International Commission on Radiological Protection
2017 Annual Report

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ICRP 2017 Annual Report
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Chair's Foreword

2017 was a year of significant importance for the International Commission on Radiological Protection. We elected new Main Commission and Committee members and hosted our 4th International Symposium on the System of Radiological Protection, which is where I announced our 90th Anniversary drive to 'Free the Annals'.

In May of 2017, the Main Commission met in Lima, Peru to review and elect the nominees put forth by respected radiological protection professionals from around the world. We elected six new members of the Main Commission, and 29 experts from the global community as new members of our now four Committees. Former members of Committee 5 are now working in Committees 1 to 4 in order to proceed with integration of protection of people and the environment into the single System of Radiological Protection.

In October, we welcomed over 500 delegates to the 4th International Symposium on the System of Radiological Protection hosted near Paris by the French Institut de Radioprotection et de Sûreté Nucléaire (IRSN), held in conjunction with the 2nd European Radiological Protection Research Week. The programme was world-class, with topics ranging from radiological protection in medicine and the environment, to post-accident recovery and dosimetry.

During the opening ceremonies of ICRP-ERPW 2017, I announced our intention to 'Free the Annals' as the next step in broadening the reach of our recommendations, ensuring that any professional, organisation, or member of the public can access them at no charge. To achieve this, we are looking to raise € 500 000 by the end of 2018.

We are making good progress, and I invite you to read more on this later in this report. This endeavour will further promote and improve radiological protection practices around the world, and we are looking for contributing organisations, agencies, and governments to support this initiative.

While working to fund our 90th Anniversary drive, we have not forgotten that ICRP exists for the public benefit. Our Committees and Task Groups will continue to address relevant issues in 2018, strengthening our commitment to continually develop and advance the System of Radiological Protection.

As we look towards our 90th year in 2018, it is easy to reflect on the accomplishments and successes this important organisation has achieved over the years. There is still hard work to be done and, as Chair, I am honoured to lead ICRP into its next chapter.

Claire Cousins.

Claire Cousins, ICRP Chair

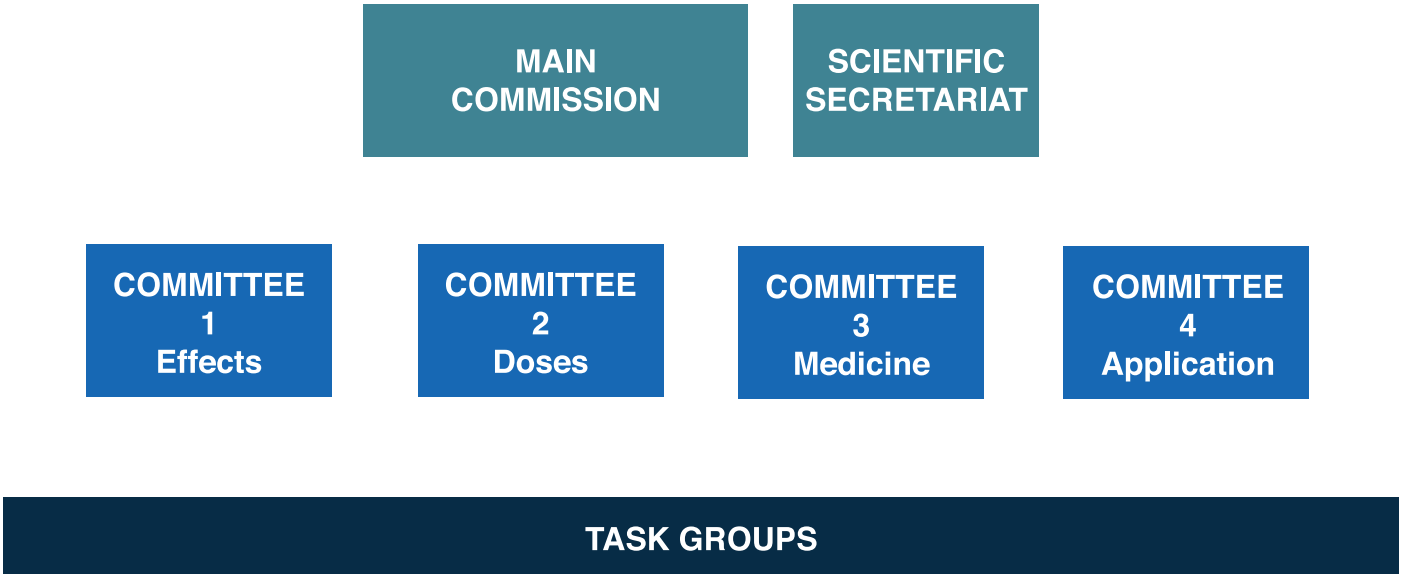
The International Commission on Radiological Protection

ICRP develops the System of Radiological Protection for the public benefit. The System takes account of the latest scientific knowledge, ethical values, and practical experience. It is the basis of standards, legislation, guidance, programmes, and practice worldwide.

The objective of the System is to contribute to an appropriate level of protection for people and the environment against the harmful effects of radiation exposure without unduly limiting the individual or societal benefits of activities involving radiation.

Originally established at the Second International Congress of Radiology in 1928 as the International X-ray and Radium Protection Committee, today ICRP is an independent international charity registered in the UK, relying on financial contributions and support from governments, industry, agencies, and foundations from around the world.

ICRP consists of the Main Commission, the Scientific Secretariat, four standing Committees, and Task Groups established as needed to undertake specific work. Members come from over 30 countries and all disciplines relevant to radiological protection. They are invited to join ICRP as independent experts on a volunteer basis for four-year terms. Representatives of organisations in formal relations with ICRP are regularly invited to both advise the Main Commission and to participate in meetings of the Committees. Individuals from these organisations may be invited to be members of Task Groups or to review drafts of work in progress, where their expertise is particularly relevant.



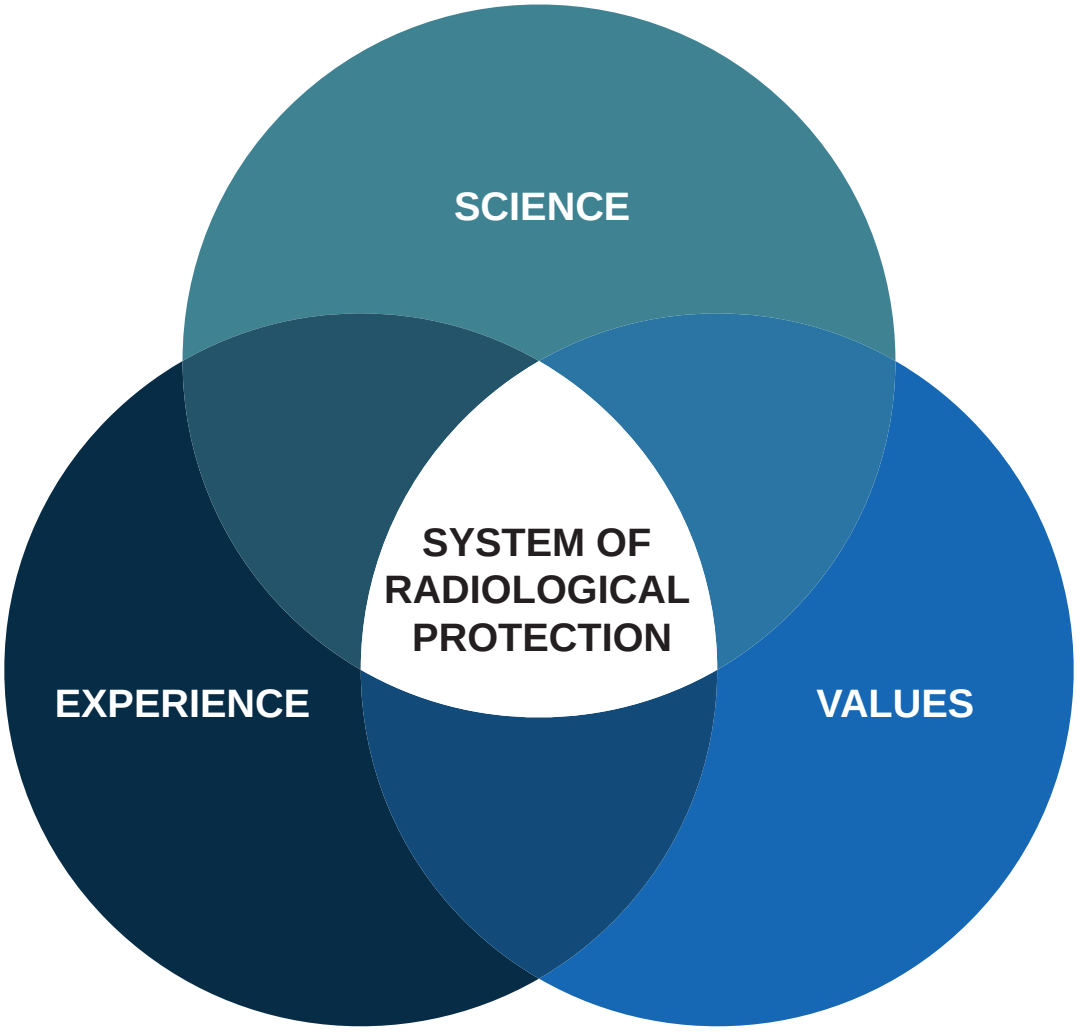
This structure supports a rigorous system of peer review. The work of Task Groups is reviewed by the relevant Committee(s), and then reviewed and approved by the Main Commission. During development, most reports are circulated to a number of organisations and individual experts for critical review, and posted for public consultation through the ICRP website.

The System of Radiological Protection

The ICRP System of Radiological Protection is based on the latest science, social and ethical values, and nearly a century of experience.

ICRP recommendations are used world-wide by intergovernmental and non-governmental advisory and standard setting agencies; government health and other regulatory authorities; educational, scientific, and healthcare institutes; operators; individual professionals; and others with an interest in radiological protection.

The International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources is based heavily on ICRP recommendations, as are the similar European Basic Safety Standards. The International Labour Organisation Convention 115, Radiation Protection Convention, General Observation 1992, refers specifically to the recommendations of ICRP.



The ICRP System of Radiological Protection forms the basis of radiological protection standards, regulations, programmes and practice world-wide.

Main Commission

The Main Commission consists of the Chair and up to twelve other members. The Main Commission is the governing body, setting the policy and programme of work, and approving all official publications.

Back Row (L-R): *Senlin Liu (China), Christopher Clement (Scientific Secretary*, Canada), John Harrison (C2 Chair, United Kingdom), Carl-Magnus Larsson (Australia), Sergey Romanov (Russia), Simon Bouffler (United Kingdom).*
Front Row (L-R)*: Dominique Laurier (France), Michiaki Kai (Japan), Werner Rühm (C1 Chair, Germany), Jacques Lochard (Vice-Chair, France), Claire Cousins (Chair, United Kingdom), Kunwoo Cho (South Korea), Kimberly Applegate (C3 Chair, USA), Donald Cool (C4 Chair, USA).*

Formally, the 'Main Commission' is ICRP, providing overall direction and oversight to the larger organisation. The members are also the trustees of ICRP as a registered charity.

The Main Commission sets the programme of work, and approves all publications. On January 1, 2017, ICRP began operating as a Charitable Incorporated Organisation, a modern and robust legal structure, while remaining a Charity registered with the Charity Commission of England and Wales.

In the Commission's first meeting in 2017, held in Lima, Peru, members were elected to the Main Commission and the 4 Committees. The Commission welcomed six new members and thanked departing members John Boice, Jaiki Lee, Hua Liu, Hans-Georg Menzel, Ohtsura Niwa, and Eliseo Vano for their many years of dedication to ICRP and the field of radiological protection.

The change in membership took effect on July 1, 2017, the start of the new four-year term.

At ICRP-ERPW 2017, the Commission, via Chair Claire Cousins, announced its intention to Free the Annals. Throughout the year, the Commission approved four reports for publication, including Ethical Foundations of the System of Radiological Protection, and Diagnostic Reference Levels in Medical Imaging.

The Main Commission will meet twice in 2018, in April, in Quebec City, Canada, followed by Stockholm, Sweden in October.

Information about ICRP and ICRU's 90th Anniversary, hosted by the Swedish Radiation Safety Authority (SSM) can be found by visiting https://www.stralsakerhetsmyndigheten.se/en/about-the-authority/international-work/icrp-icru-90/.

*Not formally Main Commission member. However, the Scientific Secretary is integral to the work of the Main Commission, often serving as the representative of ICRP.

Scientific Secretariat

The Scientific Secretariat manages the daily business of ICRP, and the Scientific Secretary often represents ICRP at international meetings.

Christopher Clement, Scientific Secretary

Haruyuki Ogino, Assistant Scientific Secretary

Lynn Lemaire, Executive Administrator

Kelsey Cloutier, Development and Communications Manager

Toshihiro Higuchi, Historian

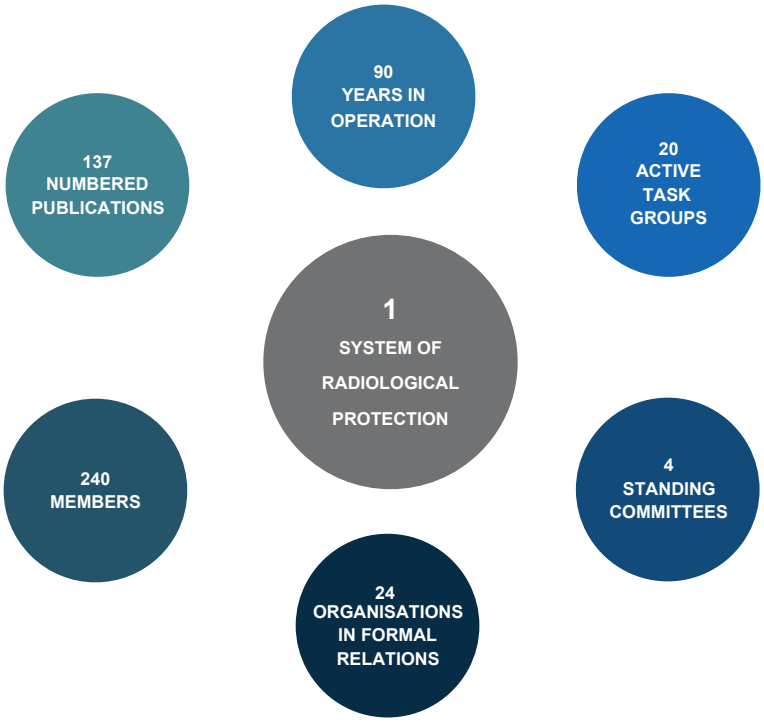
Interns

Devon Foote
Julie Reyjal
Laila Omar-Nazir

Under the leadership of the Scientific Secretary, the Scientific Secretariat is responsible for conducting the day-to-day business of ICRP. It is located in Ottawa, Canada, in an office provided as an in-kind contribution from the Canadian Nuclear Safety Commission (CNSC).

The Scientific Secretary, Executive Administrator, and Development and Communications Manager are full-time paid positions. The Assistant Scientific Secretary is staffed through a cost-free, multi-year placement, currently from the Central Research Institute of Electric Power Industry of Japan. Historian is a voluntary, part-time position. Most interns join on a four-month rotating basis through the CNSC co-op student programme.

ICRP in Numbers



Committee 1
(Radiation Effects)

C1 assesses scientific knowledge on radiation risk, examining possible implications on the System of Radiological Protection.

Back Row *(L-R): Kotaro Ozasa (Japan), Kazuo Sakai (Japan), Andrzej Wojcik (Vice Chair, Sweden), Michael Hauptmann (Netherlands), Richard Wakeford (United Kingdom)*
Front Row *(L-R): Tamara Azizova (Russia), Gayle Woloschak (United States), Werner Rühm (Chair, Germany), Jacqueline Garnier-Laplace (Secretary, France), Sisko Salomaa (Finland), Dan Stram (United States), Quanfu Sun (China), Mikhail Sokolnikov (Russia) Inset (L-R): Wolfgang Dörr (Austria), Preetha Rajaraman (India), and Ranajit Chakraborty (United States).*

Committee 1 (C1) addresses issues pertinent to tissue reactions, risks of cancer and heritable diseases, radiation dose responses, and effects of dose rate and radiation quality. C1 also reviews radiation-induced effects in the embryo/fetus and genetic factors, and uncertainties involved in judgements on radiation-induced health effects.

The annual C1 meeting, like all other Committees', took place in Paris, France, in conjunction with ICRP-ERPW 2017. With a composition renewed at about 30%, this was the first meeting of the 2017-2021 term. C1 now also includes expertise to move towards an integrated system for radiological protection including effects on non-human species.

The Working Party on individual radio sensitivity will produce a review of relevant publications released since the Health Protection Agency-Advisory Group on Ionising Radiation (HPA-AGIR) report (2013) on Human Radiosensitivity. The Working Party on Circulatory disease will prepare a review for the next C1 meeting in 2018.

Task Group (TG) 64 on Cancer Risk for Alpha Emitters will finalise a draft in the 4th quarter of 2018 to be reviewed at the next C1 meeting. TG 91 on Radiation Risk Inference at Low Dose and Low Dose Rate Exposure for Radiological Protection Purposes updated its action plan. A number of articles were published by members of this TG in scientific journals around the world.

TG 99 on Reference Animals and Plants (RAPs) Monographs continued to establish a link between RAPs and Representative Organisms for risk assessment. A complete draft version of this report is expected in 2019. TG 102 on Detriment Calculation Methodology is to establish a solid basis for future ICRP Recommendations, with a draft report expected in late 2018.

At ICRP-ERPW 2017, C1 held joint meetings with C4, C2, and C3 and discussed low-dose/low-dose rate effects, effective dose, and the importance of individual sensitivity and suscepability, respectively.

Committee 2

(Doses from Radiation Exposures)

C2 develops reference models and data, including dose coefficients for the assessment of exposure to radiation.

***Back Row(L-R)**: Chan Hyeong Kim (South Korea), Frank Wissman (Germany), Derek Jokisch (United States), Alexander Ulanowski (Austria), Augusto Giussani (Germany), Wesley Bolch (Secretary, United States), Tatsuhiko Sato (Japan)*
***Front Row(L-R)**: Francois Paquet (Vice Chair, France), Maria Antonia Lopez (Spain), Eric Blanchardon (France), Nina Petoussi-Henss (Germany), John Harrison (Chair, United Kingdom), Volodymyr Berkovskyy (Ukraine), Rich Leggett (United States), Tracy Smith (United Kingdom), Junli Li (China)*

The first meeting of the new term (2017-2021) was held jointly with those of other committees and ICRP-ERPW 2017.

Discussions at the Committee 2 (C2) meeting focused on Task Group (TG) progress. TG 79 completed its report on the Use of Effective Dose as a Risk-Related Dosimetric Quantity; public consultation was approved by the Main Commission to take place during 2018. TG 96 on Computational Phantoms and Radiation Transport completed *Publication 133*, providing internal radiation transport data for the adult reference phantoms. Work on pediatric reference phantoms was advanced. TG103 reported good progress on converting adult phantoms to high-quality mesh format for future calculations. TG 90 on Age Dependant Dose Conversion for External Exposures to Environmental Sources was finalising calculations and expected to complete work in 2018. TG 95 on Internal Dose Coefficients completed Parts 2 and 3 of a series of report on occupational intakes of radionuclides, issued as *Publications 134* and *137*, respectively. Part 4 will be completed during 2018.

Former Committee 5 completed work on an update and extension of dose coefficients for non-human biota, issued as *Publication 136*. Future work on this topic will be the responsibility of C2. The development of dose coefficients for administered radiopharmaceuticals is a joint responsibility of C2 and C3: TG 36 will update coefficients using Publication 103 methodology in parallel work to that of TG95.

Other issues discussed included a joint report with ICRU to update operational quantities used in measurement of external radiation exposures, and dosimetry in emergencies.

The next meeting of C2 is planned for September 2018, in Beijing.

Committee 3

(Protection in Medicine)

C3 develops recommendations and guidance on the protection of patients, staff, and the public against radiation exposure in medicine.

***Back Row (L-R)**: Lodewijk van Bladel (Belgium), Michel Bourguignon (France), Reinhard Loose (Germany), David Sutton (United Kingdom), Makato Hosono (Japan)*
***Front Row (L-R)**: Keon Kang (South Korea), Colin Martin (Vice Chair, United Kingdom), Kimberly Applegate (Chair, United States), Madan Rehani (Secretary, United States), Marie-Claire Cantone (Italy), Jamila Alsuwaidi (UAE), Yantao Niu (China), Josep Marti-Climent (Spain)*
Inset: Sandor Demeter (Canada), William Small (United States).

Committee 3 (C3) is concerned with protection in medicine, develops recommendations and guidance on the protection of patients, staff, and the public against radiation exposure in medicine, and from July 2017, explicitly includes protection in veterinary applications. The annual Committee 3 meeting took place at ICRP-ERPW 2017, in October 2017.

The report on Diagnostic Reference Levels for Diagnostic and Interventional Imaging was released as *Publication 135* in late 2017. *Publication 139*, on Occupational Radiological Protection in Interventional Procedures, is set to be released in Q1 of 2018. The Task Group (TG) 101 report on Radiological Protection in Therapy with Radiopharmaceuticals has been submitted to the Main Commission, and will undergo critical view before being available for public consultation. TG36 on Doses to Patients from Radiopharmaceuticals, a joint TG with C2, was changed to Radiation Doses to Patients from Diagnostic Nuclear Medicine and the TG is revising *Publication 128* with a target date of 2020.

For future TGs, C3 will pursue optimisation in medical imaging, joint C3-C4 TG on Radiological Protection in Veterinary Radiology, and another joint C3-C4 TG on ethical aspects in medical exposure.

Longer term, C3 identified the following topics for potential Task Group and Working Party mandates: multiple exposures of individual patients; radiological protection aspects in daily imaging during Image Guided Radiotherapy (IGRT); use of ionising radiation in sports performance assessment; economic factors in evaluation of radiation protection practices; radiological conversion factors; and radiological protection of pre-mature babies and neonates.

Committee 3 will next meet in November, 2018 in Beijing, China.

Committee 4

(Application of the Commission's Recommendations)

C4 develops principles and recommendations on radiological protection of people and the environment in all exposure situations. Within ICRP committee's, it has the widest range of scope.

***Back Row (L-R)**: Senlin Liu (China, Main Commission), Sergey Shinkarev (Russia), Nobuhiko Ban (Japan), Mike Boyd (United States), Francois Bochud (Switzerland), David Copplestone (United Kingdom), John Takala (Canada), Jean-Francois Lecomte (Secretary, France), Thierry Schneider (France), Diego Talleia (IAEA)*
***Front Row (L-R)**: Haruyuki Ogino (Asst. Scientific Secretary, Canada), Michiaki Kai (Japan, Main Commission), Catrin Koch (Sweden), Yahong Mao (China), Nicole Martinez (United States), Anne Nisbet (United Kingdom), Donald Cool (Chair, United States), Kathryn Highley (Vice Chair, United States), Analia Canoba (Argentina), Gillian Hirth (Australia), Eduardo Gallego (Spain), Toshimitsu Homma (Japan)*

The Committee 4 (C4) programme of work includes application of the Commission's recommendations in several broad areas, including: various aspects of existing exposure situations; leading the ICRP effort in Fukushima and emergency situations; elaborating on the foundations of the System of Radiological Protection, protection of the environment; developing topical application reports in consultation with organisations with formal relations with ICRP; and, applications of work conducted by other committees in the areas of health effects, dosimetry, and medicine.

During the first meeting of the new term, C4 covered a wide range of issues, including new activities related to its revised mandate.

The report of Task Group (TG) 94 on Ethics of Radiological Protection will be released as *Publication 138* in early 2018, examining the foundations of the system of protection, and describes how the core ethical values of doing good, avoiding harm, acting justly, respecting dignity, and being prudent in decisions can be seen in the Commission's recommendations, and applied in decision-making. Topical application activities include TG 97 on Surface and Near Surface Waste Disposal, and TG 106 on Radiological Protection for Mobile High Activity Sources. Work is ongoing in TG 72 on Biota Radiation Weighting Factors, TG 74 on Dose Coefficients for Non-Human Biota, TG 76 on Naturally Occurring Radioactive Materials, TG 98 on Contaminated Sites, TG 99 on Reference Animal and Plant Monographs, and TG 105 on Considering the Environment when Applying the System of Radiological Protection.

Looking ahead, C4 has recommended to the Main Commission several new Task Groups related to the protection of the environment, radiological accidents, reasonableness and tolerability, and jointly with C3, ethics in medicine.

C4 plans to meet in the United Arab Emirates in November, 2018.

Free the Annals

On October 10, 2017, at the opening ceremonies of ICRP-ERPW 2017, ICRP Chair Claire Cousins (pictured above) announced the intention of the organisation to Free the Annals of the ICRP to celebrate our 90th anniversary in 2018. The objective is to **permanently** change the way all organisations, professionals, and other interested people everywhere access vital information on the system of radiological protection that underpins standards, legislation, and practice world-wide. Raising €500,000 in 2018 will mean all ICRP publications, except the most recent two full years, will be available for **FREE**.

Governments, educational institutions, hospitals, businesses, and professionals will be able to find relevant information immediately. Members of the public will be able to find the answers they seek without cost.
This is a significant undertaking that is well on its way, and more help is needed!

Can you or your organisation help make this transformational initiative come to fruition?
More information can be found on www.icrp.org, including how to contribute. Interested organisations are encouraged to contact Kelsey Cloutier (kelsey.cloutier@icrp.org), Development and Communications Manager.

Special thanks to those organisations who are leading the way:

FANR
الهيئة الاتحادية للرقابة النووية
Federal Authority for Nuclear Regulation

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

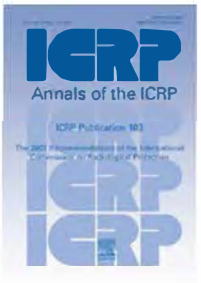
IRPA

Click here to see all supporting organisations!

FREE THE ANNALS

90th Anniversary Drive of the International Commission on Radiological Protection
Part of the ICRP Advancing Together Initiative

International organisations, national authorities, standard-setting bodies, and professionals rely on the recommendations of the International Commission on Radiological Protection (ICRP) to protect patients, workers, the public, and the environment against harm from ionising radiation. These recommendations are published in ICRP's dedicated journal, ***Annals of the ICRP***.



Let's celebrate ICRP's 90th anniversary by making access to the Annals free. To realise this goal, we aim to **raise € 500 000 by the end of 2018**. Thanks to the UAE Federal Authority for Nuclear Regulation and the US Department of Energy, the initiative launched with **20% of the needed support already achieved**. With this**,** all publications from 1928 to 1988, and a few others including the most recent fundamental recommendations *Publication 103*, are already **free to access at www.icrp.org.**

More contributions are needed from a diverse range of supporters to Free the Annals, especially from organisations that rely on the recommendations of ICRP. Success will:

- Make all ICRP publications, except for the most recent rolling two years, free to access
- Address challenges with access in developing regions, ensuring protection of patients, workers, the public, and the environment world-wide
- Simplify distribution to professionals, policy-makers, and the public everywhere
- Promote collaboration across the radiological protection community
- Recognise the organisations contributing to this transformational initiative

Contact Kelsey Cloutier for more information
Kelsey.Cloutier@icrp.org, +1 613 943 4086

"We are delighted to lead the way with a meaningful contribution towards making the Annals of the ICRP available for free, and in particular we are proud that Publication 103 is now available to everybody thanks to our contribution. Easy access will be a boon to governments, scientists, professionals, and interested citizens world-wide. Let's take on this important initiative together."

Christer Viktorsson, Director General, UAE Federal Authority for Nuclear Regulation (FANR)

"We are pleased to join other agencies and countries in ICRP's efforts with our contribution towards making the Annals of the ICRP available for free; and, in particular, we are thrilled that Publication 103 will be available to everyone. Access will be a benefit to radiation protection professionals, scientists, and interested countries world-wide. Let us undertake this critical initiative together."

Dr. Patricia R. Worthington, Director, Office of Health and Safety, US Department of Energy

Established in 1928, ICRP is an international, independent, registered charity (UK Charity #1166304), relying on voluntary contributions to support our work. Our ~250 expert members from more than 30 countries and all disciplines relevant to radiological protection volunteer their time to ICRP. Together we develop the System of Radiological Protection, which forms the basis of standards, legislation, guidance, programmes, and practice worldwide.

ICRP-ERPW 2017

The 4th International Symposium on the System of Radiological Protection, in conjunction with the 2nd European Radiological Protection Research Week took place in Paris, France from October 10-12, 2017. Hosted by the Institut de Radioprotection et de Sûreté Nucléaire (IRSN) and the five European platforms MELODI (low dose effects), ALLIANCE (radioecology), EURADOS (dosimetry), NERIS (emergency preparedness) and EURAMED (medical applications), we welcomed over 500 participants to partake in three days of sessions given by radiological protection experts from around the world.

With a wide range of topics touching on ethics, post-accident recovery, and RP in medicine among others, the event once again showed the importance of ICRP's work on the international stage. Please visit www.icrp-erpw2017.com to view a full list of supporters, presenters, and the programme. You can find videos of all presentations given at ICRP 2017 on our YouTube page.

Relations with other Organisations

IEC Electrical Equipment in Medical Practice (IEC/TC62)

IEC Nuclear Instrumentation (IEC/TC45)

Independence and Collaboration

An important strength of ICRP is its ability to provide independent recommendations and guidance. In particular, this independence relates to determining the programme of work and selecting members. However, independence does not mean isolation; engaging with other organisations stregthens ICRP's aim to advance radiological protection for the public benefit.

ICRP interacts with many organisations with an interest in radiological protection, and (as of December 31st, 2017) maintains formal relations with twenty-four organisations, shown above.

Thanks to our Supporters

ICRP relies on the voluntary financial contributions of institutions from around the world. While these contributions do not influence our membership or the programme of work, they are essential to the continuation of ICRP. It is with sincere gratitude that we thank our supporters for their dedication to ICRP and the System of Radiological Protection globally.

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

THE NIPPON FOUNDATION

FANR
الهيئة الاتحادية للرقابة النووية
Federal Authority for Nuclear Regulation

IAEA
International Atomic Energy Agency

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

United States Environmental Protection Agency

Innovative Solutions for Energy and Environment
JANUS
JAPAN NUS CO., LTD.

Canadian Nuclear Safety Commission / Commission canadienne de sûreté nucléaire

CNSC CCSN

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Swiss Confederation

Federal Department of Home Affairs FDHA
Federal Office of Public Health FOPH

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Swiss Confederation

Eidgenössisches Nuklearsicherheitsinspektorat ENSI
Inspection fédérale de la sécurité nucléaire IFSN
Ispettorato federale della sicurezza nucleare IFSN
Swiss Federal Nuclear Safety Inspectorate ENSI

Health Canada / Santé Canada

ANDRA
Agence nationale pour la gestion des déchets radioactifs

Chinese Society of Radiation Protection

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

IRSN
INSTITUT DE RADIOPROTECTION ET DE SÛRETÉ NUCLÉAIRE

Strål säkerhets myndigheten
Swedish Radiation Safety Authority

Statens strålevern
Norwegian Radiation Protection Authority

CSN
CONSEJO DE SEGURIDAD NUCLEAR

NEI
NUCLEAR ENERGY INSTITUTE

Southern Urals Biophysical Institute, Russia

NEA
Nuclear Energy Agency

ISR
The International Society of Radiology

IRPA

GEISLAVARNIR RÍKISINS
ICELANDIC RADIATION SAFETY AUTHORITY

STUK
National Institute of Radiation Protection, Denmark

JRIA
Japan Radioisotope Association

Task Groups

Active as of December 31st, 2017

C2/3 TG36:	Radiation Dose to Patients in Diagnostic Nuclear Medicine, chaired by Augusto Giussani
C1 TG64:	Cancer Risk from Alpha Emitters, chaired by Margot Tirmarche
C5 TG72:	RBE and Reference Animals and Plants, chaired by Kathryn Higley
C4 TG76:	Application of the Commission's Recommendations to NORM (Naturally Occurring Radioactive Material), chaired by Jean-François Lecomte
C2 TG79:	The Use of Effective Dose as a Risk Related Radiological Protection Quantity, chaired by John Harrison
C3 TG89:	Occupational Radiological Protection in Brachytherapy, chaired by Lawrence Dauer
C2 TG90:	Age-dependent Dose Conversion Coefficients for External Exposures to Environmental Sources, chaired by Nina Petoussi-Henβ
C1 TG91:	Radiation Risk Inference at Low-dose and Low-dose Rate Exposure for Radiological Protection Purposes, chaired by Werner Rühm
C4 TG93:	Update of ICRP Publication 109 and 111, chaired by Michiaki Kai
C2 TG95:	Internal Dose Coefficients, chaired by Francois Paquet
C2 TG96:	Computational Phantoms and Radiation Transport, chaired by Wesley Bolch
C4 TG97:	Application of the Commission's Recommendations for Surface and Near Surface Disposal of Solid Radioactive Waste, chaired by Thiagan Pather
C4 TG98:	Application of the Commission's Recommendations to Exposures Resulting from Contaminated Sites from Past Industrial, Military and Nuclear Activities, chaired by Michael Boyd
C5 TG99:	Reference Animals and Plants (RAPs) Monographs, chaired by Jacqueline Garnier-Laplace
C3 TG101:	Radiological Protection in Therapy with Radiopharmaceuticals, chaired by Yoshiharu Yonekura
C1 TG102:	Detriment Calculation Methodology, chaired by Nobuhiko Ban
C2 TG103:	Mesh-type Reference Computational Phantoms, chaired by Chan Hyeong Kim
MC TG104:	Integration of Protection of People and of the Environment in the System of Radiological Protection, chaired by Carl-Magnus Larsson
C4/5 TG 105:	Considering the Environment when Applying the System of Radiological Protection, chaired by David Copplestone
C4 TG 106:	Application of the Commission's Recommendations to Activities involving Mobile High Activity Sources, chaired by Donald Cool

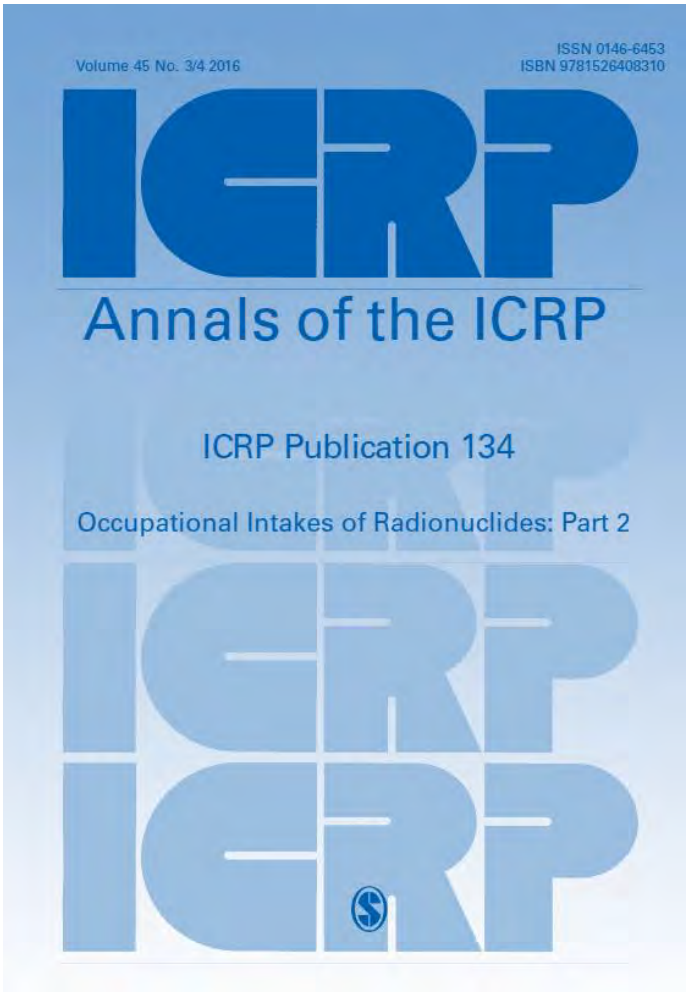
Publications in 2017

Occupational Intakes of Radionuclides: Part 2

ICRP *Publication 134*

Authors on behalf of ICRP: F. Paquet, M.R. Bailey, R.W. Leggett, J. Lipsztein, T.P. Fell,T. Smith, D. Nosske, K.F. Eckerman, V. Berkovski, E. Ansoborlo,A. Giussani, W.E. Bolch, J.D. Harrison

Abstract - The 2007 Recommendations of the International Commission on Radiological Protection (ICRP, 2007) introduced changes that affect the calculation of effective dose, and implied a revision of the dose coefficients for internal exposure, published previously in the *Publication 30* series (ICRP, 1979, 1980, 1981, 1988b) and *Publication 68* (ICRP, 1994b). In addition, new data are available that support an update of the radionuclide-specific information given in *Publications 54* and *78* (ICRP, 1988a, 1997b) for the design of monitoring programmes and retrospective assessment of occupational internal doses. Provision of new biokinetic models, dose coefficients, monitoring methods, and bioassay data was performed by Committee 2, Task Group 21 on Internal Dosimetry, and Task Group 4 on Dose Calculations. A new series, the Occupational Intakes of Radionuclides (OIR) series, will replace the *Publication 30* series and *Publications 54* , *68*, and *78*. Part 1 of the OIR series has been issued (ICRP, 2015), and describes the assessment of internal occupational exposure to radionuclides, biokinetic and dosimetric models, methods of individual and workplace monitoring, and general aspects of retrospective dose assessment. The following publications in the OIR series (Parts 2–5) will provide data on individual elements and their radioisotopes, including information on chemical forms encountered in the workplace; a list of principal radioisotopes and their physical half-lives and decay modes; the parameter values of the reference biokinetic model; and data on monitoring techniques for the radioisotopes encountered most commonly in workplaces. Reviews of data on inhalation, ingestion, and systemic biokinetics are also provided for most of the elements. Dosimetric data provided in the printed publications of the OIR series include tables of committed effective dose perintake (Sv per Bq intake) for inhalation and ingestion, tables of committed effective dose per content (Sv per Bq measurement) for inhalation, and graphs of retentionand excretion data per Bq intake for inhalation.

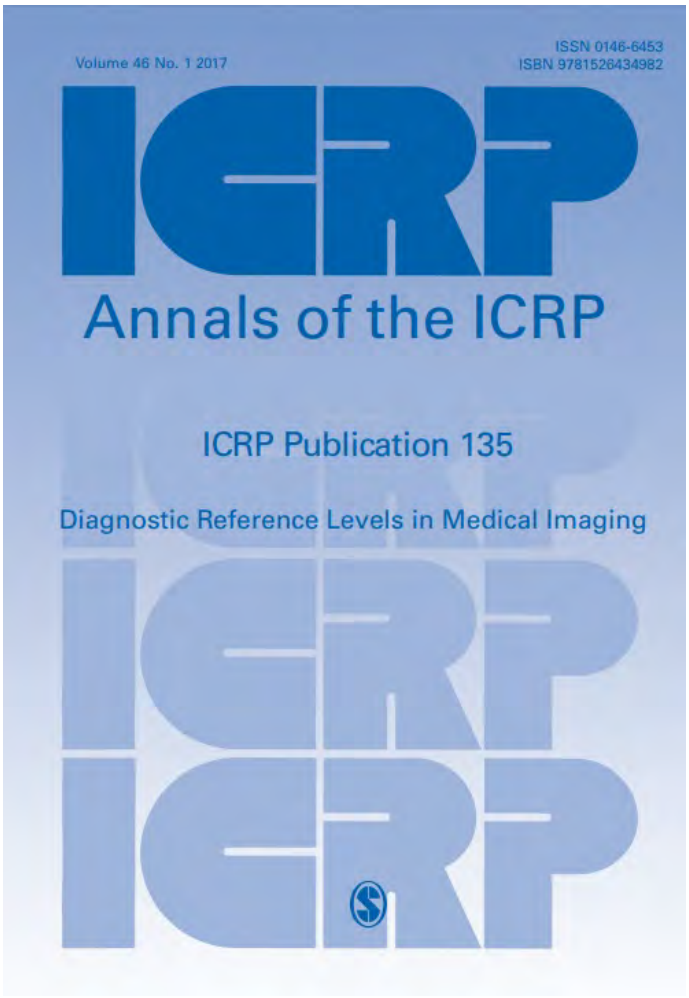


These data are provided for all absorption types and for the most common isotope(s) of each element. The electronic annex that accompanies the OIR series of reports contains a comprehensive set of committed effective and equivalent dose coefficients, committed effective dose percontent functions, and reference bioassay functions. Data are provided for inhalation, ingestion, and direct input to blood. The present publication provides the above data for the following elements: hydrogen (H), carbon (C), phosphorus (P),sulphur (S), calcium (Ca), iron (Fe), cobalt (Co), zinc (Zn), strontium (Sr), yttrium(Y), zirconium (Zr), niobium (Nb), molybdenum (Mo), and technetium (Tc).

Recommended reference format for citations
ICRP, 2016. Occupational Intakes of Radionuclides: Part 2. ICRP Publication 134. Ann. ICRP 45(3/4), 1–352.

Diagnostic Reference Levels in Medical Imaging

ICRP *Publication 135*



Authors on behalf of ICRP: E. Vaño, D.L. Miller, C.J. Martin, M.M. Rehani, K. Kang, M. Rosenstein, P. Ortiz-Lopez, S. Mattsson, R. Padovani, A. Rogers

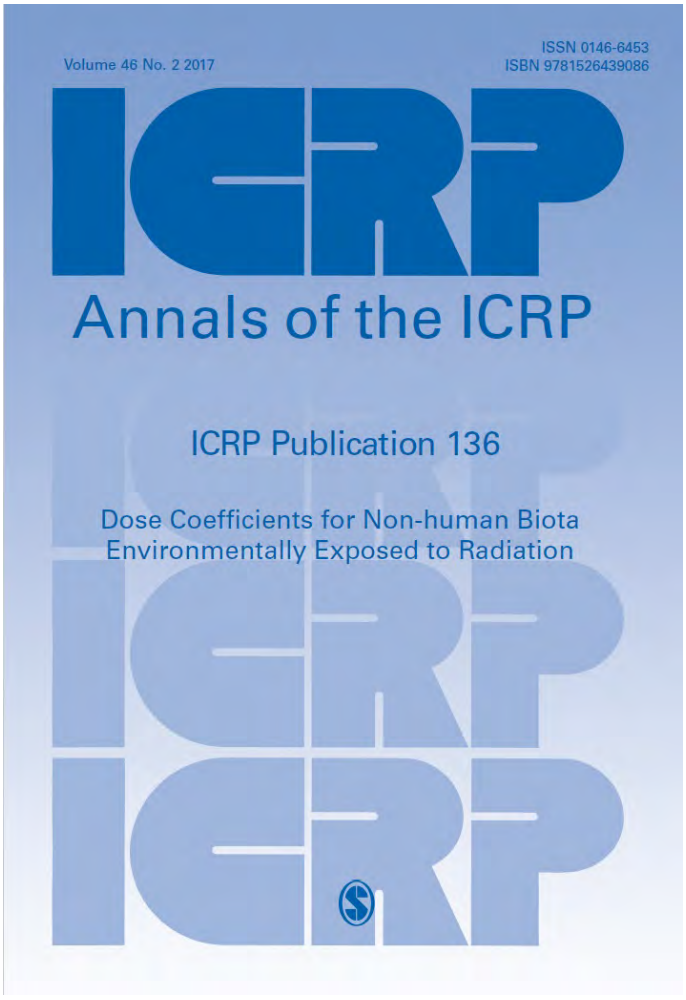
Abstract - The International Commission on Radiological Protection (ICRP) first introduced the term 'diagnostic reference level' (DRL) in 1996 in *Publication 73*. The concept was subsequently developed further, and practical guidance was provided in 2001. The DRL has been proven to be an effective tool that aids in optimisation of protection in the medical exposure of patients for diagnostic and interventional procedures. However, with time, it has become evident that additional advice is needed. There are issues related to definitions of the terms used in previous guidance, determination of the values for DRLs, the appropriate interval for reevaluating and updating these values, appropriate use of DRLs in clinical practice, methods for practical application of DRLs, and application of the DRL concept to newer imaging technologies. This publication is intended as a further source of information and guidance on these issues. Some terminology has been clarified. In addition, this publication recommends quantities for use as DRLs for various imaging modalities, and provides information on the use of DRLs for interventional procedures and in paediatric imaging. It suggests modifications in the conduct of DRL surveys that take advantage of automated reporting of radiation-dose-related uantities, and highlights the importance of including information on DRLs in training programmes for healthcare workers. The target audience for this publication is national, regional, and local authorities; professional societies; and facilities that use ionising radiation for medical purposes, and responsible staff within these facilities. A full set of the Commission's recommendations is provided.

Recommended reference format for citations
ICRP, 2017. Diagnostic reference levels in medical imaging. ICRP Publication 135. Ann. ICRP 46(1).

ICRPÆDIA
THE SYSTEM OF RADIOLOGICAL PROTECTION

Dose Coefficients for Non-human Biota Environmentally Exposed to Radiation

ICRP *Publication 136*



Authors on behalf of ICRP: A. Ulanovsky, D. Copplestone, J. Vives i Batlle

Abstract -

The diversity of non-human biota is a specific challenge when developing and applying dosimetric models for assessing exposures of flora and fauna from radioactive sources in the environment. Dosimetric models, adopted in *Publication 108*, provide dose coefficients (DCs) for a group of reference entities [Reference Animals and Plants (RAPs)]. The DCs can be used to evaluate doses and dose rates, and to compare the latter with derived consideration reference levels (DCRLs), which are bands of dose rate where some sort of detrimental effect in a particular RAP may be expected to occur following chronic, long-term radiation exposure, as outlined in *Publication 124*. These dosimetric models pragmatically assume simple body shapes with uniform composition and density, homogeneous internal contamination, limited sets of idealised sources of external exposure to ionising radiation for aquatic and terrestrial animals and plants, and truncated radioactive decay chains. This pragmatic methodology is further developed and systematically extended in this publication, which supersedes the DC values of Publication 108. Significant methodological changes since *Publication 108* include: implementation of a new approach for external exposure of terrestrial animals with an extended set of environmental radioactive sources in soil and in air; considering an extended range of organisms and locations in contaminated terrain; transition to the contemporary radionuclide database of *Publication 107*; assessment-specific consideration of the contribution of radioactive progeny to DCs of parent radionuclides; and use of generalised allometric relationships in the estimation of biokinetic or metabolic parameter values.

These methodological developments result in changes to previously published tables of DCs for RAPs, and revised values are provided in this publication. This publication is complemented by a new software tool, called 'BiotaDC', which enables the calculation of DCs for internal and external exposures of organisms with user-defined masses, shapes, and locations in the environment and for all radionuclides in *Publication 107*.

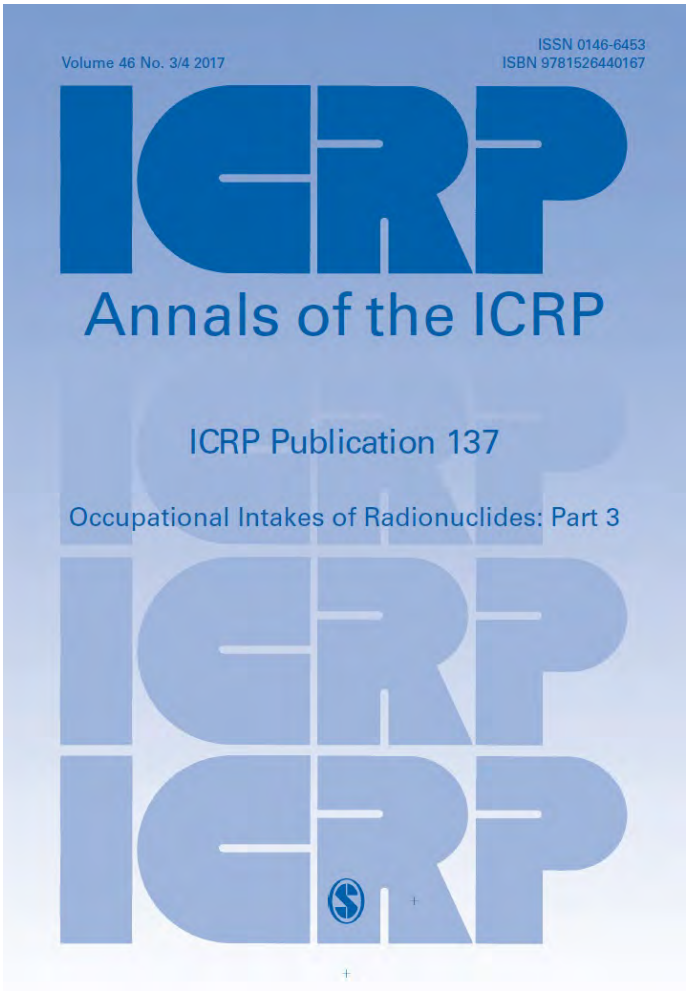
Recommended reference format for citations
ICRP, 2017. Dose coefficients for nonhuman biota environmentally exposed to radiation. ICRP Publication 136. Ann. ICRP 46(2).

Occupational Intakes of Radionuclides: Part 3

ICRP *Publication 137*

Authors on behalf of ICRP: F. Paquet, M.R. Bailey, R.W. Leggett, J. Lipsztein, J. Marsh, T.P. Fell, T. Smith, D. Nosske, K.F. Eckerman, V. Berkovski, E. Blanchardon, D. Gregoratto, J.D. Harrison

Abstract - The 2007 Recommendations of the International Commission on Radiological Protection (ICRP, 2007) introduced changes that affect the calculation of effective dose, and implied a revision of the dose coefficients for internal exposure, published previously in the *Publication 30* series (ICRP, 1979, 1980, 1981, 1988) and *Publication 68* (ICRP, 1994). In addition, new data are now available that support an update of the radionuclide-specific information given in *Publications 54* and *78* (ICRP, 1988a, 1997b) for the design of monitoring programmes and retrospective assessment of occupational internal doses. Provision of new biokinetic models, dose coefficients, monitoring methods, and bioassay data was performed by Committee 2, Task Group 21 on Internal Dosimetry, and Task Group 4 on Dose Calculations. A new series, the Occupational Intakes of Radionuclides (OIR) series, will replace the *Publication 30* series and *Publications 54*, *68*, and *78*. OIR Part 1 has been issued (ICRP, 2015), and describes the assessment of internal occupational exposure to radionuclides, biokinetic and dosimetric models, methods of individual and workplace monitoring, and general aspects of retrospective dose assessment. OIR Part 2 (ICRP, 2016), this current publication and upcoming publications in the OIR series (Parts 4 and 5) provide data on individual elements and their radioisotopes, including information on chemical forms encountered in the workplace; a list of principal radioisotopes and their physical half-lives and decay modes; the parameter values of the reference biokinetic model; and data on monitoring techniques for the radioisotopes encountered most commonly in workplaces. Reviews of data on inhalation, ingestion, and systemic biokinetics are also provided for most of the elements. Dosimetric data provided in the printed publications of the OIR series include tables of committed effective dose per intake (Sv Bq^{-1} intake) for inhalation and ingestion, tables of committed effective dose per content (Sv Bq^{-1} measurement) for inhalation, and graphs of retention and excretion data per Bq intake for inhalation.



These data are provided for all absorption types and for the most common isotope(s) of each element. The electronic annex that accompanies the OIR series of publications contains a comprehensive set of committed effective and equivalent dose coefficients, committed effective dose per content functions, and reference bioassay functions. Data are provided for inhalation, ingestion, and direct input to blood. This third publication in the series provides the above data for the following elements: ruthenium (Ru), antimony (Sb), tellurium (Te), iodine (I), caesium (Cs), barium (Ba), iridium (Ir), lead (Pb), bismuth (Bi), polonium (Po), radon (Rn), radium (Ra), thorium (Th), and uranium (U).

Recommended reference format for citations
ICRP, 2017. Occupational Intakes of Radionuclides: Part 3. ICRP Publication 137. Ann. ICRP 46(3/4).

Finances

	2013	2014	2015	2016	2017
INCOMING RESOURCES					
Contributions Received	648 572	712 583	1 074 816	998 002	1 012 503
Royalties*	139 536	170 131	204 176	142 255	184 722
Interest and Other Income	40	11	0	0	0
Total Incoming Resources	788 148	882 725	1 278 992	1 140 257	1 197 225
RESOURCES EXPENDED					
Promotion of Radiological Protection	408 655	322 803	508 519	622 915	929 988
Governance Costs †	512 225	528 105	507 745	387 504	477 652
Other Resources Expended	30 976	49 270	2 549	29 264	16 418
Total Resources Expended	951 856	900 178	1 018 814	1 039 684	1 424 058
NET MOVEMENT IN RESOURCES	(163 708)	(17 453)	260 178	100 573	(226 833)
TOTAL FUNDS CARRIED FORWARD	134 904	117 450	377 629	478 201	251 368

This is a summary of ICRP annual financial statements as audited by Tudor John Chartered Accountants, Epsom, UK. All amounts are expressed in Canadian dollars. Amounts for 2013-2016, originally reported in USD, have been converted to CAD using an exchange rate as of December 31, 2017.

In Memoriam

Charlie Meinhold

1934-2017

Committee 3 Member	(1973-1977)
Committee 3 Chair	(1977-1985)
Committee 2 Chair	(1985-1993)
Main Commission Member	(1977-1993)
ICRP Vice-Chair	(1993-2001)
ICRP MC Member Emeritus	(2001-2017)

ICRP 2019

5TH INTERNATIONAL SYMPOSIUM ON THE SYSTEM OF RADIOLOGICAL PROTECTION

19-21 NOVEMBER 2019 · ADELAIDE, SOUTH AUSTRALIA

MINES · MEDICINE · MARS

Radiation is a natural part of our environment and has been since long before humans walked the Earth. Even so, there are times when we need to take protective measures, such as for exposure to radon in mines, or for ensuring animals and plants are adequately protected. The ICRP 2019 programme looks at a range of issues associated with radiological protection in mining including the latest science on radon risk, waste management practices, and best practice in the protection of the environment.

This is an age of extraordinary advances in medicine, not least due to the novel and increasing use of radiation for diagnosis and treatment benefitting billions of people world-wide. ICRP 2019 examines cutting-edge technologies and techniques in medicine, and the advances in radiological protection needed to accompany them so that we can ensure the best possible quality of care for patients, and a safe workplace for healthcare professionals.

We have learned to fly high, work in orbit, and even travel to the moon. Now Mars is calling. On Earth we are protected from the harsh radiation of space. With advances in high-altitude air travel, space exploration, and the dawn of space tourism, we need to protect those working or travelling high in Earth's atmosphere and beyond. ICRP 2019 brings together world-class experts to address protection of passengers and crew in modern aviation and space travel.

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