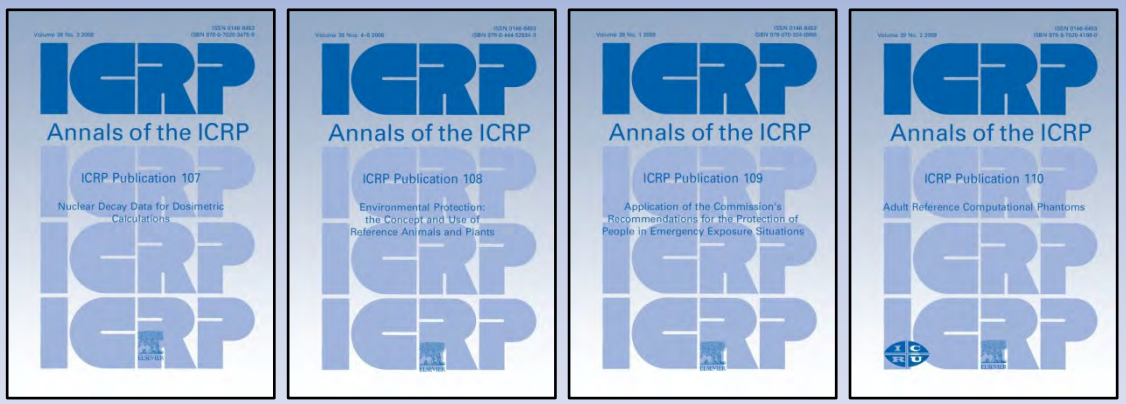
International Commission on Radiological Protection

2009 Annual Report



A Single International System of Radiological Protection since 1928

www.icrp.org

ICRP 2009 Annual Report

ICRP reference 4836-3026-9958

2010-10-01

TABLE OF CONTENTS

CHAIR'S FOREWORD

The year 2009 marks the beginning of a new four-year term for ICRP with many new members and with a new Chair, Vice-chair and Scientific Secretary at the helm. In addition it also heralds the beginning of a new era.

Over the last decade, leading up to the 2007 Recommendations of ICRP (ICRP *Publication 103*), much of our focus was on the development of this evolutionary update to the International System of Radiological Protection. This evolution was and is necessary for the system to remain current with our increasing understanding of relevant scientific findings, and also to continue to reflect current societal norms. In addition, practical application of the system highlights areas for improvement that need to be addressed.

The publication of the 2007 Recommendations can be regarded as a firm foundation, on which ICRP can build over the next decade by focussing on other priorities.

Not least of these is refining, further elaborating and supporting the International System of Radiological Protection through a series of publications that describe how the system is applied to a variety of circumstances. Some of these circumstances are already familiar, such as radiological protection in emergency exposure situations (ICRP *Publication 109*). Some are newer concepts, such as the advice in ICRP *Publication 108* on radiological protection of the environment. Others respond to new or rapidly evolving areas that use ionising radiation, for example in medical imaging, radiotherapy (ICRP *Publication 112*) and fluoroscopically guided procedures.

It is also essential for the efficient practice of radiological protection to provide a new set of dose conversion coefficients based on the revised radiation and tissue weighting factors of ICRP *Publication 103*, and the new database of nuclear decay data in ICRP *Publication 110*. This requires an enormous amount of work and effort and will take several years to complete. Nevertheless, the foundational reports mentioned above were among those published in 2009, and the next few years will see a steady stream of additional reports based on the subject of dose coefficients.

Another important role for ICRP is to remain aware of changes in scientific

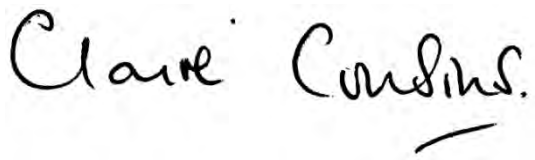
findings and societal values relevant to radiological protection and the expanding use of radiation throughout the world. These factors, as well as practical experience, are the issues that underpin the International System of Radiological Protection. Although there are no immediate plans to embark on yet another update of the system, it is vital that ICRP remain current in these areas and continually examine how scientific or societal changes might influence future changes to the System.

Now is also an opportune time for ICRP to carefully examine its purpose and role.

ICRP was established in 1928 as the International X-ray and Radium Protection Committee (subsequently renamed ICRP in 1950) and for decades was one of only two international organisations in the field of radiological protection, the other being our "sister" organisation, the International Commission on Radiological Units and Measurements (ICRU). Today, the field has many more players, and, therefore, it is more important than ever for ICRP to clearly define its purpose and role to ensure efficient and effective operations both within ICRP and in co-operation with other organisations.

During this current four-year term, ICRP is considering the context of a more sharply focussed purpose and role by reviewing its internal structure, working methods, financial basis and relationships with other organisations. ICRP will continue to be the key organisation world-wide in the areas of development and maintenance of the International System of Radiological Protection. A challenge ahead is how to co-operate most effectively with others who share the common objective of maintaining and improving radiological protection in workplaces, of the public and in the use of radiation in medicine.

ICRP is well-placed to meet these challenges, with the continuing commitment and dedication of its members who have expertise in all areas of radiological protection. There is no doubt that the next four years will require hard-work but it is hoped that a productive and successful outcome can be achieved by all.



Dr Claire Cousins
ICRP Chair

THE INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION

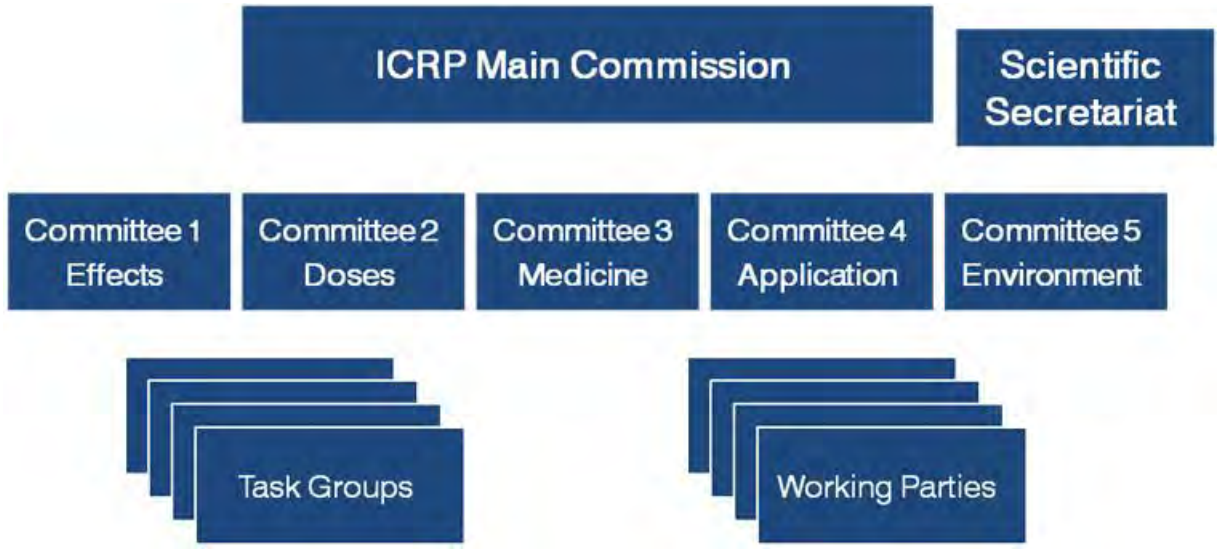
The International Commission on Radiological Protection (ICRP) is the primary international body in protection against ionising radiation. ICRP is a registered charity and is thus an independent non-governmental organisation. It was formed in 1928, at the second International Congress of Radiology, as the 'International X-ray and Radium Committee', to advance for the public benefit the science of radiological protection.

ICRP adopted its present name in 1950 to reflect its growing involvement in areas outside that of occupational exposure in medicine, where it originated.

ICRP provides recommendations and guidance on protection against the risks associated with exposure to ionising radiation, from artificial sources widely used in medicine, general industry and nuclear enterprises, and from naturally occurring sources. These reports and recommendations are published on behalf of the ICRP in the Annals of the ICRP. Each issue provides in-depth coverage of a specific subject area.

STRUCTURE

ICRP comprises the Main Commission, Scientific Secretariat, and five standing Committees on: Radiation Effects, Doses from Radiation Exposure, Protection in Medicine, Application of ICRP Recommendations, and Protection of the Environment). Task Groups and Working Parties are established as needed to undertake specific work.



The General Structure of ICRP

The Main Commission and Scientific Secretariat work together to direct, organize, and oversee the work of ICRP. All ICRP reports are approved by the Main Commission prior to publication.

The Committees advise the Main Commission in their area of expertise. They direct the work of Task Groups, and play an important role in ensuring the quality of ICRP reports.

Task Groups are established to undertake a specific task, normally the production of a single ICRP publication, and are generally comprised of a mixture of Committee members and other experts in the field invited to contribute to the work.

Working Parties are normally formed of Committee members to explore particular issues, and are sometimes transformed into Task Groups if their work is to result in an ICRP publication.

This multi-tier structure provides a rigorous Quality Management system of peer review for the production of ICRP Publications. Furthermore, before draft ICRP reports are approved for publication, they are regularly circulated to a number of bodies and individual experts, and posted for public consultation on the Internet.

MEMBERSHIP

All ICRP members are eminent scientists and policy makers in the field of radiological protection. Members of the Main Commission, Committees, Task Groups, and Working Parties are volunteers, most whose employers pay for their time and travel expenses to work with ICRP. Some volunteer their time outside of regular work or after retirement. Members are invited to serve with ICRP based on the skills and knowledge they bring to the work, and as such do not represent their countries or employers when working with ICRP.

The Main Commission consists of twelve members and a Chair, while the Committees each consist of about 15 members, except Committee 5 which is smaller. The Chair of each Committee is a member of the Main Commission.

The Commission and its Committees run for four-year terms beginning July 1st. On each occasion of a new term, at least three, and not more than five, members of the Commission must be changed. A similar rate of renewal is sought for the Committees. The current period runs from 2009 July 1st to 2013 June 30th.

THE WORK OF ICRP

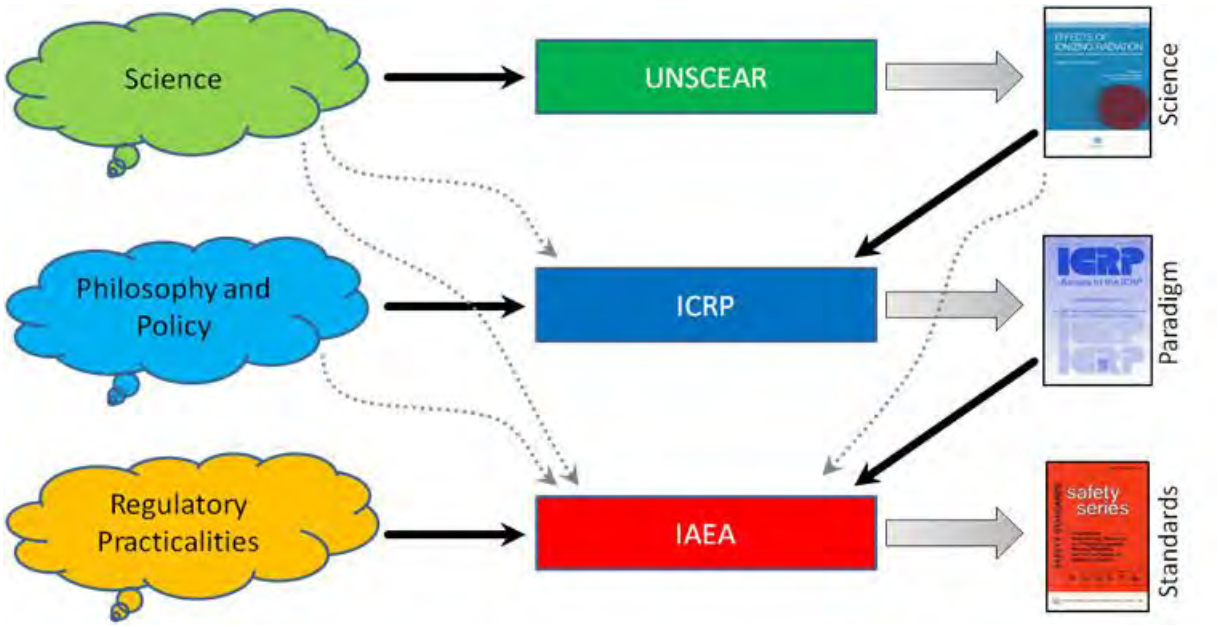
In preparing its recommendations, ICRP considers the fundamental principles and quantitative bases upon which appropriate radiation protection measures can be established, while leaving to the various national protection bodies the responsibility of formulating the specific advice, codes of practice, or regulations that are best suited to the needs of their individual countries.

The primary aim of the Commission's Recommendations is to contribute to an appropriate level of protection for people and the environment against the detrimental ef-

fects of radiation exposure without unduly limiting the desirable human actions that may be associated with such exposure.

This aim cannot be achieved solely on the basis of scientific knowledge on radiation exposure and its health effects (the purview of the United Nations Scientific Committee on the Effects of Atomic Radiation, UNSCEAR, and other organisations). It also requires a model for protecting humans and the environment against radiation.

The Recommendations are based on scientific knowledge and on expert judgement. Scientific data, such as those concerning health risks attributable to radiation exposure, are a necessary prerequisite, but philosophical and ethical considerations are similarly necessary, through which societal and economic aspects of protection must be considered. All of those concerned with radiological protection have to make value judgements about the relative importance of different kinds of risk and about the balancing of risks and benefits. In this, radiological protection is no different from other fields concerned with the control of hazards. The Commission believes that the basis for, and distinction between, scientific estimations and value judgements should be made clear whenever possible, so as to increase the transparency, and thus the understanding, of how decisions have been reached.

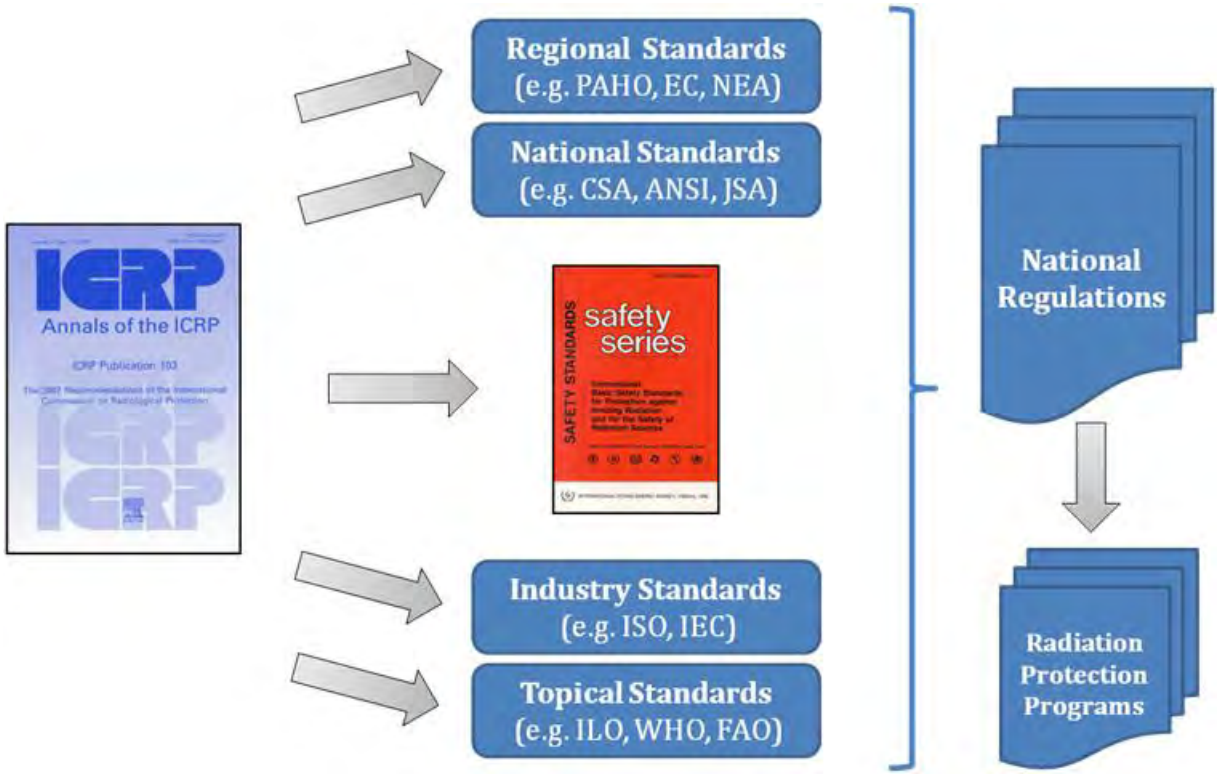


Interplay between Science, Philosophy, and Regulatory Practicalities in Radiological Protection, and Relationships between UNSCEAR, ICRP, and IAEA

ICRP has published well over one hundred publications on all aspects of radiological protection. Most address a particular area within radiological protection, but a handful of publications, the so-called fundamental recommendations, each describe the overall system of radiological protection. The system of radiological protection is based on the current understanding of the science of radiation exposures and effects, and value judgements. These value judgements take into account societal expectations, ethics, and experience gained in application of the system. As the under-

standing of the science and societal expectations have evolved over time, so too has the system of radiological protection. As well, the recommendations continue to take into account novel uses of radiation in medicine and other fields to help ensure an adequate level of safety under all circumstances.

ICRP offers its recommendations to regulatory and advisory agencies and provides advice the intended to be of help to management and professional staff with responsibilities for radiological protection. Legislation in most countries adheres closely to ICRP recommendations. The International Atomic Energy Agency (IAEA) International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources is based heavily on ICRP recommendations, and the International Labour Organisation (ILO) Convention 115, Radiation Protection Convention, General Observation 1992, refers specifically to the recommendations of ICRP. ICRP recommendations form the basis of radiological protection standards, regulations, programmes, and practice worldwide.



The ICRP System of Radiological Protection Forms the Basis of Radiological Protection Standards, Regulations, Programmes, and Practice Worldwide

MEETINGS

The Commission normally meets once or twice a year. Each Committee meets once a year. In alternate years an annual meeting of the Commission is normally conducted jointly with all of the Committees. Active Task Groups generally meet annually, while Working Parties tend to meet in conjunction with Committee meetings.

FINANCES

The activities of ICRP are financed mainly by voluntary contributions from national and international bodies with an interest in radiological protection. Some additional funds accrue from royalties on ICRP Publications. Members' institutions also provide support to ICRP by making the members' time available without charge and, in many cases, by covering their costs of attending ICRP meetings.

THE WORK PROGRAMME OF ICRP AND ITS COMMITTEES

MAIN COMMISSION

The Main Commission and Scientific Secretariat in Porto, November 2009

The Main Commission is responsible for management and oversight of all of the work of the Committees, and approval of all ICRP publications. The sections that follow, each focusing on one of the five ICRP Committees, describes this work in detail.

Main Commission members and the Scientific Secretary continued to play a key role in the dissemination of information beyond the Annals of the ICRP, through presentations and discussions at many seminars, meetings, conferences, workshops and other forums.

Thus, contact was maintained with the International Atomic Energy Agency (IAEA), the International Commission on Radiation Units and Measurements (ICRU), the International Radiation Protection Association (IRPA), the International Society for Radiology, the OECD Nuclear Energy Agency (OECD-NEA), the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), The World Health Organisation (WHO), the International Labour Organisation (ILO), the International Electrotechnical Commission (IEC), and the International Standards Organization (ISO), and many other international, regional, and national organisations.

A four-year ICRP term of membership ended on June 30, 2009, with the current term being from July 1, 2009 to June 30, 2013. Members of the Main Commission and Committees for the 2009-2013 term were elected at the November 2008 meeting of the Main Commission in Buenos Aires.

Beginning July 1, 2009 Claire Cousins, consultant vascular radiologist at Addenbrooke's Hospital, UK, now serves as the 12th ICRP Chair since 1928, taking over from Lars-Erik Holm who has now retired from ICRP service. Cousins is a member of

the British Institute of Radiology Radiation Protection Committee and a guest member of the European Society of Radiology Radiation Protection Committee.

Abel González now serves as Vice-Chair. He succeeds Roger Cox who continues to serve ICRP as a member of Committee 2. At the same time four new Main Commission members were elected: Professor Eliseo Vañó (Complutense University, Spain) as Committee 3 Chair, Jacques Lochard (CEPN France) as Committee 4 Chair, John Cooper (UK HPA), and Ohtsura Niwa (NIRS, Japan). Many new Committee and Task Group members were also elected.

SCIENTIFIC SECRETARIAT

Effective January 1, 2009, the Scientific Secretariat moved from Stockholm, Sweden (the home of the former Scientific Secretary) to Ottawa, Canada (the home of the current Scientific Secretary). The seat of ICRP remains in the United Kingdom where ICRP is an independent Registered Charity.

George Kaye served as the first Scientific Secretary when ICRP was created in 1928. The ICRP Scientific Secretary became a full-time paid position in 1962 with the appointment of David Sowby. Over time the Scientific Secretary was assisted more and more in his duties with administrative support provided in-kind through the various national organisations that hosted the Scientific Secretariat. In 2009, ICRP created the second full-time paid position of Executive Assistant to fill this role.

On January 1, 2009, Christopher Clement became ICRP Scientific Secretary, the 5th since the position became full-time in 1962 and the 10th since ICRP was first established in 1928. He succeeds Jack Valentin who has now retired after a long and distinguished career, the last decade of which was as ICRP Scientific Secretary.

Lynn Lemaire has been the Executive Assistant to the Scientific Secretary since June 2009.

As ICRP's Chief Executive, Editor of the Annals of the ICRP, and head of the ICRP Scientific Secretariat, the Scientific Secretary oversees the daily operations of ICRP; prepares, organizes, and participates in all Main Commission meetings; is directly involved in aspects of the scientific and policy work of ICRP; represents ICRP at international meetings; speaks on behalf of ICRP at workshops, symposia, and other forums; responds to requests for information about the work of ICRP; and coordinates the publication of ICRP reports including working with the authors, final editing of the reports, and various discussions and negotiations with the publisher, Elsevier.

COMMITTEE 1 (RADIATION EFFECTS)

Committee 1 has the responsibility for maintaining under review the biological effects of ionising radiation and developing documents that relate such effects to the needs of radiological protection. The members offer experience in epidemiology, statistics, medical sciences, animal sciences, cell and molecular biology, biophysics and genetics. The committee covers issues of tissue reactions, risks of cancer and heritable diseases including dose responses, effects of dose-rate and radiation quality, effects in the embryo/foetus and genetic factors in radiation response, as well as uncertainties in providing judgements on radiation-induced health effects. The committee advises the Main Commission on the biological basis of radiation-induced health effects and how epidemiological, experimental and theoretical data can be combined to make quantitative judgements on health risks to humans, particularly at low doses.

Committee 1 Members in Porto, November 2009

Committee 1 considers the approaches used and data input for the estimation of nominal risks and detriment for stochastic (cancer and heritable effects) and tissue reactions (deterministic) effects that are used for radiation protection standards. In particular, Committee 1 reviews recently published data from radiation epidemiology studies and new data on molecular and cellular effects of ionizing radiations that are pertinent to updating the basis for the 2007 Recommendations found in ICRP *Publication 103*. A number of task groups are the formal process for doing this.

Task Group 64 on Cancer Risk from Alpha Emitters

Chair: Margot Tirmarche

The Task Group is reviewing the recent reports on epidemiological data pertaining to lung cancer risk for uranium miners and residential radon exposed populations with the goal of calculating a revised detriment-adjusted nominal risk coefficient. The Report of the Task Group was prepared in draft form and is undergoing review with the goal of publication at the end of 2010. Based upon the work of the Task Group, the ICRP issued a Radon Statement in 2009 that provided the position of the Commission on radon risk assessment methodology and consistency with the approaches used by other international organizations. A follow up Task Group will consider the cancer risks for alpha emitters other than radon; this is still to be convened.

Task Group 63 on Tissue Reactions and Other Non-cancer Effects of Radiation

Chair: Fiona Stewart

The Task group will revisit the basis and the new data for establishing revised threshold doses for non-cancer effects. The ICRP has not addressed this issue for about 30 years and there are some indications that there is a much greater sensitivity than previously thought for some tissues (e.g., lens of the eye) that must be considered. The Task Group was formed in 2006 and its aim is to complete a report and have it published by the end of 2010. This will be a comprehensive review of all major organ systems considering both acute and chronic exposures for a variety of exposure scenarios.

Task Group on 75 Stem Cell Radiobiology

Chair: Ohtsura Niwa

This Task Group was established in 2007 to review the current state of knowledge of stem cell biology and radiobiology and the potential impact of stem cell effects on radiation cancer risks. There has been an enormous increase in knowledge of stem cell biology in the past 3-5 years although much less on radiation effects. The Task Group will review the literature on stem cell radiobiology in relation to cancer risk estimation and establish how knowledge of stem cell response can address uncertainties in risk estimation. The aim is to produce a comprehensive report that considers a range of organs and tissues in the first quarter 2012.

Review Activities

Committee 1 continues to review the recent literature on a number of topics related to the 2007 Recommendations in ICRP *Publication 103*.

- Radiation epidemiology
- Tissue reactions and non-cancer effects
- Susceptible populations and susceptibility
- Dosimetry and exposure
- Radiobiology
- Heritable effects
- Epigenetics
- DNA Repair and non-targeted effects

Committee 1 is considering the development of short update reports on a number of these issues rather than waiting to produce a full length report that requires several years to develop.

COMMITTEE 2 (DOSES FROM RADIATION EXPOSURES)

Committee 2 is concerned with the development of dose coefficients for the assessment of internal and external radiation exposure of workers and members of the public, considering different situations of exposure. This work involves the development of reference biokinetic and dosimetric models, reference anatomical models of the human body, and reference anatomical and physiological data.

Committee 2 in Porto, November 2009

Following from the 2007 Recommendations, Committee 2 and its Task Groups are engaged in a substantial programme of work to provide new dose coefficients for various circumstances of radiation exposure. The Committee works closely with the International Commission on Radiation Units and Measurements (ICRU) and will issue joint reports as appropriate. The Committee will lead on considerations of the use of the protection quantities, equivalent and effective dose, and proposals for alternatives where assessments of individual risk are required. Committee members support the work of the other ICRP Committees, providing members for Task Groups of Committee 1, 3 and 5.

Task Group 4 on Dose Calculations (DOCAL)

Chair: Professor Wesley Bolch

DOCAL is responsible for developing methods, computational models, and associated reference data for the calculation of absorbed, equivalent, and effective doses from both external and internal sources of radiation. Following the modifications of tissue and radiation weighting factors in ICRP *Publication 103* and the release of ICRP *Publication 110* Adult Reference Computational Phantoms, a major focus of DOCAL activities this past year was to assemble new reference data on external ra-

diation dose coefficients using the revised values of the weighting factors and the ICRP adult reference computational phantoms. A subset of these data has been provided to a joint ICRP/ICRU Task Group of on radiation doses to aircraft crew and DOCAL also provided calculational support to the Task Group on Radiation Protection in Space. Progress is being made on improving skeletal dosimetry using paired macro- and micro-CT images to define dose delivery within target regions of red bone marrow and bone endosteum. DOCAL continues to develop paediatric phantoms for use by Committees 2 and 3 in dose assessments for both environmental and medical exposures. The Task Group is working closely with the Task Group on Internal Dosimetry (INDOS) on the generation of dose coefficients for the upcoming Occupational Intakes of Radionuclides (OIR) document.

Task Group 21 on Internal Dosimetry (INDOS)

Chair: John Harrison

The primary purpose of the ICRP Committee 2 Task Group on Internal Dosimetry (INDOS) is to develop biokinetic models for the behaviour of inhaled and ingested radionuclides. Biokinetic models for individual elements and their radioisotopes are used to calculate the total number of radioactive decays (transformations) occurring within specific tissues, organs or body regions (source regions) during a given period of time (usually to age 70y). Dosimetric models are then used to calculate the deposition of energy in all important organs/tissues (targets) for emissions in each source region, and hence absorbed, equivalent and effective dose. All dose coefficients require revision following the changes made in the 2007 Recommendations. In addition to the changes in dosimetry discussed above, the opportunity is being taken to update biokinetic models for the new calculations. Doses will be calculated using ICRP *Publication 100* Human Alimentary Tract Model and changes will be made to the ICRP Human Respiratory Tract Model to take account of more recent data. In addition, revisions are being made to many models for the systemic behaviour of individual elements following absorption to blood, making them more physiologically realistic. Work continues on a series of reports to replace ICRP *Publications 30* and *68* on doses to workers. These reports will provide data for the interpretation of bioassay measurements as well as giving dose coefficients. Attention will then be focussed on dose to members of the public.

Task Group 67 on Radiation Exposures of Astronauts in Space

Chair: Günther Dietze

The Task Group is concerned with the exposure of astronauts on space missions. The complex radiation fields in space include very high-energy charged particles with many different heavy ions up to Nickel-59 from cosmic radiation together with secondary particles produced by nuclear reactions in the materials of space vehicles. These fields are very different from radiation fields on earth. The report will focus on providing data on the radiation fields, for the assessment of doses to astronauts and

will describe methods of radiation monitoring, of measuring radiation field parameters, and of individual monitoring of astronauts. The absorbed dose coefficients for organs and tissues of the human body used in the report are being calculated using the new ICRP reference anatomical models, in cooperation with the DOCAL Task Group.

COMMITTEE 3 (PROTECTION IN MEDICINE)

Committee 3 is concerned with protection of persons and unborn children when ionising radiation is used for medical diagnosis, therapy, or for biomedical research; also, assessment of the medical consequences of accidental exposures.

Committee 3 Members in Porto, November 2009

Committee 3 evaluates aspects of radiological protection relevant to medicine with ongoing task groups and working parties as described below.

Task Group 70 on Preventing Accidental Exposures from New External Beam Radiation Therapy Technologies

Chair: Pedro Ortiz Lopez

The Main Commission approved this document to be published as ICRP *Publication 112* in 2010. The document concludes that lessons from conventional techniques are applicable to newer technologies. It also concludes that there are additional lessons from new technologies. Anticipative approaches provide a risk-informed and rational choice of safety provisions.

Task Group 54 on Radiological Protection Education and Training for Medical Diagnostic and Interventional Procedures for Healthcare Staff and Students

Chair: Professor Eliseo Vañó

The Task Group document was submitted to the Main Commission for its meeting in November 2009, and was approved for public consultation subject to minor clarifications.

Task Group 70 on Evaluation and Management of Secondary Cancer Risk in Radiation Therapy (with Special Reference to Modern Techniques)

Chair: Professor Jean-Marc Cosset

A new title was proposed for the document being produced by this Task Group: Secondary cancer risk after modern radiotherapy; practical recommendations. With a simpler approach of the risk models, based only on what has been validated and published, and concentrating on practical recommendations, the document should be ready for public consultation late in 2010 or early in 2011.

Task Group 36 on Dose to Patients from Radiopharmaceuticals

Chair: Professor Sören Mattsson

ICRP *Publication 106* used the MIRD (Medical Internal Radiation Dose) computational model and tissue weighting factors from ICRP *Publication 60*. The new ICRP reference phantoms for adults as well as children and newborn infants will be used in this future publication. This will also include updated information on radioiodine substances as well as new and improved models for a number of new radiopharmaceuticals.

Task Group on 62 Radiation Protection for Cardiologists Performing Fluoroscopically Guided Procedures

Chair: Claire Cousins

The document being produced by this Working Party should be ready for approval by the Main Commission for public consultation in 2010.

Working Party on Protecting Children

The document being produced by this Working Party should be ready for approval by the Main Commission for public consultation in 2010.

A number of Committee 3 Task Groups and Working Parties were newly formed in 2009:

- Task Group on Avoiding adverse radiation effects to doctors and patients in fluoroscopically guided procedures -practical guidelines, chaired by Madan Rehani
- Working Party on Radiation protection in charged particle radiotherapy, chaired by Professor Yoshiharu Yonekura
- Working Party on Follow up of persons accidentally exposed, chaired by Igor Gusev
- Working Party on Screening with ionizing radiation in asymptomatic individuals, chaired by Katrine Ahlstrom Riklund

Committee 3 is monitoring the following issues, areas, and initiatives:

- Widening the use of reference levels for interventional radiology, digital radiology and new technology
- Radiation dose management for fluoroscopically guided interventional procedures (NCRP Scientific Committee 2-3)
- Protection in PET/CT and cyclotrons
- Radiation detriment and effective dose
- Possible effects resulting from interaction between ionizing and non-ionizing radiations

Committee 3 has recognized that the following may need to be addressed in the near future:

- Justification in medical exposure
- Occupational protection in brachytherapy
- Dose reduction resulting from new imaging technology
- Challenges in obtaining dose distributions from workers for relatively high exposure situations (such as fluoroscopically guided interventional procedures)

COMMITTEE 4 (APPLICATION OF THE COMMISSION'S RECOMMENDATIONS)

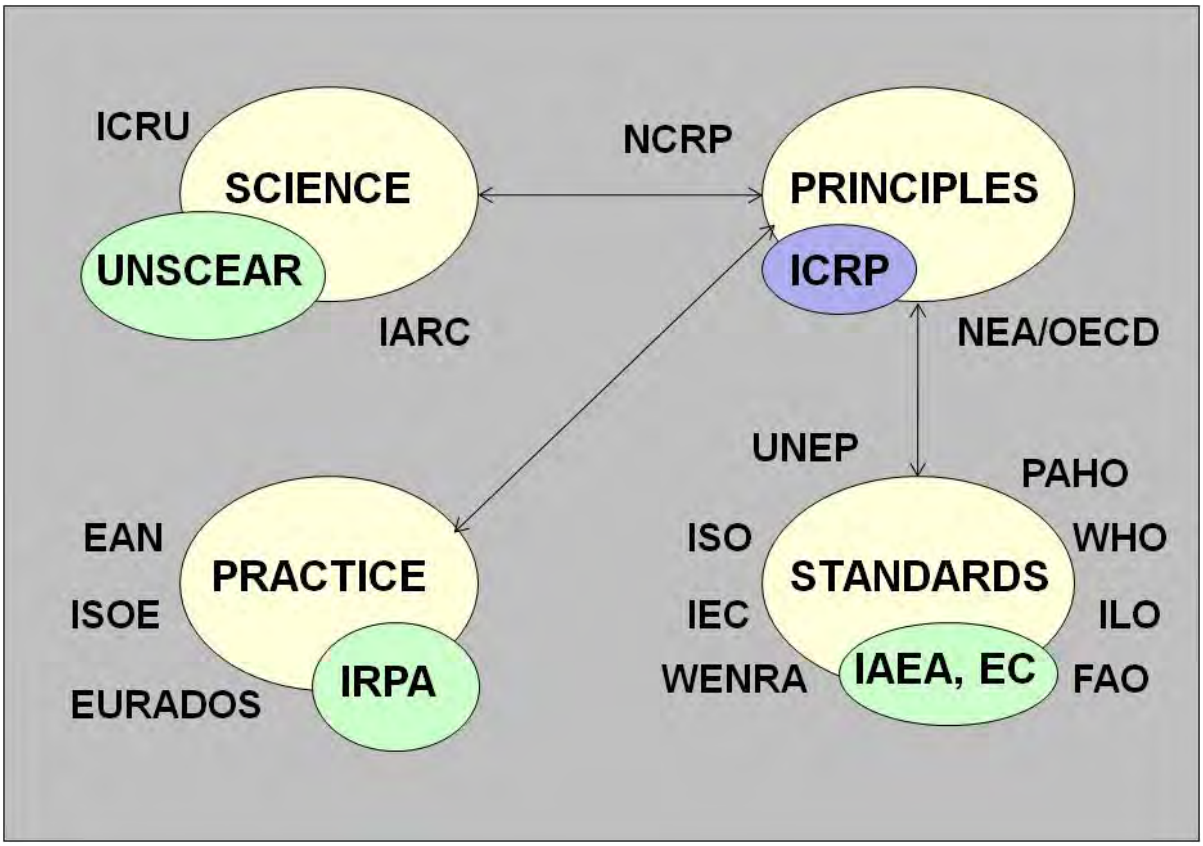
ICRP Committee 4 has the responsibility to consider the practical application of the Commission's recommendations. The Committee also acts as a major point of contact between the ICRP structure and other international organisations and professional bodies concerned with protection against ionising radiation.

Committee 4 Members in Porto, November 2009

During 2009 two reports, which marked the work of the Committee during the previous years, were finalized. The first one is related to the application of the Commission's Recommendations for the protection of populations during nuclear or radiological emergencies, now ICRP *Publication 109*. The second one covers the application of the Commission's Recommendations for the protection of populations living in contaminated areas after a nuclear accident or a radiation event, which will be published as ICRP *Publication 111*.

The main event for the Committee was the meeting held in Porto, Portugal with the other Committees and the Main Commission, opening the new 2009-2013 term. It was the opportunity to review of the membership, priorities, and programme of work of the Committee. Committee 4 now consists of 17 members, including 5 new members, from 14 countries, and nine observers from international organisations: EC, IAEA, IEC, ILO, IRPA, ISO, NEA, UNSCEAR and WHO. The new Chairman is Jacques Lochard, replacing Annie Sugier. Wolfgang Weiss is the Vice-chairman and Jean-François Lecomte the Secretary.

Committee 4 is the major point of contact between ICRP and other international organisations.



Relationships between ICRP and selected organisations involved in radiological protection

Committee 4 identified three priorities for the current 4-year term:

- To develop advice on the implementation of the new recommendations (ICRP *Publication 103*) and to contribute to their dissemination: review and update past publications, recommendations for the application of the radiological protection principles in particular exposure situations such as emergency and existing exposure situations, stakeholder engagement including self-help protective actions as well as the development of the radiation protection culture among workers and the public;
- To review of the ethical and social values underlying the principles and concepts of the radiation protection system: precautionary principle, tolerability of risk, equity, and sustainable development;
- To enhance the dialogue and cooperation with international organisations and professional societies: observers are invited to fully participate in the discussion of the Committee, bringing their experience and considerations from their organisations.

The program of work of the Committee 4 adopted in Porto for the years 2009 to 2013 is described below.

Task Group 76 on the Application of the Commission's Recommendations to NORM (Naturally Occurring Radioactive Materials)

Chair: Peter Burns

Approved by the Main Commission in Berlin in 2007, the Task Group has been re-launched in Porto in 2009 with a refined objective and a new membership. Its objective is to develop a framework for the practical application of the Commission's recommendations, in particular the optimisation principle, for the protection of workers, the public and the environment in cases of exposure arising from Naturally Occurring Radioactive Material (NORM). Taking into account publications and documents of other international organisations, the Task Group report will cover the entire range of activities associated with the processing, production or use of bulk materials with enhanced levels of naturally occurring radionuclides, as well as the presence of such materials in consumer products, particularly in construction materials. The application of such a framework should also be illustrated to a few relevant activities that are currently a concern (oil, coal, rare earths, and phosphate). The report should be published in 2011.

Task Group 80 on the Application of the Commission's Recommendations to the Geological Disposal of Long-lived Solid Radioactive Waste

Chair: Wolfgang Weiss

This Task Group was approved by the Main Commission Porto in November 2009. Its objective is to prepare a publication that describes in plain language and clarifies the application of the new recommendations for the protection against occupational and public exposures that may result from the geological disposal of long-lived solid radioactive waste. Taking into account previous ICRP recommendations (ICRP *Publications 77* and *81*) and relevant materials from international organisations, the publication will discuss how the key radiological protection principles for planned exposure situation apply to the successive phases of managing such type of disposal of long-lived solid radioactive waste. It will also address the transition from a planned to an existing exposure situation in cases of loss of control as well as the applicability of estimated individual and collective effective doses as a means for making decisions about the different time scales in the lifetime of a repository. The report should be published in 2011.

Task Group 81 on the Application of the Commission's Recommendations to Radon Exposure

Chair: Jean-François Lecomte

In Porto, the MC also approved a new Task Group on radon exposure. The objective is to prepare a publication that describes and clarifies the application of the new recommendations (ICRP *Publication 103*) for the protection of the public and workers

(notably workers in uranium mines and other mines) against radon and thoron exposures in dwellings, workplaces and other locations. The publication will discuss in which cases exposure to radon is either a planned exposure situation or an existing exposure situation with the relevant application of the radiological protection principles, as well as the dosimetric reference and rationale. The publication will also address the setting of reference levels and dose constraints. The publication will build on the previous ICRP *Publications 65*, *101* and *103*, the joint C1-C2-C4 report on assessment and control of lung cancer risk from radon and the November 2009 Commission's Statement on radon as well as experience from many countries and organisations. The report should be published in 2011.

Task Group on the Application of the Commission's Recommendations to the Protection of Aircrews from Cosmic Rays

Chair: Jacques Lochard

This Task Group was approved by the Main Commission in Porto in 2009. Its objective is to prepare a publication that describes and clarifies the application of the new recommendations (ICRP *Publication 103*) for the protection of aircrews against cosmic rays. The publication will discuss the type of exposure situations relevant to control aircrew exposures and the appropriate radiation protection principles to be implemented. Particular attention will be given to the practical implementation of the optimization principle with the associated reference levels. The final report is expected in 2012.

Working Party on the Application of the Commission's Recommendations to Occupational Exposure

Chair: Ann McGarry

This Working Party, created in 2007, continues the review of the current status of occupational exposure to identify particular occupational exposure situations which would benefit from further guidance from ICRP. In 2009, Committee 4 considered the final report prepared by CEPN (France) on occupational exposures in various sectors, the RPII document on the evolution of ICRP occupational dose limit and the CRPPH/EGOE case study on the implementation of the new ICRP recommendations. It was concluded that the Working Party shall continue its work preparing an article summarizing information resulting from national and international reports (in particular CRPPH, IAEA, EC/ESOREX and ALARA-Network) about occupational exposure in the different types of exposure situations. The article should be considered by the Committee in 2010. The Working Party should also prepare a document setting out a draft framework for cooperation between Committee 4 and observer organisations.

Working Party on the Concept of Radiation Risk within the System of Radiological Orotection

Chair: Jacques Lochard

This Working Party was created in Porto in November 2009. It's objective is to review the use of the concept of radiation risk in the evolution of the radiological protection system. It also will review the related concepts such as detriment and effective dose and clarify the issue of having a prospective view for risk comparison, the influence of uncertainty of risk as well as the attributability and plausibility of risk. On that basis, the Working Party will produce in 2010 a first paper describing a risk-informed approach in contrast to a risk-based approach covering both stochastic and deterministic effects.

Working Party on the Application of the Commission's Recommendations in Security Screening

Chair: Donald Cool

Considering the increasing use of security screening, this Working Party was created in 2009 to deal with the application ICRP principles for protection of people in the use of ionizing radiation in screening activities applied to persons and cargo for security purposes. Its objective is to: examine the types, magnitudes, and trends in the use of the different types of radiations and methods for the purpose of security screening that affects individuals; examine the exposure levels that may be incurred by those individuals, either as a consequence of being directly screened, or exposed (drivers and trafficked persons) as consequence of cargo screening, including the occupationally exposed individuals in set up for use start, operation and maintenance of the screening equipment; examine the materials that have already been developed by national and international organizations dealing with security screening, and provide a review of the similarities and differences in the approaches currently being used.

COMMITTEE 5 (PROTECTION OF THE ENVIRONMENT)

Committee 5 is concerned with radiological protection of the environment. It will aim to ensure that the development and application of approaches to environmental protection are compatible with those for radiological protection of man, and with those for protection of the environment from other potential hazards.

Committee 5 Members in Porto, November 2009

Following the publication of its major document on Reference Animals and Plants (ICRP *Publication 108*), Committee 5 is continuing to consider how this basic information can best be applied to different exposure situations, and the additional data bases necessary to do so. It is also looking at how the Commission's advice might best be used to satisfy a wide range of environmental protection requirements arising from regional or national legislation. The science base relating to environmental protection is also being further reviewed, particularly with regard to radiation weighting factors, and to the utility of more realistic dosimetry for some biotic types.

Task Group 73 on Environmental Protection: Transfer Parameters for Reference Animals and Plants

Chair: Per Strand

To estimate exposure of Reference Animals and Plants to ionising radiation, models are usually required to simulate the behaviour of radionuclides in the environment. This Task Group has reviewed existing data bases with regard to a wide range of transfer parameters in order to estimate the internal and external exposure of the Reference Animals and Plants. The resultant data base is now complete and will be subjected to public consultation prior to final publication.

Task Group 69 on Improved Dosimetry for Reference Animals and Plants

Chair: Gerhard Pröhl

This Task Group is examining better dosimetric models for application to the larger Reference Animals and Plants, including the use of voxel phantoms. It will be reporting to Committee 5 in 2010.

Task Group 72 on RBE and Reference Animals and Plants

Chair: Kathryn Higley

This Task Group is reviewing the data bases with regard to RBE and the Reference Animals and Plants, and is examining the potential for the use of radiation weighting factors to apply to the vertebrate members of the set. It will be reporting to Committee 5 in 2010.

Joint C5/C4 Task Group 82 on the Application of the ICRP's Approach to Environmental Protection under Different Exposure Situations

Chair: Prof R Jan Pentreath

Although ICRP *Publication 103* had introduced a new 'environmental protection' requirement into its Recommendations (following on from ICRP 91), the subsequent publication of ICRP *Publication 108* has now made it necessary to demonstrate, explicitly, how the expanded ICRP framework collectively fits together in a coherent way. This joint Task Group is addressing this issue and will report to the Main Commission in 2011.

ICRP PUBLICATIONS IN 2009

Four reports were published in the Annals of the ICRP in 2009:

- ICRP *Publication 107*: Nuclear Decay Data for Dosimetric Calculations
- ICRP *Publication 108*: Environmental Protection: the Concept and Use of Reference Animals and Plants
- ICRP *Publication 109*: Application of the Commission's Recommendations for the Protection of People in Emergency Exposure Situations
- ICRP *Publication 110*: Adult Reference Computational Phantoms (jointly with ICRU)

In addition, in 2009 permission was granted for organisations to prepare translations of ICRP publications into various languages including translation of ICRP *Publication 105*, Radiological Protection in Medicine, into Arabic, French, Italian, and Spanish. Translation of other ICRP publications is ongoing. Translated publications are generally made available for free download through the ICRP web site.

ICRP *PUBLICATION 107*: NUCLEAR DECAY DATA FOR DOSIMETRIC CALCULATIONS

In this report, the Commission provides an electronic database of the physical data needed in calculations of radionuclide-specific protection and operational quantities. This database supersedes the data of ICRP *Publication 38*, and will be used in future ICRP publications of dose coefficients for the intake of or exposure to radionuclides in the workplace and the environment.

The database contains information on the half-lives, decay chains, and yields and energies of radiations emitted in nuclear transformations of 1252 radionuclides of 97 elements. The CD accompanying the publication provides electronic access to complete tables of the emitted radiations, as well as the beta and neutron spectra. The database has been constructed such that user-developed software can extract the data needed for further calculations of a radionuclide of interest.

A Windows-based application is provided to display summary information on a user-specified radionuclide, as well as the general characterisation of the nuclides contained in the database. In addition, the application provides a means by which the user can export the emissions of a specified radionuclide for use in subsequent calculations.

ICRP *PUBLICATION 108*: ENVIRONMENTAL PROTECTION: THE CONCEPT AND USE OF REFERENCE ANIMALS AND PLANTS

In its latest recommendations for a system of radiological protection, the Commission considered it necessary and appropriate to broaden its scope in order to address, di-

rectly, the subject of protection of the environment, although it acknowledged that there is no simple or single universal definition of 'environmental protection', and that the concept differs between countries and from one circumstance to another. It is a very large and complicated subject. Nevertheless, the Commission did consider it appropriate to set out some high-level ambitions with regard to environmental protection and the specific issue of potential radiation effects, and thus included within its general aims those of wishing to prevent or reduce the frequency of deleterious radiation effects in the environment to a level where they would have a negligible impact on the maintenance of biological diversity, the conservation of species, or the health and status of natural habitats, communities, and ecosystems. It also recognised the needs of some national authorities to demonstrate, directly and explicitly, that the environment is being protected within their own legislative frameworks.

The Commission also stated, however, that it believed that its approach to environmental protection should be commensurate with the overall level of risk (and thus optimised), and that it should be compatible with other approaches being made to protect the environment. Some form of numerical guidance is therefore necessary, and the Commission said that it considered that such guidance – built on a knowledge of the relationships between exposure and dose, between dose and effect, and between effect and possible consequences – needed to be based on a sound scientific system similar to that developed for human protection, and that this could best be achieved by the creation of a set of Reference Animals and Plants.

This publication therefore introduces the concept of reference animals and plants, and defines a small set. It discusses their pathways of exposure, and collates and discusses the adequacy of the best-available data relating to their dosimetry at different stages of their life cycles. In addition, this publication further develops and uses this information to derive sets of tabulated data (dose conversion factors, in terms of μGy/day per Bq/kg) that allow the dose to be calculated for 75 radionuclides that may be within, or external to, each organism.

This publication reviews what is known about the effects of radiation upon such biotic types (or of similar organisms, where more precise data are lacking) with regard to the effects of mortality, morbidity, reduced reproductive success, and chromosomal damage. Drawing on this information, the report derives a set of derived consideration reference levels for each biotic type in order to help optimise the level of effort that might be expended on its environmental protection, or that of similar types of organisms, and thus serve as points of reference in any wider consideration of what authorities may wish to do under different exposure situations. The various factors that should be taken into account when considering what to do if the derived consideration reference levels are likely to be attained are also discussed.

Some broader background information on the types of animals and plants used is also provided. Additional information is provided on advice with regard to extrapolat-

ing and interpolating the limited set of dosimetric models to other shapes and sizes of animals and plants.

The Commission acknowledges that, in many circumstances, exposure to radiation is but one factor to consider. It therefore intends to provide high-level guidance and advice upon which regulators and operators may draw in order to demonstrate compliance, where necessary, with the wide range of international and national environmental legislation that already exists, or is likely to emerge in the near future. It also intends to supplement this introductory report with additional relevant data sets, and with further guidance on issues such as radiation weighting factors.

ICRP *Publication 109*: Application of the Commission's Recommendations for the Protection of People in Emergency Exposure Situations

This report was prepared to provide advice on the application of the Commission's 2007 Recommendations. The advice includes the preparedness for, and response to, all radiation emergency exposure situations defined as: 'situations that may occur during the operation of a planned situation, or from a malicious act, or from any other unexpected situation and require urgent action in order to avoid or reduce undesirable consequences'. An emergency exposure situation may evolve, in time, into an existing exposure situation. The Commission's advice for these types of situation is published in two complementary documents (that for emergency exposure situations in this report, that for existing exposure situations following emergency exposure situations in a forthcoming report entitled 'Application of the Commission's recommendations to the protection of individuals living in long-term contaminated territories after a nuclear accident or a radiation emergency').

The Commission's 2007 Recommendations re-state its principles of justification and optimisation, and the requirement to protect against severe deterministic injury, as applying to emergency exposure situations. For the purpose of protection, reference levels for emergency exposure situations should be set in the band of 20–100 mSv effective dose (acute or per year). The reference level represents the level of residual dose or risk above which it is generally judged to be inappropriate to plan to allow exposures to occur. The Commission considers that a dose rising towards 100 mSv will almost always justify protective measures. Protection against all exposures, above or below the reference level, should be optimised.

More complete protection is offered by simultaneously considering all exposure pathways and all relevant protection options when deciding on the optimum course of action in the context of an overall protection strategy. Such an overall protection strategy must be justified, resulting in more good than harm. In order to optimise an overall strategy, it is necessary to identify the dominant exposure pathways, the time scales over which components of the dose will be received, and the potential effectiveness of individual protective options. If, in application of an overall protection

strategy, protection measures do not achieve their planned residual dose objectives, or worse, result in exposures exceeding reference levels defined at the planning stage, a re-assessment of the situation is warranted. In planning and in the event of an emergency, decisions to terminate protective measures should have due regard for the appropriate reference level.

The change from an emergency exposure situation to an existing exposure situation will be based on a decision by the authority responsible for the overall response. This transition may happen at any time during an emergency exposure situation, and may take place at different geographical locations at different times. The transfer should be undertaken in a co-ordinated and fully transparent manner, and should be understood by all parties involved.

ICRP *Publication 110*: Adult Reference Computational Phantoms

This report describes the development and intended use of the computational phantoms of the Reference Male and Reference Female. In its 2007 Recommendations, ICRP adopted these computational phantoms for forthcoming updates of organ dose coefficients for both internal and external radiation sources. The phantoms are based on medical image data of real people, yet are consistent with the data given in ICRP *Publication 89* on the reference anatomical and physiological parameters for both male and female subjects. The reference phantoms are constructed after modifying the voxel models (Golem and Laura) of two individuals whose body height and mass resembled the reference data. The organ masses of both models were adjusted to the ICRP data on the adult Reference Male and Reference Female, without compromising their anatomic realism. This report describes the methods used for this process and the characteristics of the resulting computational phantoms.

Chapter 1 summarises the main reasons for constructing these phantoms – voxel phantoms being the state of the art, and the necessity for compliance with the anatomical characteristics of the Reference Male and Reference Female given in ICRP *Publication 89*. Chapter 2 summarises the specifications of the computational phantoms with respect to external dimensions and the source and target regions that are required. Chapter 3 characterises the previously segmented voxel models (Golem and Laura) that are the origins of the reference phantoms. Chapter 4 sketches the modifications that had to be applied to these models to create voxel models of the Reference Male and Reference Female. Chapter 5 is a description of the resulting reference computational phantoms of the Reference Male and Reference Female. Finally, Chapter 6 indicates their applications and highlights their limitations.

The phantoms' technical descriptions are contained in Annexes A–H, which represent the larger part of this report. The numerical data representing the phantoms are contained on an electronic data storage medium (CD-ROM) that accompanies the

printed publication. One of the aims of this report is to assist those who wish to implement the reference phantoms for their own calculations.

Furthermore, to illustrate the uses of these phantoms, graphical illustrations of conversion coefficients for some external and internal exposures are included in Annexes I–L. A comprehensive set of recommended values will be published in separate reports. Finally, Annex M presents a description of the data files on the CD-ROM.

OBTAINING ICRP PUBLICATIONS

An index to all ICRP publications can be found at www.icrp.org.

ICRP publications are available from reputable booksellers or directly from the Commission's publishers, Elsevier Science:

Web sites: www.elsevier.com
www.sciencedirect.com/science/journal/00742740
(for ICRP *Publication 23* and earlier)
www.sciencedirect.com/science/journal/01466453
(for ICRP *Publication 24* and later)
www.icrp.info

Questions to Elsevier Science regarding print subscriptions should be directed to:

Americas
Journals Customer Service
Tel: (877) 839-7126 (Toll Free US & Canada)
Tel: (314) 453-7041 (Outside US & Canada)
Fax: (314) 453-5170
E-mail: JournalsOnlineSupport-usa@elsevier.com

Europe, Africa, Middle East
Customer Service Department
PO Box 211
1000 AE Amsterdam
The Netherlands
Tel: +31 20-485-3757
Fax: +31 20-485-3432
E-mail: JournalsCustomerServiceEMEA@elsevier.com

Asia and Australia
Customer Service Department
Winsland House I
3 Killiney Road #08-01
Singapore 239519
Tel: +65 6349-0222
Fax: +65 6733-1510
E-mail: JournalsCustomerServiceAPAC@elsevier.com

Japan
Customer Service Department
4F Higashi Azabu, 1 Chome Bldg
1-9-15 Higashi Azabu, Minato-ku
Tokyo 106-0044, Japan
Tel: +81 3 5561 5037
Fax: +81 3 5561 5047
E-mail: JournalsCustomerServiceJapan@elsevier.com

ICRP MEMBERSHIP AS OF DECEMBER 31, 2009

MAIN COMMISSION

Claire Cousins (Chair)
Abel J González (Vice-chair)
John D Boice Jr
John Cooper
Jaiki Lee
Jacques Lochard (C4 Chair)
Ohtsura Niwa
Hans G Menzel (C2 Chair)
Ziqiuang Pan
R Jan Pentreath (C5 Chair)
R Julian Preston (C1 Chair)
Natalia Shandala
Eliseo Vañó (C3 Chair)

Christopher H Clement
(Scientific Secretary)

Emeritus Members
Roger H Clarke
Bosse Lindell
Charles B Meinhold
Fred A Mettler
Warren K Sinclair
Christian Streffer

SCIENTIFIC SECRETARIAT

Christopher H Clement
(Scientific Secretary)
Lynn Lemaire
(Executive Assistant)

COMMITTEE 1 (RADIATION EFFECTS)

R Julian Preston (Chair)
Jolyon Hendry (Secretary)
Tamara Azizova
Ranajit Chakraborty
Sarah Darby
William Morgan
Colin Muirhead
Nori Nakamura
Werner Rühm
Sisko Salomaa
Alice Sigurdson
Fiona Stewart
Dan Stram
Margot Tirmarche
Richard Wakeford
Ping-Kun Zhou

COMMITTEE 2 (DOSES FROM RADIATION EXPOSURES)

Hans G Menzel (Chair)
John Harrison (Secretary)
Mikhail Balonov
David Bartlett
Vladimir Berkovski
Wesley Bolch
Roger Cox
Günther Dietze
Keith Eckerman
Akira Endo
Nobuhito Ishigure
Richard Leggett
Joyce Lipsztein
Jizeng Ma
Francois Paquet
Nina Petoussi-Henβ
Ambika Sahai Pradhan

COMMITTEE 3 (PROTECTION IN MEDICINE)

Eliseo Vañó (Chair)
Madan Rehani (Secretary)
Katrine Åhlström Riklund
Mario Baeza
Jean-Marc Cosset
Igor Gusev
John Hopewell
Pek-Lan Khong
Pedro Ortiz Lopez
Sören Mattsson
Hans Ringertz
Marvin Rosenstein
Yoshiharu Yonekura
Baorong Yue

COMMITTEE 4 (APPLICATION OF THE COMMISSION'S RECOMMENDATIONS)

Jacques Lochard (Chair)
Wolfgang Weiss (Vice-chair)
Jean-François Lecomte (Secretary)
Peter Burns
Donald Cool
Michiaki Kai
Hua Liu
Senlin Liu
Sigurður Magnússon
Pedro Carboneras Martinez
Gustavo Massera
Ann McGarry
Khammar Mrabit
Serguy Shinkarev
Jane Simmonds
Alex Simanga Tsela
Werner Zeller

COMMITTEE 5 (PROTECTION OF THE ENVIRONMENT)

R Jan Pentreath (Chair)
Carl-Magnus Larsson (Vice-chair)
Kathryn Higley (Secretary)
Francois Bréchignac
Almudena Real Gallego
Gerhard Pröhl
Kazuo Sakai
Per Strand

SUMMARY FINANCIAL INFORMATION 2005-2009

ITEM	2009	2008	2007	2006	2005
INCOME STATEMENT					
Incoming Resources					
Grants Received	418 408	412 100	472 703	231 592	310 100
Royalties	107 231	84 596	112 589	127 176	88 048
Interest	1 138	5 935	14 996	15 862	11 605
Other Income	2 109	1 516	925	1 044	861
Total Incoming Resources	528 886	504 147	601 213	375 674	410 614
Resources Expended					
Promotion of Radiological Protection	461 268	326 444	386 541	361 434	229 876
Governance Costs	204 291	140 175	152 942	145 498	165 526
Other Resources Expended	(22 834)	33 418	(13 079)	(35 396)	31 796
Total Resources Expended	642 725	500 037	526 404	471 536	427 198
Net Movement in Resources	(113 839)	4 110	74 809	(95 862)	(16 584)
Total Funds Carried Forward	**390 153**	**503 922**	**499 882**	**425 073**	**520 935**
BALANCE SHEET					
Tangible Fixed Assets	5 977	3 109	1 516	2 895	4 562
Current Assets	400 563	529 296	511 375	439 223	539 779
Creditors (falling due within the year)	(16 387)	(28 413)	(13 009)	(17 045)	(18 884)
Net Assets	**390 153**	**503 992**	**499 882**	**425 073**	**520 935**

All amounts expressed in USD

This table is summary of the annual financial statements of ICRP as audited by Tudor John Chartered Accountants, Epsom, UK.

ORGANISATIONS PROVIDING GRANTS TO ICRP IN 2009

Commission of European Communities

International Atomic Energy Agency

International Radiation Protection Association

International Society of Radiology

Organisation of Economic Cooperation and Development: Nuclear Energy Agency

Australia: Australian Radiation Protection and Nuclear Safety Agency

Argentina: Autoridad Regulatoria Nuclear de Argentina

Canada: Canadian Nuclear Safety Commission & Health Canada

China: Chinese Society of Radiation Protection

Denmark: National Board of Health

Finland: Säteilyturvakeskus

France: Institut de Protection et de Sûreté Nucléaire

Germany: Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

Iceland: Geislavarnir Rikisins

Japan: Japan Atomic Energy Agency

Norway: Statens strålevern

Russia: Burnasyan Federal Medical Biohysical Center, Federal Medical Biological Agency

South Korea: Korea Nuclear International Cooperation Foundation

Spain: Consejo de Seguridad Nuclear

Sweden: Miljödepartementet

USA: Nuclear Regulatory Commission & Environmental Protection Agency

CONTACT INFORMATION

Christopher Clement, ICRP Scientific Secretary and Editor of the *Annals of the ICRP*, can be contacted at:

Christopher H Clement CHP
International Commission on Radiological Protection
PO Box 1046, Station B
280 Slater Street
Ottawa, Ontario K1P 5S9
CANADA

Telephone: +1 (613) 944-1918
Fax: +1 (613) 944-1920
E-mail: sci.sec@icrp.org
Web site: www.icrp.org