



International Commission on Radiological Protection  
2016 Annual Report

ICRP 2016 Annual Report

ICRP Reference Number 4822-4204-6283

Sept 5<sup>th</sup>, 2017

© 2017 ICRP

#### Contact

Christopher Clement, ICRP Scientific Secretary and Editor-in-Chief of the Annals of the ICRP

International Commission on Radiological Protection

PO Box 1046, Station B

280 Slater Street

Ottawa, Ontario

K1P 5S9

CANADA

(tel) +1 (613) 947-9750

(fax) +1 (613) 944-1920

[sci.sec@icrp.org](mailto:sci.sec@icrp.org)

[www.icrp.org](http://www.icrp.org)

UK Charity Number 298173 & 1166304

# Chair's Foreword

The need for continued, focused, and increased global engagement with professionals, policy-makers, and the public was one of three strategic priorities set by ICRP in 2016. We have placed more emphasis on ensuring that our Main Commission, Committee and Task Group meetings include opportunities to engage locally and regionally, often through open workshops or symposia. Meeting with people from all over the world, gives us a better understanding of the day-to-day challenges being faced in radiological protection and how we can contribute most effectively to ensure protection of people and the environment. It also gives us an opportunity to share our work, touching on another of our three strategic priorities: promoting awareness of radiological protection and broadening access to ICRP recommendations.

We have also made strides in engaging with other organisations and are now in formal relations with 23 worldwide organisations with an interest in radiological protection. Our annual roundtable with them has become an important date in our calendar as an opportunity to discuss strategic issues at a global level.

Our efforts to increase engagement can also be seen in the more proactive use of social media following the hiring of Kelsey Cloutier to the position of Development and Communications Manager in December. This is just the beginning; his addition to the ICRP Scientific Secretariat will have a significant impact on our development and communications activities in the years to come.

We know that there is further work to do. Engagement works at its best when communication, dialogue, and discussions are held regularly, and proper follow-ups are completed. We are still seeking the financial resources needed to produce positive, tangible results.

Throughout this report, I invite you to take note

of the work of our Committees and Task Groups, and the locations of our gatherings. At the same time, let me remind you that ICRP exists for the public benefit and be sure that we continually strive to contribute to this goal. Like most things in life, the greater the input of time and effort, the better the outcome.



*Claire Cousins.*

Claire Cousins, ICRP Chair

# The International Commission on Radiological Protection

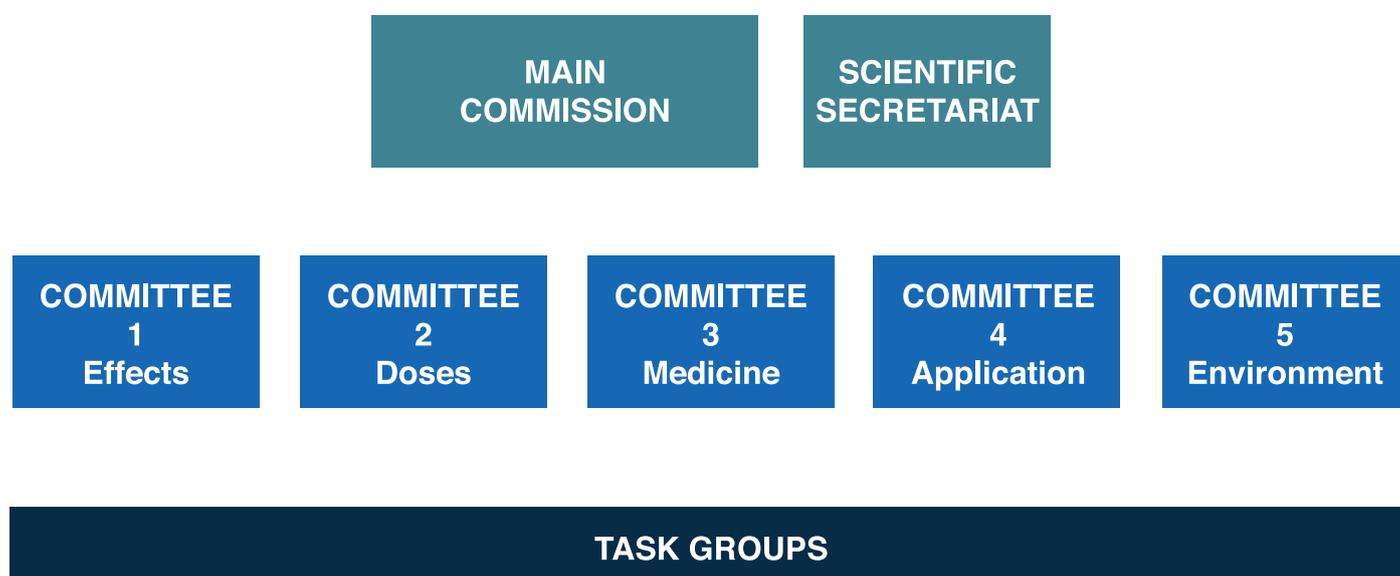
ICRP develops the System of Radiological Protection for the public benefit. The System takes account of the latest scientific knowledge, ethical values, and practical experience. It is the basis of standards, legislation, guidance, programmes, and practice worldwide.

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.

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.

ICRP consists of the Main Commission, the Scientific Secretariat, five standing Committees, and Task Groups established as needed to undertake specific work. Representatives of organisations in formal relations with ICRP are regularly invited to advise the Main Commission, and occasionally invited to participate in meetings of the Committees. Individuals may be invited to be members of Task Groups or to review drafts of work in progress, where their expertise is particularly relevant.



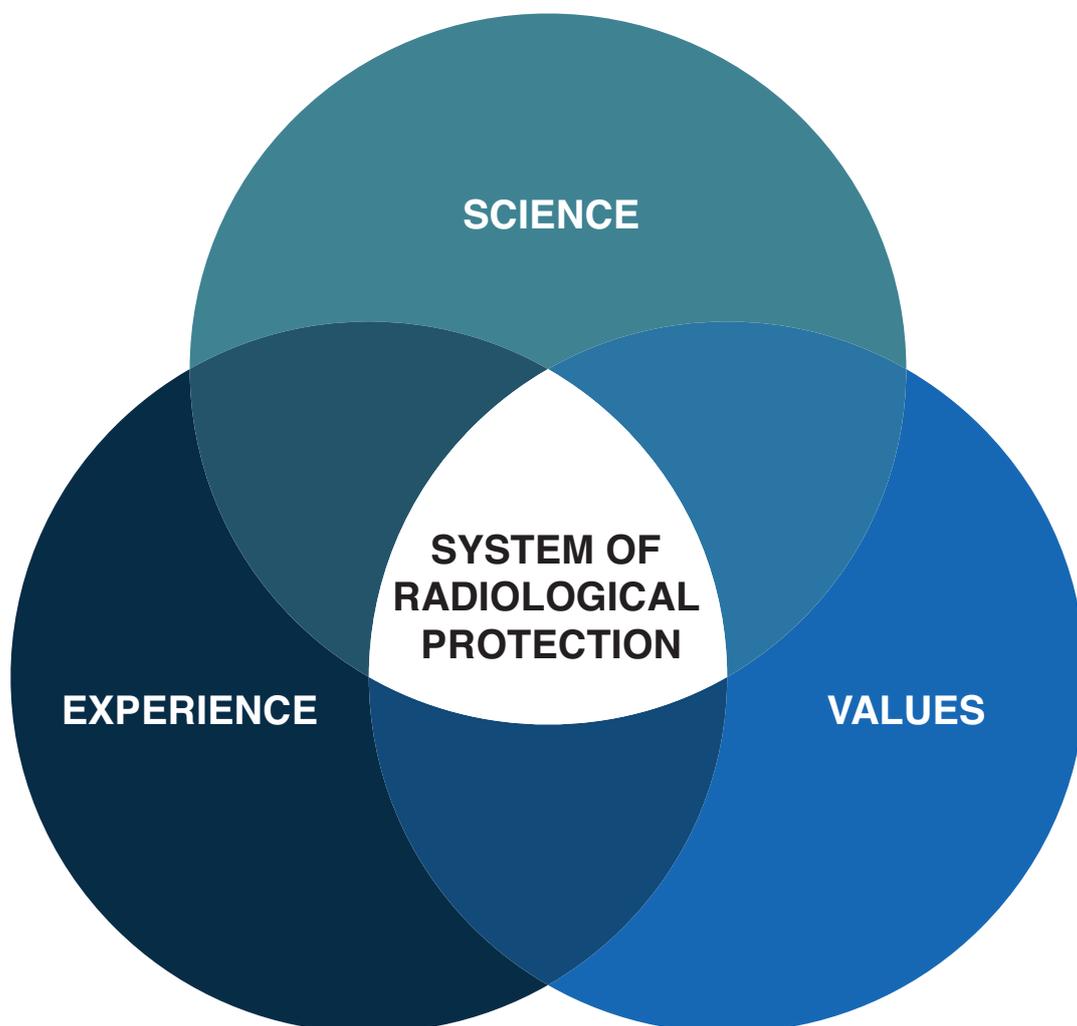
This structure supports a rigorous system of peer review. The work of Task Groups is reviewed by the relevant Committee(s), and then reviewed and approved by the Main Commission. During development, most reports are circulated to a number of organisations and individual experts for critical review, and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



Pictured from left to right. FRONT ROW: John Boice, John Harrison (C2 Chair), Jacques Lochard (Vice-Chair), Claire Cousins (Chair), Carl-Magnus Larsson, Jai-Ki Lee, Werner Rühm (C1 Chair), Eliseo Vano (C3 Chair). BACK ROW: Haruyuki Ogino (Assistant Scientific Secretary\*), Donald Cool (C4 Chair), Christopher Clement (Scientific Secretary\*), Kathryn Higley (C5 Chair\*), Sergey Romanov, Ohtsura Niwa, Hans-Georg Menzel, Hua Liu.

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.

In 2016, the Main Commission reviewed the Committee structure and their mandates, including the discontinuation of C5. Discussions started on how the Commission will address environmental and veterinary components of Radiological Protection moving forward. They

progressed towards a CIO governance framework, with the Commission themselves leading the way. Additionally, under the leadership and guidance of the Main Commission, ICRP has experienced a financial turnaround in recent years as can be seen in the financial statement at the end of this report.

The Main Commission met twice in 2016. In May, in conjunction with IRPA's 14<sup>th</sup> International Congress in Cape Town, South Africa, and again in October in Shenzhen, China.

\*Not formally Main Commission members. However, the C5 Chair and Scientific Secretary are integral to the work of the Main Commission, and the Scientific Secretary often serves as a 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 Assistant



Kelsey Cloutier, Development and Communications Manager



Toshihiro Higuchi, Historian

## Interns

Tiffany Lo, CNSC  
 Alexander Komasa, CNSC  
 Trent Peerla-Proulx, CNSC  
 Nguyen Tat Thanh, University of Hiroshima

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 Assistant, 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. The Historian is voluntary, part-time position. Most interns join on a four-month rotating basis through the CNSC co-op student programme.

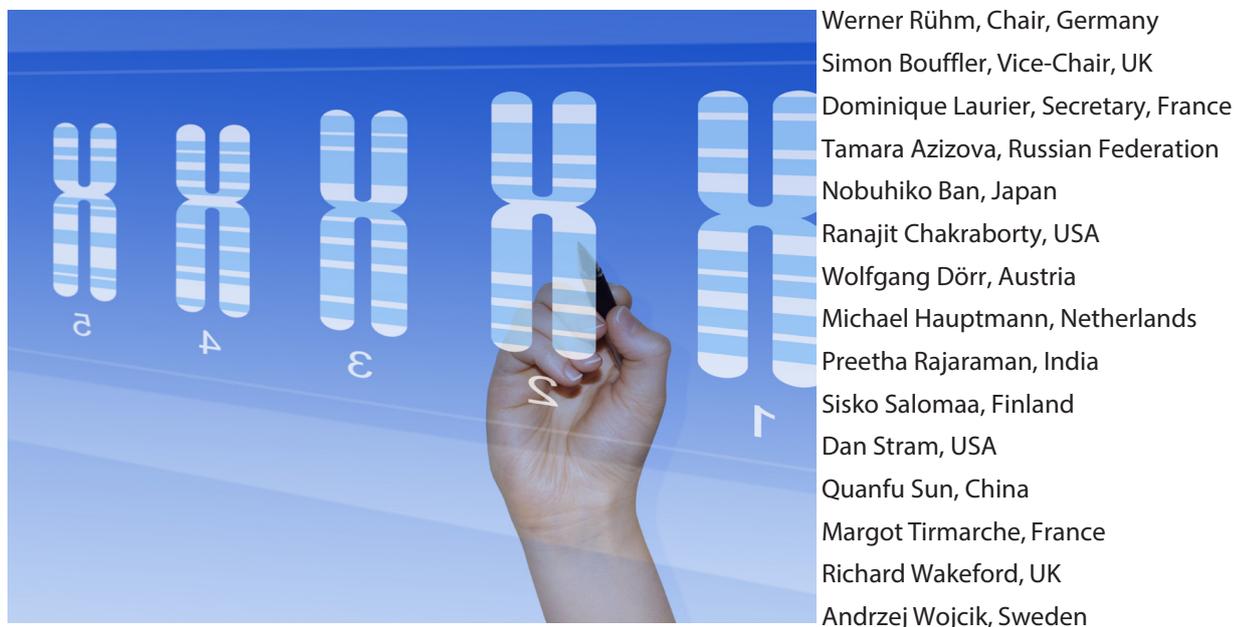
## ICRP in Numbers



# Committee 1

## (Radiation Effects)

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



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 took place from Nov 9<sup>th</sup>-16<sup>th</sup>, 2016, in Chennai, India. The meeting was held in conjunction with the International Conference on Radiation Biology (ICRB) (Nov 9<sup>th</sup>-11<sup>th</sup> at Sri Ramaswamy Memorial University) and included a number of satellite meetings with Indian scientists and organisations. At ICRB, C1 organised a session where C1 activities were presented, followed by an open panel discussion with participants from the Indian Association of Radiation Protection (IARP). Additionally, all committee members present contributed to various sessions.

During the closed C1 meeting, the following Task Groups (TGs) were discussed in detail: TG64 on "Cancer risk from Alpha Emitters"; TG91 on "Radiation Risk Inference at Low-dose and Low-dose Rate Exposure for Radiological Protection

Purposes"; TG102 on "Detriment Calculation Methodology". The Committee also reviewed the scientific literature in areas pertinent to its Terms of Reference, and global advances, trends, and programmes were discussed at length.

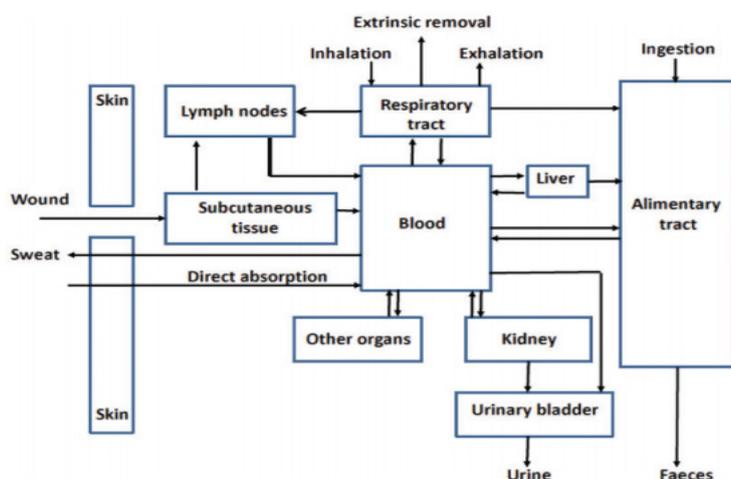
Before, TGs 91 and 102 had met at RERF in Hiroshima, Japan, (Oct 6<sup>th</sup> - 7<sup>th</sup>), followed by an "Informal Exchange Seminar of RERF Young Scientists with ICRP members" (Oct 8<sup>th</sup>), and a "Joint RERF-ICRP Workshop on Health Risk of Radiation and the System of Radiological Protection", at the University of Tokyo (Oct 9<sup>th</sup>), and a "ICRP experts meeting 2016" (Oct 11<sup>th</sup>) at Station Conference Tokyo.

The next meeting of C1, as well as all other Committee's, will take place in Paris, France in Oct 2017 at the 4<sup>th</sup> edition of ICRP's biennial Symposium on the System of Radiological Protection.

# Committee 2

## (Doses from Radiation Exposures)

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



- John D Harrison, Chair, UK
- Francois Paquet, Vice-Chair, France
- Wesley E. Bolch, Secretary, USA
- Michael R Bailey, UK
- Volodymyr Berkovskyy, Ukraine
- Luiz Bertelli, USA
- Douglas Chambers, Canada
- Marina Degteva, Russian Federation
- Akira Endo, Japan
- John G S Hunt, Brazil
- Chan Hyeong Kim, South Korea
- Rich Leggett, USA
- Jizeng Ma, Austria
- Dietmar Nosske, Germany
- Nina Petoussi-Henss, Germany
- Frank Wissmann, Germany

The annual ICRP Committee 2 meeting took place from September 22<sup>nd</sup>-25<sup>th</sup>, 2016 at Oxford University, United Kingdom, following the first meeting of the European Radiation Protection Week, organised by research associations on low dose effects (MELODI), dosimetry (EURADOS), radioecology (ALLIANCE), emergency preparedness (NERIS), and the recently launched medical association (EURAMED).

Discussions at the Committee 2 meeting included Task Group progress and the programme of work for the next term starting in July 2017. Other topics included a joint report with the International Commission on Radiation Units and Measurements to update operational quantities used in external radiation exposure. Committee 2 currently has six active Task Groups responsible for the calculation of dose coefficients and supporting data and provision of advice on dosimetric quantities.

Task Group 79 will provide advice on the use of effective dose, including the contentious issue of its relationship to cancer risks. The goal is to gain Main Commission approval for public consultation

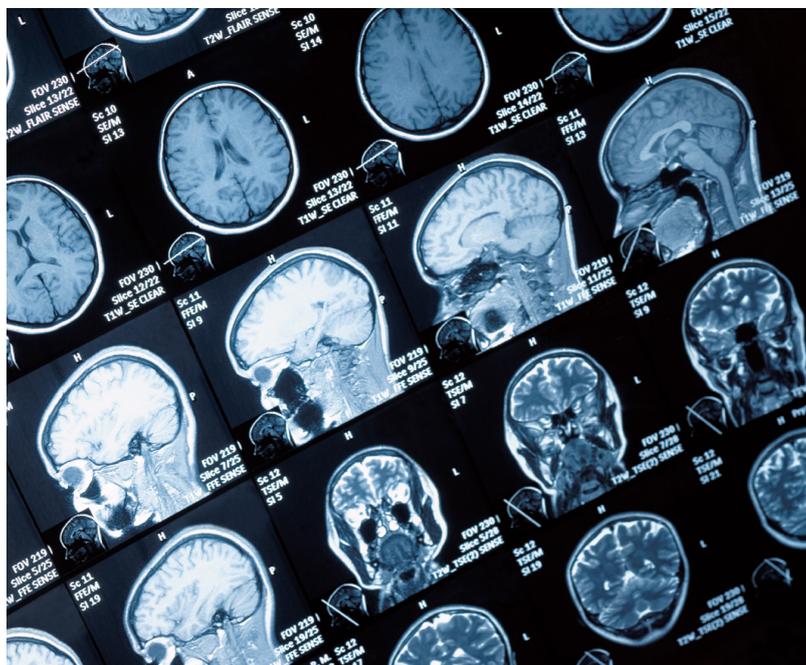
in 2017. Task Group 90 will provide dose coefficients for external exposures of members of the public, including children of different ages. These data will be of particular interest in the context of accidental releases to the environment and also long-term land contamination. Task Group 95 is responsible for internal dose coefficients and is currently preparing the Occupational Intakes of Radionuclides series of reports, providing bioassay data as well as dose coefficients (see Publications 130, 134).

Committee 2 currently has two Task Groups working on the development of reference anatomical phantoms. Task Group 96 is providing models and associated data for the current round of calculations of dose coefficients (see Publication 133). Task Group 103 is future-proofing models for future calculations.

# Committee 3

## (Protection in Medicine)

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



Eliseo Vano, Chair, Spain  
Donald L. Miller, Vice-Chair, USA  
Madan M. Rehani, Secretary, USA  
Kimberly E. Applegate, USA  
Michel Bourguignon, France  
Lawrence T. Dauer, USA  
Sandor Demeter, Canada  
Keon Kang, South Korea  
Åhlström Riklund Katrine, Sweden  
Pek-Lan Khong, China  
Reinhard Loose, Germany  
Pedro Ortiz Lopez, Austria  
Colin Martin, UK  
Pierre Scalliet, Belgium  
Yoshiharu Yonekura, Japan  
Baorong Yue, China

Committee 3 is concerned with protection in medicine. It develops recommendations and guidance on protection of patients, staff, and the public from medical related exposure. The Committee considers topics relating to protection radiotherapy, nuclear medicine, diagnostic and interventional radiology, and veterinary medicine has now been added to C3's mandate. The annual ICRP Committee 3 meeting took place from November 6<sup>th</sup>-9<sup>th</sup>, 2016 in Abu Dhabi, UAE. It was held at the Cleveland Clinic Abu Dhabi (CCAD) in conjunction with a joint symposium on Radiation Protection in Medicine.

The report on Diagnostic Reference Levels for Diagnostic Imaging was approved by the Main Commission following public consultation, and a draft report on Occupational Radiological Protection in Interventional Procedures has been revised following public consultation. A proposal to create a Task Group on Radiological Protection in Medicine related to Individual Radio-susceptibility awaits deliberation by Committee 1. Task Group 89: Occupational Radiological Protection in Brachytherapy remains on hold, and development of a draft report on Justification of the Use of Ionising Radiation in Medical Imaging will be considered during the next term. Combined

Task Group TG 36 of C3 with C2: Doses to Patients from Radiopharmaceuticals, has developed dose coefficients, while Task Group 101: Radiological Protection in Therapy with Radiopharmaceuticals will have a draft ready for C3 to review, prior to the next meeting. The Committee has provided input into the work of Task Group 79: The Use of Effective Dose as a Risk-related Radiological Protection Quantity, and prepared a draft text on Radiation and Your Patient – a Guide for Health Care Practitioners. Finally, the educational slides for Publication 128 on "How to protect your hands in nuclear medicine work" were approved.

Looking forward, the Committee identified several topics for potential work; Framework for the optimisation in medical imaging; Radiological protection aspects in imaging in radiotherapy (IGRT); Radiological Protection aspects of the lens of the eye, cardiovascular system, and brain.

# 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.



Donald A Cool, Chair, USA  
Kun-Woo Cho, Vice-Chair, South Korea  
Jean-Francois Lecomte, Secretary, France  
François Bochud, Switzerland  
Michael Boyd, USA  
Analia Canoba, Argentina  
Mark Doruff, USA  
Eduardo Gallego, Spain  
Toshimitsu Homma, Japan  
Michiaki Kai, Japan  
Senlin Liu, China  
Ann McGarry, Ireland  
Anne Nisbet, UK  
Deborah Oughton, Norway  
Thiagan Pather, South Africa  
Sergey Shinkarev, Russian Federation  
John Takala, Canada

The Committee 4 programme of work includes several broad areas including a series of reports covering various aspects of existing exposure situations, leading the ICRP effort in Fukushima, elaborating on the foundations of the System of Radiological Protection, and developing topical application reports in consultation with liaison organisations with formal relations with ICRP.

The Committee 4 meeting was hosted by CAMECO Corporation in Saskatoon, Canada, and included a seminar with CAMECO and AREVA staff on the System of Radiological Protection.

Related to existing exposure situations, work continued with Task Group 76 on Radiological Protection against Enhanced Exposure from Industrial Processes using NORM, and Task Group 98 on Exposures resulting from Contaminated Sites from past industrial, military and nuclear activities are each under development. Responding to the lessons learned from Fukushima, Task Group 93 on Protection in the event of a nuclear accident will update previous publications dealing with emergency situations and the post-accident

recovery phase. Task Group 94 on Ethics of Radiological Protection examines 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 Task Group 97 on Surface and Near Surface Waste Disposal, and Task Group 106 on Radiological Protection for Mobile High Activity Sources.

Looking ahead, Committee 4 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 Committee 3, ethics in medicine.

# Committee 5

## (Protection of the Environment)

C5 develops reference models and data, and guidance on radiological protection of the environment.



Kathryn A Higley, Chair, USA  
Almudena Real, Vice-Chair, Spain  
David Copplestone, Secretary, UK  
Jordi Vives i Batlle, Belgium  
Jacqueline Garnier-Laplace, France  
Jianguo LI, China  
Kazuo Sakai, Japan  
Per Strand, Norway  
Alexander Ulanovsky, Germany

Committee 5 is mostly concerned with radiological protection of the environment. Its goal is to ensure the development and application of approaches to environmental protection are in line with the recommendations and standards in place for humans, as well as with those for protection of the environment from other potential hazards.

The annual ICRP Committee 5 meeting took place from October 6<sup>th</sup>-7<sup>th</sup>, 2016 in Aomori, Japan.

Task Group 74: More Realistic Dosimetry for Non-human species, completed public consultation, receiving three sets of comments. These comments will be addressed, and the report is expected to be published in 2017. The draft report for Task Group 72: RBE and Reference Animals and Plants, was also submitted to the Main Commission for review.

Following a meeting at Oxford during the 1st European Radiological Protection Research Week, Committee 5 discussed the ongoing efforts of Task Group 99: Reference Animals and Plants (RAPs) Monographs. Proposed scenarios to be considered by the group, as well as the approach proposed for evaluating data used with Derived Consideration

Reference Levels were the topics of discussion. It was also determined that biological information at the family level will be used as the basis for comparing RAPs to the wider range of organisms in wildlife groups. TG99 members will meet again in Bruges, Belgium in April 2017 at the time of the COMET meeting.

The Committee reviewed other issues including the National, European, and International Developments in the field of radiological protection. The membership also participated in a joint symposium on Environmental Protection within the ICRP System of Radiological Protection, organised in conjunction with and supported by the Institute of Environmental Sciences. This was held in Rokkasho, Aomori, Japan on October 4th, 2016. Committee 5 members Almudena Real, Alexander Ulanovsky, Jacqueline Garnier-Laplace, David Copplestone, and Chair Kathryn Higley all presented on various topics of RP.

# Task Groups

Active as of December 31<sup>st</sup>, 2016

- C2/3 TG36: Radiopharmaceuticals, Chaired by D. Noßke
- C1 TG64: Cancer Risk from Alpha Emitters, Chaired by Margot Tirmarche
- C5 TG72: RBE and Reference Animals and Plants, Chaired by Kathryn Higley
- C5 TG74: More Realistic Dosimetry for Non-human Species, Chaired by Alexander Ulanovsky
- 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-Henß
- C1 TG91: Radiation Risk Inference at Low-dose and Low-dose Rate Exposure for Radiological Protection Purposes, Chaired by Werner Rühm
- MC TG92: Terminology and Definitions, Chaired by Wolfgang Dörr
- C4 TG93: Update of ICRP Publication 109 and 111, Chaired by Michiaki Kai
- C4 TG94: Ethics of Radiological Protection, Chaired by Kun-woo Cho
- 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
- MC TG100: ICRP Reflection Group on NCRP Council Committee 1, Chaired by Jacques Lochard
- 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 C5 TG 105: Considering the Environment when Applying the System of Radiological Protection, Chaired by David Coplestone
- C4 TG 106: Application of the Commission's Recommendations to Activities involving Mobile High Activity Sources, Chaired by Donald Cool

# Examples of Global Engagement

## 2016

JANUARY 12-13, 2016 STOCKHOLM, SWEDEN 

NKS Seminar - Nordic perspectives of Fukushima

FEB 13-14, 2016 HIROSHIMA, JAPAN 

5<sup>th</sup> Phoenix Leader Education Program International Symposium, Hiroshima University

FEBRUARY 18, 2016 TOKYO, JAPAN 

ICRP Symposium on Radiological Protection Dosimetry

Abstracts and presentations available at: <http://www.icrp.org/page.asp?id=258>

FEB 27-28, 2016 HIROSHIMA, JAPAN 

Hiroshima International Council for the Health Care of the Radiation-Exposed (HICARE) International Symposium to mark the 70<sup>th</sup> Anniversary of the Atomic Bombings

APRIL 12-14, 2016 TEL AVIV, ISRAEL 

28th Conference of the Israel Nuclear Societies

July 12, 2016 SEOUL, SOUTH KOREA 

KHNP Radiation Health Institute 2016 Symposium on Recent Advancement on Radiation Health

AUGUST 25, 2016 SASKATOON, CANADA 

Committee 4 met with AREVA and CAMECO

OCTOBER 4, 2016 ROKKASYO, AOMORI, JAPAN 

Joint IES-ICRP Symposium on environment protection within the ICRP system of radiological protection.

Abstracts and presentations available at: <http://www.icrp.org/page.asp?id=331>

OCTOBER 9, 2016 TOKYO, JAPAN 

Joint RERF-ICRP workshop on health risk of radiation and the system of radiological protection

Abstracts and presentations available at: <http://www.icrp.org/page.asp?id=332>

OCTOBER 25, 2016 SHENZHEN, CHINA 

ICRP Session in the 2016 Annual Meeting of China Society of Radiation Protection

NOVEMBER 8-9, 2016 ABU DHABI, UAE 

Radiation Protection in Medicine Symposium

NOVEMBER 11, 2016      CHENNAI, INDIA 

ICRP C1 Panel Session in the International Conference on Radiation Biology (ICRB 2016)

Representation at IAEA RASSC, UNSCEAR, OECD-NEA-CRPPH, and EC Article 31 Group of Experts meetings

## ICRP in Fukushima

MARCH 11-12, 2016      MIYAKOJI, TAMURA CITY, FUKUSHIMA, JAPAN 

Dialogue on the rehabilitation of living conditions in Fukushima  
The situation of Miyakoji today

JULY 9-10, 2016      IITATE VILLAGE, FUKUSHIMA, JAPAN 

litate village follow-up dialogue seminar: sharing experiences in litate village today

OCTOBER 1-2, 2016      KAWAUCHI VILLAGE, FUKUSHIMA, JAPAN 

The rehabilitation of living conditions in the Futaba region



# Relations with other Organisations



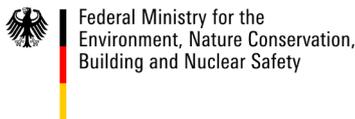
## Independence and Collaboration

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 benefits 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 31<sup>st</sup>, 2016) maintains formal relations with twenty-three organisations.

# 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 undoubtedly play a crucial role in allowing ICRP to conduct day-to-day business. It is with unwavering gratitude that we would like to thank our supporters for their dedication to us and the System of Radiological Protection globally.



Chinese Society of Radiation Protection



Southern Urals Biophysical Institute, Russia



National Institute of Radiation Protection, Denmark



# Publications in 2016

## Radiological Protection from Cosmic Radiation in Aviation

ICRP Publication 132 Ann. ICRP 45(1), 1–48, 2016

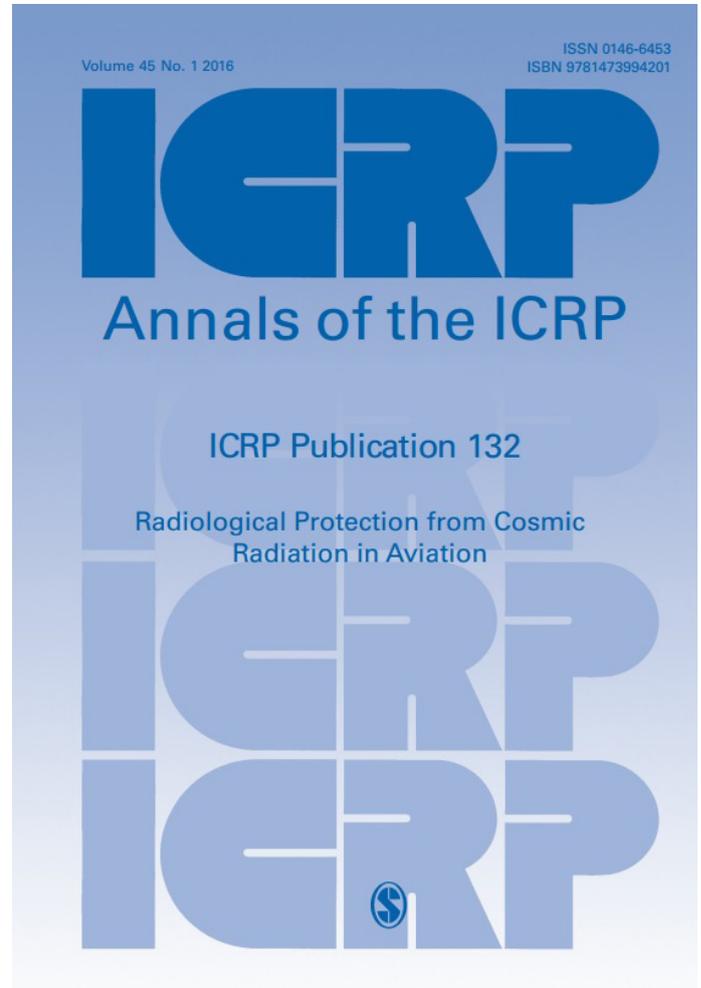
J. Lochard, D.T. Bartlett, W. Rühm, H. Yasuda, J-F. Bottollier-Depois

**Abstract** - In this publication, the International Commission on Radiological Protection (ICRP) provides updated guidance on radiological protection from cosmic radiation in aviation, taking into account the current ICRP system of radiological protection, the latest available data on exposures in aviation, and experience gained worldwide in the management of exposures in aviation. The publication describes the origins of cosmic radiation, how it exposes passengers and aircraft crew, the basic radiological protection principles that apply to this existing exposure situation, and the available protective actions. For implementation of the optimisation principle, the Commission recommends a graded approach proportionate to the level of exposure that may be received by individuals. The objective is to keep the exposure of the most exposed individuals to a reasonable level. The Commission also recommends that information be disseminated to raise awareness about cosmic radiation, and to support informed decisions among concerned stakeholders.

Recommended reference format for citations

ICRP, 2016. Radiological Protection from Cosmic Radiation in Aviation. ICRP Publication 132. Ann. ICRP 45(1), 1–48.

Video, plain-language summary, and many easy-to-read information available at ICRPædia.



<http://www.icrp.org/icrpaedia/system.asp>

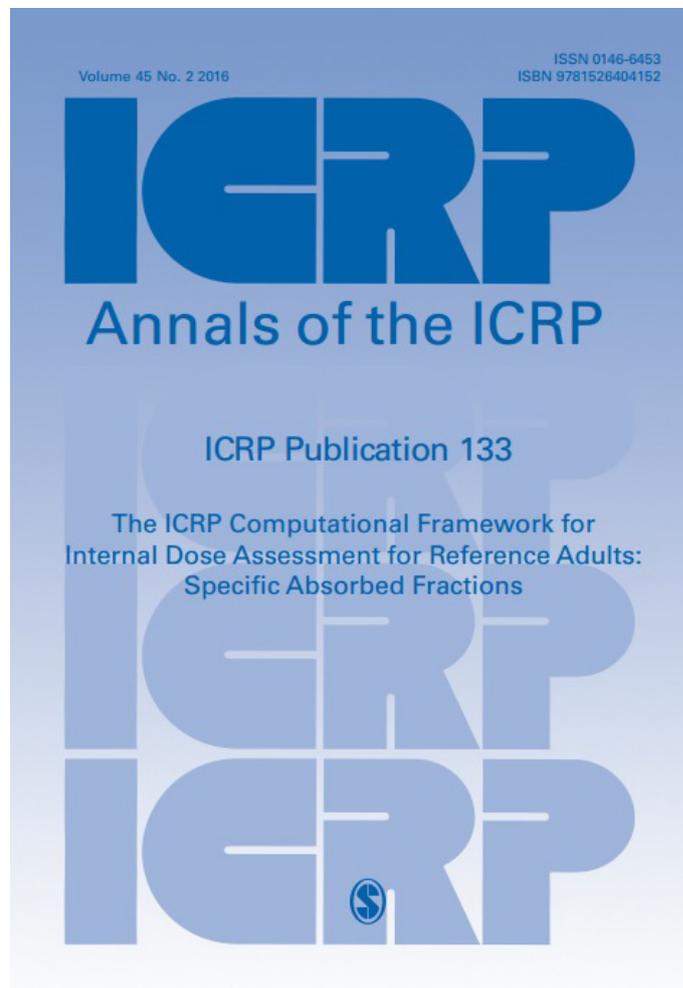
# The ICRP Computational Framework for Internal Dose Assessment for Reference Adults: Specific Absorbed Fractions

ICRP Publication 133

Ann. ICRP 45(2), 1–74, 2016

W.E. Bolch, D. Jokisch, M. Zankl, K.F. Eckerman, T. Fell, R. Manger, A. Endo, J. Hunt, K.P. Kim, N. Petoussi-Henss

Abstract - Dose coefficients for assessment of internal exposures to radionuclides are radiological protection quantities giving either the organ equivalent dose or effective dose per intake of radionuclide following ingestion or inhalation. In the International Commission on Radiological Protection's (ICRP) Occupational Intakes of Radionuclides (OIR) publication series, new biokinetic models for distribution of internalised radionuclides in the human body are presented as needed for establishing time-integrated activity within organs of deposition (source regions). This series of publications replaces Publications 30 and 68 (ICRP, 1979, 1980, 1981, 1988, 1994b). In addition, other fundamental data needed for computation of the dose coefficients are radionuclide decay data (energies and yields of emitted radiations), which are given in Publication 107 (ICRP, 2008), and specific absorbed fraction (SAF) values – defined as the fraction of the particle energy emitted in a source tissue region that is deposited in a target tissue region per mass of target tissue. This publication provides the technical basis for SAFs relevant to internalised radionuclide activity in the organs of Reference Adult Male and Reference Adult Female as defined in Publications 89 and 110 (ICRP, 2002, 2009). SAFs are given for uniform distributions of mono-energetic photons, electrons, alpha particles, and fission-spectrum neutrons over a range of relevant energies. Electron SAFs include both collision and radiative components of energy deposition. SAF data are matched to source and target organs of the biokinetic models of the OIR publication series, as well as the Publication 100 (ICRP, 2006) Human Alimentary Tract Model and the Publication 66 (ICRP, 1994a) Human Respiratory Tract Model, the latter as revised within Publication 130 (ICRP, 2015). This publication further outlines the computational



methodology and nomenclature for assessment of internal dose in a manner consistent with that used for nuclear medicine applications. Numerical data for particle-specific and energy-dependent SAFs are given in electronic format for numerical coupling to the respiratory tract, alimentary tract, and systemic biokinetic models of the OIR publication series.

Recommended reference format for citations  
ICRP, 2016. The ICRP computational framework for internal dose assessment for reference adults: specific absorbed fractions. ICRP Publication 133. Ann. ICRP 45(2), 1–74.

# Finances

	2016	2015	2014	2013	2012
INCOMING RESOURCES					
Contributions Received	742 216	799 343	529 949	482 334	533 025
Royalties*	105 795	151 846	126 527	103 772	199 059
Interest and Other Income	0	8	8	30	1 331
Total Incoming Resources	848 011	951 189	656 484	586 146	733 414
RESOURCES EXPENDED					
Promotion of Radiological Protection	463 263	378 187	240 069	303 917	401 855
Governance Costs †	288 188	377 611	392 753	380 943	269 846
Other Resources Expended	21 764	1 896	36 642	23 037	13 034
Total Resources Expended	773 215	757 694	669 464	707 897	684 735
NET MOVEMENT IN RESOURCES	74 796	193 495	(12 980)	(121 750)	48 679
TOTAL FUNDS CARRIED FORWARD	355 639	280 843	87 348	100 328	222 078

This is a summary of ICRP annual financial statements as audited by Tudor John Chartered Accountants, Epsom, UK. All amounts are expressed in US dollars.

\* In 2012 ICRP reverted to accrual accounting for royalties. Historically royalties had been accounted for on a cash basis (royalties earned in a year being received and recognised as income in the following year). Due to this change royalties for 2012 include royalties received in 2012 (earned in 2011) and royalties earned in 2012 (received in 2013).

† The increase in governance costs beginning in 2013 relates to the "Advancing Together" fundraising campaign.

In 2016, ICRP transformed to a Charitable Incorporated Organisation (UK Registered Charity 116304). The figures for 2016 relate to this legal entity, and the unincorporated association UK Registered Charity 298173, combined.

The majority of ICRP support is received in kind. For example, members' institutions make members' time available without charge and, in many cases, cover their costs of attending ICRP meetings.





# In Memoriam



## Bo Lindell

1922-2016

Scientific Secretary	(1959-1962)
Committee 4 Member	(1962-1965)
Main Commission	(1962-1965)
Committee 3 Chair	(1965-1977)
ICRP Vice-Chair	(1969-1977)
ICRP Chair	(1977-1985)
ICRP MC Emeritus Member	(1985)



ICRP  
2017

4<sup>TH</sup> INTERNATIONAL  
SYMPOSIUM  
ON THE SYSTEM  
OF RADIOLOGICAL  
PROTECTION  
PARIS - FRANCE

ICRP 2017

October 10-12, 2017  
Paris, France

4<sup>TH</sup> INTERNATIONAL SYMPOSIUM ON THE SYSTEM OF RADIOLOGICAL PROTECTION

IN CONJUNCTION WITH THE EUROPEAN RADIOLOGICAL PROTECTION RESEARCH WEEK

**IRSN**  
INSTITUT  
DE RADIOPROTECTION  
ET DE SURETÉ NUCLEAIRE



EURADOS

NERIS