, from 5:00 to 6:00 pm at the Allstream Centre. This will be a great opportunity to meet with colleagues and vendors attending this year’s trade show.
- The President’s Reception will be followed a baseball game—Toronto Blue Jays versus Tampa Bay Rays. Game time is at 7:07 pm. Tickets are available through the CRPA website for $15. Let’s go out to the ball game!

Tuesday, May 17
- Delegates will have an opportunity to attend the Exhibitors’ Reception from 5:00 to 7:00 pm. This will be a chance to chat with our exhibitors about their products and services.

Wednesday, May 18
- The Conference Banquet will be held at the Hockey Hall of Fame. Enjoy an evening of dinner and drinks, tour the amazing hockey displays, and participate in interactive games.
- Take a break from the conference to attend one or all of these great functions and enjoy meeting with friends and colleagues. We look forward to seeing you there!

Conference Companion Program

Many delegates will be coming to the conference with family and friends. We want to be sure your companions enjoy their stay and make the most of their visit to Toronto while you attend conference sessions. We have planned trips around the city to see iconic landmarks and give participants a glimpse into the city’s daily life. Highlights include visits to Ripley’s aquarium, Casa Loma, the Royal Ontario Museum, and the Art Gallery of Ontario.

We will also be spending some time at Yonge-Dundas Square, the central hub of downtown. Located directly across from the Eaton Centre, it is a popular attraction for tourists and residents alike.

A ferry excursion to Centre Island, Toronto’s island getaway, will be a reprieve from the hustle and bustle of the city without having to drive for hours. This island community features an amusement park, a deli, a café, and beaches.

We look forward to meeting you in Toronto.
Activités sociales

Afin de tirer le meilleur parti de votre temps à Toronto, participez aux nombreuses activités sociales prévues tout au long du congrès.

**Le lundi 16 mai**
- La réception de la présidente aura lieu lundi, de 17 h à 18 h, au Centre Allstream. Ce sera une excellente occasion de rencontrer des collègues et des exposants qui participent au salon de cette année.
- La réception de la présidente sera suivie d’une partie de baseball : Les Blue Jays de Toronto contre les Rays de Tampa Bay. La partie débute à 19 h 07. Les billets sont disponibles sur le site Web de l’ACRP au prix de 15 $. Allons voir la partie!

**Le mardi 17 mai**
- Les délégués auront l'occasion d'assister à la réception des exposants de 17 h à 19 h. Ce sera l'occasion de discuter avec nos exposants de leurs produits et services.

**Le mercredi 18 mai**
- Le banquet du congrès se tiendra au Temple de la renommée du hockey. Profitez d’une soirée avec repas bien arrosé, visitez les étonnantes expositions de hockey et participez à des jeux interactifs.
- Prenez une pause en assistant à l’une ou à plusieurs de ces activités, et profitez de la rencontre avec amis et collègues. Nous avons hâte de vous voir!

Programme des accompagnateurs pour le congrès

Plusieurs délégués participeront au congrès en compagnie de leur famille et de leurs amis. Nous voulons être certains que vos accompagnateurs apprécient leur séjour et qu’ils profitent au maximum de leur visite à Toronto pendant que vous assistez aux conférences. Nous avons prévu plusieurs visites dans la ville pour voir certains sites emblématiques et donner aux participants un aperçu de la vie quotidienne en ville. Les sites les plus intéressants sont l’aquarium Ripley, le Casa Loma, le Musée royal de l’Ontario et le Musée des beaux-arts de l’Ontario.

Nous passerons aussi un peu de temps au carré Yonge-Dundas, le point convergent du centre-ville. Situé directement en face du centre Eaton, il est très populaire, tant chez les touristes que chez les résidents.

Une excursion en bateau autour de l’île centrale, l’île de Toronto qui permet de s’évader, constituerait un sursis au tourbillon animé de la ville sans avoir à conduire des heures durant. Les attraits de l’île comprennent un parc d’attractions, une charcuterie, un café et des plages.

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Principles of Radiation Shielding

This course will cover the main principles of radiation shielding, including what a build-up factor is, how scatter off lead shielding affects the dose rate, how the angle at which radiation passes through shielding affects the dose rate, and strategies used for shielding. The course is intended for radiation safety personnel operating programs in universities, hospitals (large and small), and medical Class II facilities.

Instructor: Sunil Chitra is currently working at CERN, the high-energy particle physics laboratory in Geneva, Switzerland. He has more than 20 years of experience in radiation protection. Chitra was operational health physicist for 15 years in a medium-energy heavy-ion accelerator at the Tata Institute of Fundamental Research (TIFR) in Mumbai, India. During these years, Chitra carried out shielding calculations for electron accelerators, positive-ion accelerators, heavy-ion medical accelerator cyclotrons, reactor-coupled sub-critical systems of varying kinds, radioactive sources, fuel-handling facilities, and others. His work also includes research and development in accelerator radiation protection, designing and developing monitoring instruments, and estimating source terms through experiments and theory. He has extensive experience in teaching radiation protection, including radiation shielding.

Changes to Regulatory Requirements Affecting Nuclear Power Plants

This course will ensure radiation safety staff understand the recent changes to regulations that affect nuclear power plants, the practical implications of the changes, and strategies for implementing changes to the radiation protection program.

Instructor: Maureen McQueen has been a radiation safety professional for 30 years and has worked in the UK, the US, and Canada. McQueen’s experience includes being a radiation safety officer and manager in Canadian facilities, as well as being a health physicist and manager in the nuclear industry in the UK. McQueen currently works as a radiation safety consultant. She is the former manager of radiation protection programs at Bruce Power Nuclear Plant, where she was responsible for the review, interpretation, and application of regulations. She managed a full-scale revision of the Bruce Power radiation safety program to meet new regulatory requirements and standards, which Canadian Nuclear Safety Commission (CNSC) approval. McQueen has also revised radiation protection programs at the DC Cook and Prairie Island Nuclear Plants as well as for the USA Alliance fleet of nuclear reactors.

First Responder Radiological Events

This course was designed for emergency first responders (police, fire, and emergency medical services personnel) to enhance radiation knowledge when presented with a radiological incident related to medical facility radioactive work areas, industrial sources, or radioactive material transport accidents. The course will include theory presentations, hands-on training with radiation-detection equipment and open-forum tabletop exercises.

At the completion of this training session, participants will be able to

• identify the risks and hazards of ionizing radiation,
• recognize common sources of radiation (medical, industry, transport),
• understand the differences between common radiation detection instruments and their applications during incident response, and
• understand regulations as they relate to emergency response.

Instructors: Gina Capone received a BSc in pharmacology at the University of Toronto and is a certified medical radiation technologist in the discipline of nuclear medicine. Since 2000, Gina has worked as a senior Radiation Safety Specialist at the University Health Network in Toronto. Capone is responsible for the radiation safety program in diagnostic nuclear medicine applications. Her radiation-safety responsibilities include risk and hazard assessments for new isotopes, training staff, and radiological-incident response. Capone is co-chair of the chemical, biological, radiological, nuclear, and explosive (CBRNE) committee and trainer for practical CBRNE response. Capone advised on Ministry of Health and Long-Term Care's Radiation Emergency Response Plan, and has participated in several Radiation Emergency Assistance Center Training Site (REAC/TS) and CBRNE training courses. In addition, Capone has facilitated outreach training sessions to local emergency responders including police, emergency medical services, fire and HAZMAT teams.

Frank Tourneur has a Bachelor of Engineering degree in nuclear engineering and has worked in nuclear/radiation safety since 1988. Frank worked as a senior reactor shift engineer at Chalk River Nuclear Laboratories, eventually moving to a position with the Radiation Safety department. Frank is a certified as a health physicist in 1999. Since 2000, Frank has worked at the University Health Network as the corporate radiation safety officer and is responsible for the oversight and implementation of radiation safety. Frank is a former board member of the Canadian Radiation Protection Association and continues to be an active member on several nuclear standards, including CSA N1600-2016, general requirements for nuclear emergency management programs.
CRPA’s Vision and Mission Realized at the Future of Nuclear Conference

By Tanya Neretljak, CRPA (R)
Chair, Registered Radiation Safety Professionals Committee, CRPA Past President

On November 10, 2015, Mindfirst and Future of Nuclear hosted their third annual Future of Nuclear conference in Toronto. The full-day conference brought together key stakeholders in the nuclear energy industry.

The Future of Nuclear conference featured keynote presentations from the former Chief of the Saugeen Ojibway Nation and First Nations deep geological repositories (DGR) negotiator, Randall Kahgee, and Jerry Keto, VP of Nuclear Decommissioning, Ontario Power Generation. The day’s topics focused on issues surrounding Ontario’s DGR, nuclear plant decommissioning, dealing with spent fuel, and education about the myths and realities of the health effects of radiation.

CRPA members represented the expert panel on Radiation Myths and Realities. The panel’s objective was to provide information about the latest research on the positive and negative attributes of radiation, insight into radon levels and associated health risks, and to present evidence on what is fact and what is fiction. Douglas Chambers, Director, Technical Knowledge and Innovation Radiation Services, ARCADIS Canada Inc., led the panel session with an introduction on continued on page 31...
Howdy y’all. I’m CRPA’s self-proclaimed southern-most member (latitude 29.28 degrees North, or Texas for the uninformed). Last year you somehow elected me as your first American director (at least I think you did, but with this being a presidential election year in the US, facts may have been stretched). Recently, I gave a presentation about CRPA at the US Health Physics Society’s (HPS) mid-year meeting on a balmy 23°C February afternoon in Austin, Texas. As your Director of External Affairs, my purpose at this event was to promote and increase awareness of CRPA south of the 48th parallel, and to compare and contrast the two national radiation protection organizations. An audience of approximately 200, including four CRPA members, gathered on the final afternoon of the conference to hear the presentation. For those not familiar with HPS, it has roughly 3,100 full and associate members, or about 10 times CRPA membership. Not surprising, considering the population of the US is almost 10 times the population of Canada. One structural difference between HPS and CRPA is the division of the organization into chapters.

An HPS chapter is a geographically based subset of the parent organization, which meets independently and has its own bylaws and officers. The chapter I’m most familiar with is the South Texas Chapter (STC–HPS); I served as its president from April 2013 to April 2014. The STC–HPS is one of the largest and most active chapters in the US (but there may be some personal bias here). STC–HPS has about 220 members and draws most of its membership from five major metropolitan areas within a four-hour drive from one another: Houston, San Antonio, Austin, Waco, and College Station/Bryan. The chapter holds three independent, one-day meetings a year: a topical meeting (theme varies), a student meeting (with cash awards to the student presenters), and an affiliate’s fair. We use the Saturday meeting format to allow people to drive to the meeting’s location on a Friday evening and perhaps socialize with others—a pseudo-hospitality suite (not quite up to Canadian standards), usually held in a bar or pub (or watering hole as we say in Texas). The meeting locations rotate between cities. The topical meeting is usually held at one of our affiliate (corporate) member’s facilities, the student meeting is held at one of the universities, and the vendor’s fair is normally held at a hotel on the famous river walk in San Antonio. In addition to these meetings, we usually hold an STC–HPS breakfast social meeting at the National HPS summer meeting.

My experiences within STC–HPS and CRPA have been similar. When I attend either’s function, I feel I know about 50% of the people attending. In many ways, it feels like a family reunion. My experiences as STC–HPS president and CRPA BoD member are similar as well. Both boards have highly dedicated volunteers who get things done, despite having full-time jobs and other responsibilities. The productivity and dedication of the volunteers, which is an absolute necessity, never ceases to amaze me. I strongly encourage all CRPA members to volunteer your time and efforts. Give what you can give and, yes, it will vary depending on what phase of life you are in. You’ll be glad you did.

I have one final observation; I was surprised to learn that HPS has over 100 Canadian members, representing about 4% of its membership. In searching CRPA membership directory, I found three American members of CRPA (including me), representing less than 1% of its membership. I hope my efforts to promote CRPA within HPS will prompt a few of my fellow American citizens to broaden their horizons and venture north of the border to Toronto this year, and will inspire some to take out a CRPA membership... but not too many. I definitely do not want to see CRPA become “HPS North.” CRPA has a unique, friendly, and informal culture; please don’t change that. I’m hooked on it... or maybe it’s the Tim Hortons’ ice cap.
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CRPA Member Compliance Challenges

By Tanya Neretljak, CRPA (R)
Chair, Registered Radiation Safety Professionals Committee, CNSC–CRPA working-group member

Background
In spring 2014, CRPA joined CNSC to develop the CNSC–CRPA Working Group. This working group is comprised of CNSC members from the Directorate of Nuclear Substance and Radiation Devices and registered members of CRPA. The working group was formed after many years of persistent recruitment by the CRPA Registered Radiation Safety Professionals committee and the board. The first meeting of the CNSC–CRPA working group was held in September 2014 to develop a mission and terms of reference for the group. At that meeting, the working-group members decided that a poll of CRPA members would be conducted to provide CNSC with information on challenges faced with interpreting and enforcing compliance with applicable regulations.

The Poll
In fall 2014, we invited all CRPA members to submit the top three challenges they face when dealing with regulatory compliance or with regulatory aspects of their job. The objective of the exercise was to poll the CRPA membership and gather pertinent information that will be used to drive topic-related discussions with the regulators. We left the question of challenges open ended; respondents could choose any three they faced on a regular basis. A total of 38 responses were received from members representing various industries. Figure 1 and Figure 2 represent the submission distribution.

What We Heard
All the submitted comments provided examples of common challenges faced by many workers and/or radiation safety program administrators in Canada. From the responses, three overarching themes arose:

• Administration of the Radiation Safety Program, including administration, training, and radiation protection
• Enforcement, including audits, inspections, security

Here’s what we heard.

Regulator Challenges
• there remains a gap between the idea of what is a reasonable probability of obtaining a dose higher than 1mSv
• ensuring the proper requirements to wear radiation monitoring equipment is consistent and always used by workers

Licensee Challenges
NORM
• lack of formal regulations for NORM
• lack of regulator experience in NORM management
• lack of audits and inspections for NORM-producing facilities
• understanding EQ limits of NORM
• identifying waste streams that have NORM, and demonstrating and making sure they are below clearance levels

continued on page 30 . . .
CRPA Member Compliance Challenges

...continued from page 29

**Administration**
- unnecessary duplication of reporting within limited time period for Annual Compliance Report, Type I/Type II Inspection Follow-up Reports, Desktop License Assessment Reports, License Renewals
- unnecessary duplication of reporting in different submission formats
- non-user-friendly forms
- sending in changes to Policies and Procedures as required for licence amendments
- reduced budgets and resources for implementing programs, particularly training
- document retention—a quick reference guide would be helpful
- transport of sources and responsibilities (importing, exporting, shippers, importer on record versus licensee, etc.)

**Training**
- a challenge because there are so many different groups that require different levels of awareness and training of new staff who arrive at any moment—clinical staff arrive one day and are set to work the next; it is challenging to get them trained in radiation safety awareness as well as issue a badge prior to their starting work

**Radiation Protection**
- field work—ensuring workers are able to appreciate the rationale for the radiation protection measures being implemented for the job
- enforcing the actual use of personal protective equipment by staff
- dose estimates and calculations for GD-52 document
- compliance with non-NEWs
- physicians usually enjoy a professional autonomy, which they sometimes confuse with the right to decide what health and safety rules apply

**Enforcement**

**Audits and Inspections**
- Regulators are not interested in improving the regulatory process when suggestions come from a single source. There needs to be a serious levelling between the regulator and the licensee community before we can move ahead together in honest collaboration.
- inefficient federal inspections—should be a mechanism implemented whereby licensing specialists actually inspect licensees
- concern of reporting—AMPs recently issued do not fit the non-compliance (UWO $1000 fine versus loss of source...continued from page 29
CRPA’s Vision and Mission Realized at the Future of Nuclear Conference

CRPA’s Vision and Mission

Realized at the Future of Nuclear Conference

...continued from page 26

Security

• additional security requirements and whether they are effective or reasonable
• verifying the personal trustworthiness or background checks on foreign students that work with Category 3 sealed sources

CRPA representatives of the working group are hopeful that this newly formed relationship will provide the platform for regulator engagement on topics that influence and shape how RP professionals and RSOs conduct their business under the NSRD framework. If you would like to add to our discussion and submit your challenges to be presented to the regulator, please email Tanya Neretljak (Tanya.neretljak@uoit.ca).

A follow-up article will describe the recommendations put forth by the working group on these collected challenges in the next edition of the Bulletin.

...continued from page 26

radon facts and associated health risks. Christopher Clement, Science Secretary, ICRP, presented information on the myths associated with ionizing radiation and an introduction to the linear no-threshold model. The panel presentations concluded with Tanya Neretljak, Radiation Safety Officer, UOIT, who gave a historical scientific perspective on radiation hormesis from the rise of the nuclear age and the discovery of X-rays to the current debate over the use of the linear no-threshold model for estimating health effects and regulating radiation exposure.

The expert panel nicely complimented presentations given by Ontario Power Generation, Nuclear Waste Management Organization, Candu Energy, and Terrestrial Energy Inc. These talks focused on short-term and long-term decommissioning efforts, the global nuclear fuel cycle storage and recycling challenges, molten salt reactors, and an update on DGR. Panelists fielded a variety of questions from power workers, union representatives, lawyers, political scientists, and global energy and sustainability students, and engineering students. The most recurring questions from the audience dealt with public engagement, public awareness, and dispelling radiation myths. It was evident that safety was on the forefront of everyone’s mind as the topic of nuclear energy and nuclear power was discussed. CRPA was well represented and well versed to answer the call and respond to many thought-provoking radiation myths that were discussed during the conference in a room that heavily represented nuclear power. As the expert voice of radiation safety professionals, CRPA members provided scientific knowledge and expertise, fulfilling the association’s mandate to educate the current and next generation of nuclear energy workers, environmentalists, and potential global energy leaders.

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Conservatism does not always serve you well!

by Stéphane Jean François
certified health physicist

Question

Don’t worry, this remark has nothing to do with politics! It is simply a fact that I have observed over my few years in radiation protection. A radiation safety officer must not only evaluate the dose received by a worker or a member of the public, but also assign a maximum dose.

Sometimes, this professional suddenly becomes very conservative, perhaps too conservative, and significantly over or under estimates the expected dose to people who have been exposed. Following is an example that I encountered in a previous life. Remember that the name, locations, and exact story have been changed to protect the innocent!

During an audit in an imaginary country well-known for its colourful presidential election candidates, the principle auditor stumbled upon an unidentified lead container that has been left on a tracer synthesis research workbench close to a cyclotron. This container might have remained unnoticed except for the fact that the auditor happened to have a survey meter with him that was indicating a reading of 35 uSv/h at 1 m. What was the suspicious element? Carbon-11, a radionuclide with a half-life of 20.38 minutes.

The real problem was that a maintenance worker had used this work station that same day to repair and recondition a vacuum pump, as well as some other work. The worker was in the room and at least 1 m from this container for about 11 hours. Can you estimate the worker’s dose?

The investigation revealed that the container was initially emitting about 5.4 mSv/h @ 1 m. This approximated dose was obtained using a reading from an area monitor (to monitor a precise area) and the relative distance from the detector in the corridor of a nearby cyclotron. The fact that the alarm did not ring is another story...
Answer

So, we have an initial exposure of 5.4 mSv/h @ 1 m and an exposure time of at least 11 hours. We can’t simply multiply the exposure time by the initial reading (59.4 mSv), or by the final exposure rate after many hours (0.385 mSv), because this estimate would be TOO conservative. The solution lies somewhere in between.

We need to come back to basics:
The exposure after 11 hours will likely be proportional to the number of C-11 atoms that were present during the exposure period. And we need to assume that the exposure time is long relative to the half-life of C-11 (660 minutes is a rather long time compared to 20 minutes). This is the “conservative” assumption that we have chosen.

So,

\[ X_{(11\text{ hours})} \propto N_0 \text{ and } D_{x_0} \propto A_0 \text{ and } A_0 = \lambda N_0 \]

where \( D_{x_0} \) = initial dose rate (5.4 mSv/h),
\( X_{(11\text{ hours})} \) dose after 11 hours,
\( N_0 \) number of initial C-11 atoms,
\( A_0 \) Initial C-11 activity,
\( \lambda \) : C-11 decay constant.

\[ \lambda = (\ln(2)/20.38 \text{ min}) = 0.034/\text{min} = 2.04/\text{h}. \]

We can then calculate the mean life: \( t_{\text{mean}} = \frac{1}{\lambda} = 0.49 \text{h} \)

Reminder for \( t_{\text{mean}} \) vs \( t_{0.5} \):
If \( N_t / N_0 = e^{-(t)} = 0.5 \), then \( t = t_{0.5} \), represents the half-life.
If \( N_t / N_0 = e^{-(t)} = e \), then \( t = t_{\text{avg}} \), represents the mean life.

We have :

\[ X_{(11\text{ hours})} / D_{x_0} = N_0 / A_0 = N_0 / \lambda \text{ N}_0 = 1 / \lambda = t_{\text{mean}} \]

So: \( X_{(11\text{ hours})} = D_{x_0} t_{\text{mean}} = 5.4 \text{ mSv/h x 0.49h} = 2.6 \text{ mSv}. \)

Essentially, we are not using an actual time period to calculate the dose rate from C-11 atoms whose dose rate varies rapidly over time. Instead, we use an average exposure time, which takes into account the rapid decay of the radionuclide. Remember that the longer the exposure time is compared to the half-life, the more accurately this equation will calculate the radioactive decay of a single radionuclide in a single compartment.

We obtain a reading that is 23 times lower than the 59.4 mSv and 7 times higher then the weak 0.39 mSv. At least were right on one point: the answer lies in between the two absolute values!

Of course, it would be possible to complicate the problem by adding another transfer compartment or other first order decay phenomenon. But that’s for next time.

Réponse

Nous avons donc une exposition initiale de 5,4 mSv/h @ 1 m et une durée d’exposition d’au moins 11 heures. Impossible de simplement multiplier le temps d’exposition par la valeur de l’exposition initiale (59,4 mSv) ou par la valeur d’exposition après plusieurs heures (0,385 mSv) car cela serait TROP conservateur. La solution se trouve entre les deux valeurs.

Il faut donc revenir à des concepts de base :
L’exposition après 11 heures sera vraisemblablement proportionnelle au nombre d’atomes de C-11 présents au début de la période d’exposition. Surtout, il faudra supposer que le temps d’exposition est long, comparativement à la demi-vie du C-11 (660 minutes étant une durée plutôt longue comparativement à 20 minutes). C’est l’hypothèse « conservatrice » que nous avons choisie.

Donc,

\[ X_{(11\text{ heures})} \propto N_0 \text{ et } D_{x_0} \propto A_0 \text{ et } A_0 = \lambda N_0 \]

où \( D_{x_0} \) est le débit de dose initiale (5,4 mSv/h),
\( X_{(11\text{ heures})} \) la dose après 11 heures,
\( N_0 \) le nombre d’atomes de C-11 initial,
\( A_0 \) l’activité de C-11 initiale,
\( \lambda \) : la constante de décroissance du C-11.

\[ \lambda = (\ln(2)/20.38 \text{ min}) = 0.034/\text{min} = 2.04/\text{h}. \]

On peut alors calculer le temps de vie moyen : \( t_{\text{moy}} = 1/\lambda = 0.49 \text{h} \)
Rappel pour \( t_{\text{moy}} \) vs \( t_{0.5} \):
Si \( N_t / N_0 = e^{-(t)} = 0.5 \), alors \( t = t_{0.5} \), le temps de demi-vie.
Si \( N_t / N_0 = e^{-(t)} = e \), alors \( t = t_{\text{moy}} \), le temps de vie moyen.

Nous avons :

\[ X_{(11\text{ heures})} / D_{x_0} = N_0 / A_0 = N_0 / \lambda \text{ N}_0 = 1 / \lambda = t_{\text{moy}} \]

Donc : \( X_{(11\text{ heures})} = D_{x_0} t_{\text{moy}} = 5.4 \text{ mSv/h x 0.49h} = 2.6 \text{ mSv}. \)

Essentiellement, on utilise non pas une durée chronologique réelle pour calculer la dose provenant d’un débit dose qui varie rapidement avec le temps, mais bien un temps moyen d’exposition qui permet de tenir compte de la décroissance rapide du radionucléide. Rappelons que plus le temps d’exposition est grand par rapport à la demi-vie, plus cette évaluation correspondra à la réalité de la décroissance radioactive d’un seul radionucléide dans un seul compartiment.

On est donc 23 fois en-deçà d’un potentiel trop élevé de 59,4 mSv, et 7 fois plus élevé qu’une estimation trop faible de 0,39 mSv. Toutefois, nous avions raison sur un point : la réponse se trouvait bien entre ces deux valeurs absolues!

Bien entendu, il serait possible de compliquer le problème en ajoutant un autre compartiment de transfert, ou un autre phénomène de décroissance de premier ordre. Mais, ce sera pour une prochaine fois.
Submissions Procedures

Authors submitting manuscripts for consideration are asked to follow these guidelines.

1. Submit manuscripts (in English or French) electronically as attachments (in Microsoft Word).
2. Include the title of the paper, author(s) name(s) and affiliation(s), and email address to which correspondence should be sent.
3. Include an abstract of no more than 200 words and a biographical note of not more than 50 words for the author and any co-authors.
4. Submission of a manuscript implies that it is not being considered for publication elsewhere. Once accepted for publication in the Bulletin, consent from the editor must be obtained before a manuscript, or any part of it, may be published elsewhere in the same form.
5. Authors are invited to submit manuscripts at any time during the year to

   Email: secretariat@crpa-acrp.ca

   Ph: 613-253-3779

   Editor (c/o CRPA Secretariat)

   Number 1 ..................... October 23
   Number 2 ..................... February 23
   Number 3 ..................... June 23

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Message de la présidente / President’s Message

... suite de la page / continued from page 7

au conseil de commissions internationales et en promouvant ses experts et leurs réalisations scientifiques. Notre congrès à Toronto accordera une large place aux découvertes scientifiques et à l’information technique, allant de la détection et des mesures, jusqu’à la radioprotection, en passant par la compréhension des effets des radiations ionisantes et non ionisantes sur la santé. Il y aura aussi des sessions techniques de formation continue pour répondre aux besoins de nos membres.


Un de mes principaux objectifs au sein du CA sortant aura été de souligner l’importance de la transparence au sein de notre Association. Sans communication régulière, la transparence se perd. Toutefois, la communication régulière est une scientifique. Ainsi, lors de la récente conférence de l’ACRP aura major component dedicated to scientific discoveries and technical information, from detection and measurements to radiological protection and understanding health effects associated with ionizing and non-ionizing radiation. There will also be technical continuing education offerings to fill the needs of our members. My predecessor, Jeff Dovyak, positioned CRPA to become more visible by promoting it to regulators and politicians during his tenure, thereby promoting CRPA and its professionals along the way. Today, CRPA has two active working groups with CNSC and is working towards synergies with other like-minded organizations. Visibility and recruitment efforts continued into 2016: board members and student representatives endorsed CRPA at two student open-house events, a new revival of the CRPA mentorship program is now being championed by the CRPA(R) members to reach more licensees across Canada, and the International Radiation Protection community will be inundated with the CRPA delegation at the IRPA14 Congress in Cape Town. If successful, IRPA16 will return to North American and CRPA will continue to play a key role on the IRPA2024 task force. As you can see, CRPA’s strategic plan will maintain a focus on increased visibility, outreach, retention, and growth for the foreseeable future.

One of my main objectives with the board I have worked with was to emphasize the importance of transparency within the association. Without regular communication, transparency is misunderstood, but regular communication is a great task and a hefty feat. It takes a lot of time and effort to make things happen and twice the time and effort to share that information. This is the particular challenge that faces each board. But try we must. I believe that the development of our regular communications from the board...
tâche considérable qui relève de l’exploit. Elle exige beaucoup de temps et d’efforts pour faire avancer les choses, et encore le double pour diffuser cette information. Il s’agit d’un défi particulier qui se pose à chaque CA. Mais nous devons le relever. Je crois que l’établissement de communications régulières venant du CA a permis à nos membres d’avoir une meilleure compréhension du rôle que joue l’ACRP dans le domaine de la radioprotection au Canada. J’espère que vous avez lu notre communiqué mensuel et que vous apprécierez l’énorme travail effectué jour après jour par nos membres. Petit à petit, l’Association s’améliore et bâtit progressivement son avenir. C’est avec humilité que j’ai pris part à ce processus après une succession de grands présidents.

À l’aube de mon départ, je peux sincèrement dire que j’ai tenu l’unique promesse de ma campagne : me dévouer à l’Association et consacrer temps et efforts au CA pour un mandat de trois ans. Bien que je me retire après seulement deux années, je compte réaliser de nouvelles initiatives en cours d’élaboration, tenir ma promesse de respecter le code de conduite professionnel et poursuivre la promotion de notre communauté de professionnels de la radioprotection.

Respectueusement,

Tanya Neretljak
Présidente, ACRP

has allowed members to have a better understanding of the role CRPA plays within the Canadian radiation protection community. I hope that you have been following our monthly communiques and can appreciate the enormous amount of work that our members do on an ongoing basis. Each year, the association takes steps towards improvements. These are all building blocks that shape the future of the association. I am humbled to have been part of this process after a succession of great past presidents.

As I step down from the board, I can say whole heartedly that I stayed true to my one and only campaign promise from two years ago: committing myself to the association and dedicating my time and efforts to the board for a three-year term. Although I leave after only two, I plan to follow through on new initiatives that are in their developing stages and keep my promise to uphold my professional code of conduct and continue the outreach movement within our radiation protection community.

Respectfully,

Tanya Neretljak
President, CRPA

**Bulletin**
Canadian Radiation Protection Association
Association canadienne de radioprotection

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3. Inclure un résumé d’un maximum de 200 mots et une note biographique d’un maximum de 50 mots pour l’auteur et tout co-auteur, s’il y a lieu.
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- Numéro 3 .......................... 23 juin

**Publicités**
Bien que les publicités soient recherchées et acceptées pour contrer les coûts de production du Bulletin, celui-ci est d’abord publié pour et au nom des membres de l’ACRP. Ainsi, le fait d’inclure des annonces demeure entièrement à la discrétion de l’ACRP. L’ACRP se réserve le privilège de refuser, omettre ou annuler toute publicité qui ne serait pas pertinente à la nature professionnelle du Bulletin ou qui serait d’une manière quelconque inappropriée pour nos membres.

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Coming Events / Table des annonces

- **Health Physics Society 61st Annual Meeting** July 17–21, 2016, Spokane, WA NORM/TENORM (naturally occurring radioactive material / technologically enhanced naturally occurring radioactive material) Industry Day will be held as part of the 2016 HPS meeting. For more information, visit http://hps.org/meetings.

- **NORM VIII Symposium** October 18–21, 2016, Rio de Janeiro, Brazil The 2016 symposium will address the radiation protection control of naturally occurring radioactive materials (NORM) and will include the results of new research, explore practical case studies of industrial applications and waste disposal practices, evaluate the practical implication of international and national standards, and identify new societal needs and technical requirements for regulators and industry. Possible solutions for using, recycling, and disposal of NORM residues will be another focus area, as well as the quality of NORM sampling and measurements. The event is an essential platform for NORM industries, academic and research institutions, and regulatory authorities to share experiences, review progress made, identify opportunities, and provide an in-depth analysis of current challenges. For more information, visit http://normviii.ird.gov.br.

- **Health Physics Society 50th Midyear Meeting** January 22–25, 2017, Bethesda, MD This meeting includes presentations on scientific endeavours and practical experience of specialists in radiation protection and exhibits of radiation protection equipment and services. For more information, visit http://hps.org/meetings.

- **Global Conference on Radiation Topics (ConRad) 2017** May 8–11, 2017, Munich, Germany Topics will include preparedness, response, protection, and research. For more information, email christinabeinke@bundeswehr.org.

- **Neutron and Ion Dosimetry Symposium (NEUDOS13) May 14–19, 2017, Cracow, Poland** The symposium offers a great opportunity to share knowledge, exchange experience, and promote new ideas in the field of neutron, proton, and ion dosimetry. It will attract scientists from research bodies, regulatory authorities, and industry worldwide. The program will consist of oral and poster sessions from contributed papers. Invited lectures will be given by high-level experts. For more information, visit http://neudos2017.ifj.edu.pl.

- **Congrès annuel de l’ACRP 5–7 juin 2017, Saskatoon, SK** Réfléchir sur l’avenir. For more information, visit http://crpa-acrp.org/conference/.

- **CRPA annual conference** June 5–7, 2017, Saskatoon, SK Reflecting on the Future. For more information, visit http://crpa-acrp.org/conference/.

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CRPA Bulletin / Bulletin de l’ACRP  Vol 37 No 2 / 37

CRPA is pleased to announce the results for the 2016 Elections

- President-Elect: Valerie Phelan
- Treasurer: Mojgan Soleimani
- Director: Grant Cubbon
- Director: Scott Nichelson

l’ACRP est heureuse d’annoncer les résultats des élections 2016

- Présidente désignée : Valerie Phelan
- Trésorière : Mojgan Soleimani
- Directeur : Grant Cubbon
- Directeur : Scott Nichelson
Stéphane Jean-François is a certified radiation safety specialist and the head of Radioprotection Inc. An engineer/physicist by training, he started his career with the CNSC in 1992, then became the radiation safety officer for the Merck Frosst Centre for Therapeutic Research in 1995.

Tanya Neretljak, a biosafety and radiation safety officer at University of Ontario Institute of Technology, is the chair of the Registered Radiation Safety Professionals Committee and the president of CRPA.

Tanya Neretljak, l’agent responsable de la biosécurité et de la radioprotection à l’Institut universitaire de technologie de l’Ontario, est la présidente du Comité des professionnels de la radioprotection agréés et la présidente de l’ACRP.

Scott Nichelson, a certified health physicist and industrial hygienist, began his career in health and safety with the United States Air Force in the mid-1980s. He retired after 28 years on active duty and is currently serving as a civilian instructor for the US Army Medical Department and School in San Antonio, Texas. Scott discovered CRPA in 2002, and is a diehard fan of the NBA’s San Antonio Spurs.


Anthony Waker is the University Network of Excellence in Nuclear Engineering (UNENE) / Natural Sciences and Engineering Research Council (NSERC) Senior Industrial Research Chair in health physics and environmental safety at the University of Ontario Institute of Technology (UOIT). Prior to joining UOIT in 2005, Waker was senior researcher and manager of radiation biology and health physics at the Chalk River Laboratories of Atomic Energy of Canada. Throughout his career Waker has been engaged in radiation detector development research for radiation protection dosimetry, and experimental microdosimetry and its application to neutron therapy, neutron activation analysis, and neutron monitoring.

Anthony Waker est titulaire de la Chaire de recherche industrielle en radioprotection et en respect de l’environnement de la University Network of Excellence in Nuclear Engineering (UNENE) / Conseil de recherches en sciences naturelles et en génie du Canada (CRSNG) à la University of Ontario Institute of Technology (UOIT). Avant de travailler pour l’UOIT en 2005, Waker était chercheur en chef et directeur de radiobiologie et de radioprotection des Laboratoires de Chalk River d’Énergie atomique du Canada limitée (EACL). Tout au long de sa carrière, Waker a travaillé en recherche sur le développement de détecteurs de rayonnement pour la dosimétrie en radioprotection et pour la microdosimétrie expérimentale ainsi que ses applications à la neutronthérapie, à l’analyse par activation neutronique et au contrôle neutronique.
CRPA Bulletin / Bulletin de l’ACRP

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CRPA/ACRP
welcomes our new members/
souhaite la bienvenue aux nou-
veaux membres

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- Elise Normand
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- Lawrence John Schreiner
  Cancer Centre of Southeastern Ontario at KGH

Student members / Membres étudiants :

- Zeinab Al Husari
  University of Tehran
- Farazdak Bohra
  McMaster University

Membership in the association is open to individuals with appropriate training who are actively engaged in some aspect of the science and practice of radiation protection.

For more information about membership, visit http://crpa-acrp.org.

Les individus ayant une formation adé-
quate et qui sont activement impliqués 
dans un aspect de la science et de la 
pratique de la radioprotection peuvent 
deviennent membres de l’association.

Pour en savoir davantage au sujet de 

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Meet the newest members of the CANBERRA Contamination Monitor Family

The Cronos Gamma Object/Tool Monitors

CANBERRA is pleased to announce the addition of the Cronos-4 and Cronos-11 Gamma Object/Tool Monitors to our suite of advanced personnel contamination monitors. The Cronos monitors join our industry standard Argos™ and GEM™ Whole Body Monitors and Sirius™ Hand and Foot Monitors. Built on our established GEM Gamma Exit Monitor technology and with input from a wide variety of our customers, Cronos is the monitor you need in your facility for high throughput, durability and ease of operation.

Both Cronos models have high sample capacity to accommodate larger items (or a larger number of items) than typical units in use today. The Cronos-4 has a 129-liter internal volume (twice that of other units), and the Cronos-11 has a volume two and a half times larger than the Cronos-4 at 325 liters.

With six large plastic detectors surrounding the sample on all sides, both Cronos models offer minimum detectable activities (MDAs) comparable to much smaller units as well as a uniform efficiency response.

The Cronos-4 and Cronos-11 also feature built-in weighing scale, up to 100 kg, with removable scale tray for cleaning.

You spoke. We listened. Now you can take advantage of the results! Contact CANBERRA to learn more about the Cronos-4 and Cronos-11 Gamma Object/Tool Monitors.

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