

ICRP

2002 Annual Report of the International Commission on Radiological Protection



ICRP

ICRP Annual Report on 2002
2003-04-05
ICRP Reg. No. 52/429/03

Cover photo: The Main Commission met in Chilton, UK, in May 2002.

From left: Mrs J. Stather (guest), Dr A. J. González, Miss F. Fry (Committee 2; guest), Mr D. Talbot (NRPB Secretary; guest), Dr J. Stather (Committee 2; guest), Prof. Y. Sasaki, Mrs R. Cox (guest), The Hon. G. Joy Dicus, Prof. R.H. Clarke (Chairman), Mr N. Winkler, Dr A. Sugier, Dr J. Valentin (Scientific Secretary), Dr L.-E. Holm, Mrs R.H. Clarke (guest), Dr R. Cox, Prof. C. Streffer, Dr J. D. Boice Jr, Prof. Z.-Q. Pan.

Prof. F. A. Mettler and Prof. R. Alexakhin were unable to participate on this occasion.

Our Mission Statement

**The International Commission on Radiological Protection, ICRP,
is an independent Registered Charity,
established to advance for the public benefit
the science of radiological protection,
in particular by providing recommendations and guidance
on all aspects of protection against ionising radiation.**

Chairman's Foreword

This is the second year of the current Main Commission and it met twice in 2002. The main business has been concerned with the continuation of the developments of the recommendations applicable for the start of the 21st century and the philosophy for protection of non-human species.

I attended the International Congress of the International Society of Radiology in Cancun, Mexico in July and presented to our parent body, the programme of ICRP for the coming period. I was gratified to receive strong endorsement of our proposals especially for the initiative to simplify protection policy and practice in addition to obtaining support for our move into protection of the environment.

There was a first Forum on Radiological Protection of the Environment hosted by the NEA/OECD in Taormina, Sicily during February, in which several Main Commission Members participated and which proved an extremely productive meeting. Wide support for the ICRP initiative was expressed and the draft report by our Task Group benefited greatly from the discussions.

I also presented ICRP work on revised recommendations to the Nordic

Nuclear Safety Group in Roskilde, Denmark, in March while in April I presented a number of lectures on ICRP to Cuban colleagues in Havana. The Main Commission met at NRPB Chilton in May to progress draft documents for discussions by our four Committees. This was followed by an invited presentation to the Belgian Nuclear Radiological Protection and Nuclear Medicine Societies in Brussels, Belgium.

In June the Deutsche Strahlenschutzärzte presented me with the Hanns-Langendorff Medaille and I gave an invited lecture to them in Velden, Austria. This was followed in July by presentations to the US Federal and State regulators at an ISCORS (Interagency Steering Committee on Radiation Standards) meeting in Washington DC.

September saw me attend a very successful meeting of a Workshop on Internal Dosimetry of Radionuclides in Oxford, England. I then presented a paper to the Scientific meeting of the IAEA General Conference in Vienna, following which I gave invited lectures to CIEMAT and CSN in Madrid, Spain.

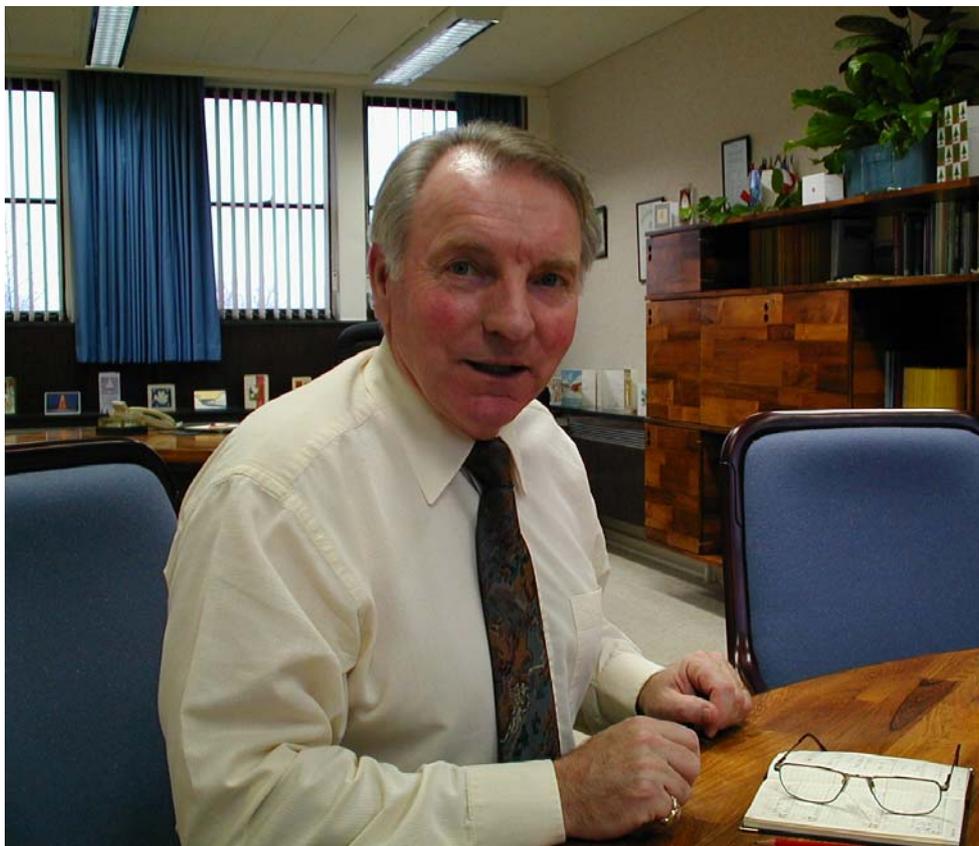
The second Main Commission meeting was hosted by Fred Mettler in

Albuquerque in October after which I presented papers to the Asian and Oceanic Congress for Radiation Protection, a Regional IRPA meeting in Seoul, Korea and an NEA/Asian regional conference on the Evaluation of the System of Radiological Protection in Tokyo, Japan. In early November I was invited to discuss ICRP ideas with the Strahlenschutzkommission in Goslar, Germany and also to

present lectures in Suzhou, China at a medical radiology conference.

All in all, it was a busy year for me as Chairman, but very rewarding to see the interest we in the Main Commission have stimulated, world-wide, in searching for the most useful and practical ways to apply our protection expertise in the future.

Roger H Clarke



Professor Roger H Clarke is the Chairman of the International Commission on Radiological Protection.

The International Commission on Radiological Protection

The primary body in radiological protection is ICRP. It was formed in 1928 as the 'International X-ray and Radium Committee', but adopted its present name in 1950 to reflect its growing involvement in areas outside that of occupational exposure in medicine, where it originated.

Broad structure

ICRP consists of the Main Commission, Committee 1 (Radiation Effects), Committee 2 (Doses from Radiation Exposure), Committee 3 (Protection in Medicine), Committee 4 (Application of ICRP Recommendations), *ad hoc* Task Groups and Working Parties, and the Scientific Secretariat.

Membership

The Main Commission consists of twelve members and a Chairman, while the Committees contain between 15 and 20 members each. The Commission and its Committees run for four-year periods, from 1 July. On each occasion of a new period, 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. Such a new period began 1 July 1997, and the autumn 2000 meetings of the Commission and its Committees were the last time that the members of the 1997 – 2001 term met.

Meetings

The Commission meets once or twice a year. Each Committee meets once a year. Twice in each four-year period, the annual meeting of the Committees is conducted jointly and together with the

Commission. These meetings are funded as necessary from monies available to ICRP.

Financing

The activities of ICRP are financed mainly by voluntary contributions from national and international bodies with an interest in radiological protection. (A list of the bodies providing such contributions in 2000 is appended at the end of this report). 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, contributing to their costs of attending meetings.

Mode of operation

The Commission uses Task Groups and Working Parties to deal with specific areas. Task Groups are formally appointed by the Commission to perform a defined task, usually the preparation of a draft report. A Task Group usually contains a majority of specialists from outside the Commission's structure. It is funded as necessary from monies available to ICRP.

Working Parties are set up by Committees to develop ideas, sometimes leading to the establishment of a Task Group. The membership of a Working Party is usually limited to Committee members. Working Parties receive no funding of their own, *i.e.* they operate primarily by correspondence and by meetings in direct conjunction with meetings of the Committee concerned.

These activities are co-ordinated with a minimum of bureaucracy by a Scientific Secretary, ensuring that ICRP recommendations are promulgated.

Thus, ICRP is an independent international network of specialists in various fields of radiological protection. At any one time, about one hundred eminent scientists are actively involved in the work of ICRP. The four-tier structure described provides a rigorous Quality Management system of peer review for the production of ICRP Publications.

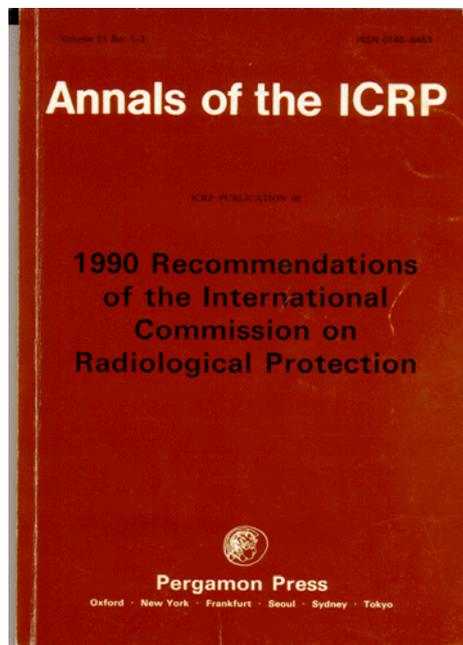
Furthermore, before draft ICRP reports are approved for publication, they are regularly circulated to a number of bodies and individual experts, and posted for public consultation on the Internet.

Objective

In preparing its recommendations, the Commission considers the fundamental principles and quantitative bases on 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 aim of the recommendations of ICRP is to

- *provide an appropriate standard of protection for mankind from sources of ionising radiation, without unduly limiting beneficial practices that give rise to exposure to radiation.*



The 1990 Recommendations of ICRP were issued as ICRP Publication 60 in our own journal, the Annals of the ICRP.

The Work Programme of the Commission and its Committees:

The Commission is an independent Registered Charity, established to advance for the public benefit the science of radiological protection, in particular by providing recommendations and guidance on all aspects of protection against ionising radiation.

Committee 1 considers the risk of induction of cancer and heritable disease (stochastic effects) together with the underlying mechanisms of radiation action; also, the risks, severity, and mechanism of induction of tissue/organ damage and developmental defects (deterministic effects).

Committee 2 is concerned with the development of dose coefficients for the assessment of internal and external radiation exposure, development of reference biokinetic and dosimetric models, and reference data for workers and members of the public.

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 4 is concerned with providing advice on the application of the recommended system of protection in all its facets for occupational and public exposure. It also acts as the major point of contact with other international organisations and professional societies concerned with protection against ionising radiation.

The Main Commission of ICRP met twice in 2002: In Chilton, UK, in May, and in Albuquerque, NM, USA, in October. The main issue at these meetings was the preparation of a set of draft fundamental ICRP Recommendations, intended to replace the current (1990) Recommendations sometime in 2005.

*The four standing Committee met once each:
Committee 1 in Chapel Hill, NC, USA, in September;
Committee 2 in Chilton, UK, in September;
Committee 3 in Chiba and Kyoto, Japan, in September; and
Committee 4 in Paris, France, in June.*

New publications

One issue of the Commission's journal, the *Annals of the ICRP*, was printed in the calendar year 2002. This was Supporting Guidance 2, comprising two different reports in the same set of covers:

- Radiation and your patient; A guide for medical practitioners, and

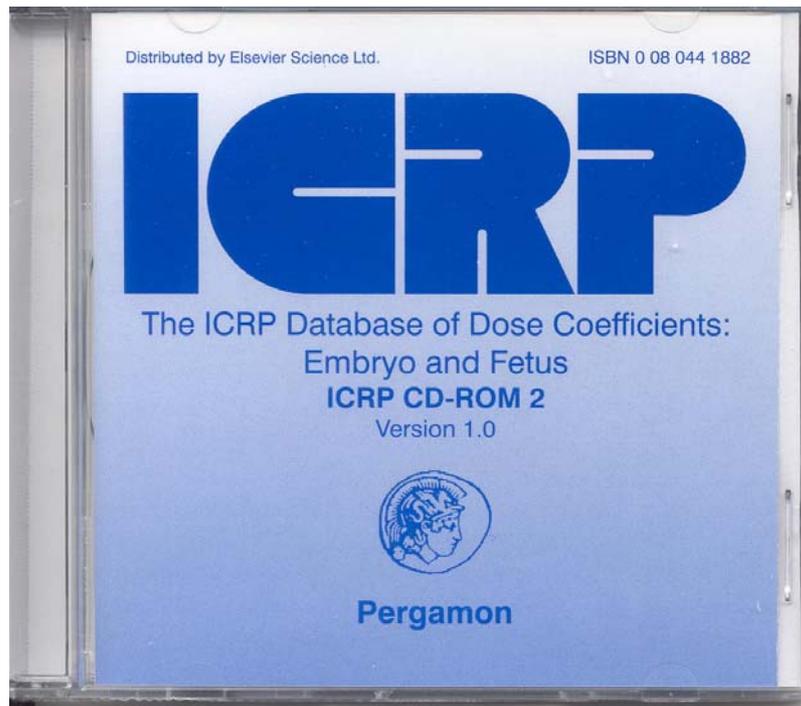
- Diagnostic Reference Levels in medical imaging – Review and additional advice.

Furthermore, ICRP released its second CD-ROM:

- The ICRP Database of dose coefficients: Embryo and fetus.

Two further reports were approved and are published as 2002 issues of the *Annals of the ICRP*, although printing was not completed until early in 2003. These are:

- Supporting Guidance 3: Guide for the practical application of the ICRP Human Respiratory Tract Model; and
- Publication 89: Basic anatomical and physiological data for use in radiological protection: Reference values.



ICRP CD-ROMs have rapidly become a cherished tool for many research workers all over the world.

Committee 1 (Radiation Effects):

Committee 1 of the International Commission on Radiological Protection has the responsibility for maintaining the biological effects of ionising radiation under review and developing documents that relate such effects to the needs of radiological protection.

The most important issues for Committee 1 are as follows:

- Mechanisms of damage and repair;
- The Linear-No Threshold (LNT) dose-response hypothesis;
- Risk factors for cancer;
- Relative Biological Effectiveness (RBE) for neutrons and protons, alpha particles, and Auger emitters;
- Provision of judgements on weighting factors to be used;
- Non-cancer endpoints; and
- Deterministic effects of prolonged exposures.

The current programme of work for Committee 1 that has been agreed by the Commission will include the preparation of reports by four Task Groups:

- A review of epidemiological evidence of radiation-induced cancer at low doses and characterisation of the dose-response relationship,

- Radiation effects on developing embryo/fetus to include judgements on the risks of cancer, neurological dysfunction and other deterministic effects,
- An evaluation of RBEs in respect of deterministic and stochastic effects, and
- Preparation of supporting material (a 'foundation document') for the next basic ICRP Recommendations.

Working Parties will continue:

- to review published epidemiological studies,
- to survey developments in cell and molecular biology relevant to the effects of ionising radiation,
- to identify cells at risk,
- to provide evidence of dose and dose-rate effects from animal studies,
- to advise on genetics risks in relation to both mendelian and multifactorial disorders, and
- to survey the evidence of synergism or additivity between the effects of ionising radiations and chemical carcinogens on cells and tissues.



Committee 1 is currently compiling a comprehensive report on the various aspects of radiation risk to the human embryo and fetus. Committee 2 is also providing input to this project.

Committee 2 (Doses from Radiation Exposures):

Committee 2 has the responsibility for establishing dose coefficients for internal and external exposures. This necessarily involves developing the dosimetric models to be used in the calculations. The Committee and its Task Groups have been developing a series of documents related to both external radiation and internally incorporated radionuclides. The programme of work of Committee 2 has been quite extensive following publication of the 1990 Recommendations.

The most important issues for Committee 2 are as follows:

- A model of the human alimentary tract;
- A compilation of the human anatomy and physiology;
- A voxel phantom to replace older mathematical models of man;
- Quality assurance for new biokinetic models;
- Dose coefficients for external irradiation;
- Compilation of new biokinetic data; and
- A serious re-consideration of target cells vs. organ average doses.

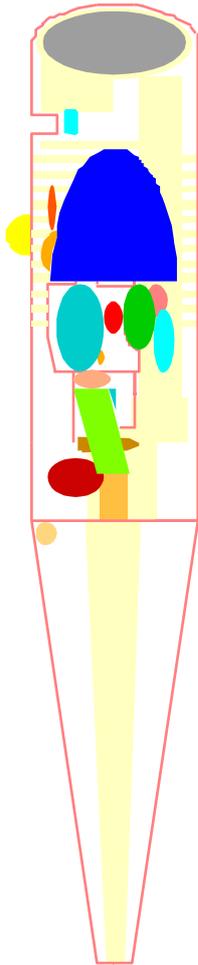
A number of Task Groups do exist and the major activities are:

- Reference Man (*ICRP Publication 23*) is being revised. The Respiratory tract model is in *Publication 66*, the Skeleton is in *Publication 70*, and Basic Anatomical and Physiological Data for Use in Radiological Protection are now approved.

- Dosimetric Model for the Alimentary Tract to replace the current 1966 GI Tract model.
- Dose calculations for the new reference phantoms.

The completion of these various Committee 2 Task Group reports should coincide with the revision of *ICRP Publication 30 (Limits for Intakes of Radionuclides by Workers)*. The future programme of work of Committee 2 will include:

- Application of the human respiratory tract model to specific materials to provide site-specific dose coefficients
- A continuing review of biokinetic and dosimetric models required for the revision of *ICRP Publication 30*
- A critical appraisal of the dosimetry of radon between the model of the respiratory tract and the epidemiological data, in conjunction with Committee 1
- Development of realistic human phantoms for dose calculation based on medical imaging
- Provision of dose coefficients on CD-ROM
- Establishment of dose conversion factors for submersion in a cloud of, or from ground contaminated at varying depths with, radioactive material.



MIRD phantom



Voxel phantom

An important issue for Committee 2 is the substitution of an anatomically realistic voxel phantom, obtained digitally in magnetic resonance tomography and/or computed tomography, for the MIRD phantom which is a mathematical representation of a human body.

Committee 3 (Protection in Medicine):

The responsibility of Committee 3 is radiological protection and safety in medicine.

The most important issues for Committee 3 are as follows:

- Continued attention to topical problems such as dose management in digital radiology and in paediatric radiology, accident prevention in brachytherapy, and protection of members of the public from radiation from patients treated with radionuclides;
- Implications of variations in genetic susceptibility to cancer induction;
- Summarising and updating general information on radiological protection in medicine as a 'foundation document' amending and updating *Publication 73*;
- Assessment of quantities and units for medical uses; and
- Re-assessment and further development of criteria for biomedical research.

The major task following *Publications 84 to 87* (on pregnancy and medical radiation, on dose management in interventional radiology [85] and in computed tomography [87], and on accident prevention in radiotherapy) has been the establishment of four Task Groups to produce reports on:

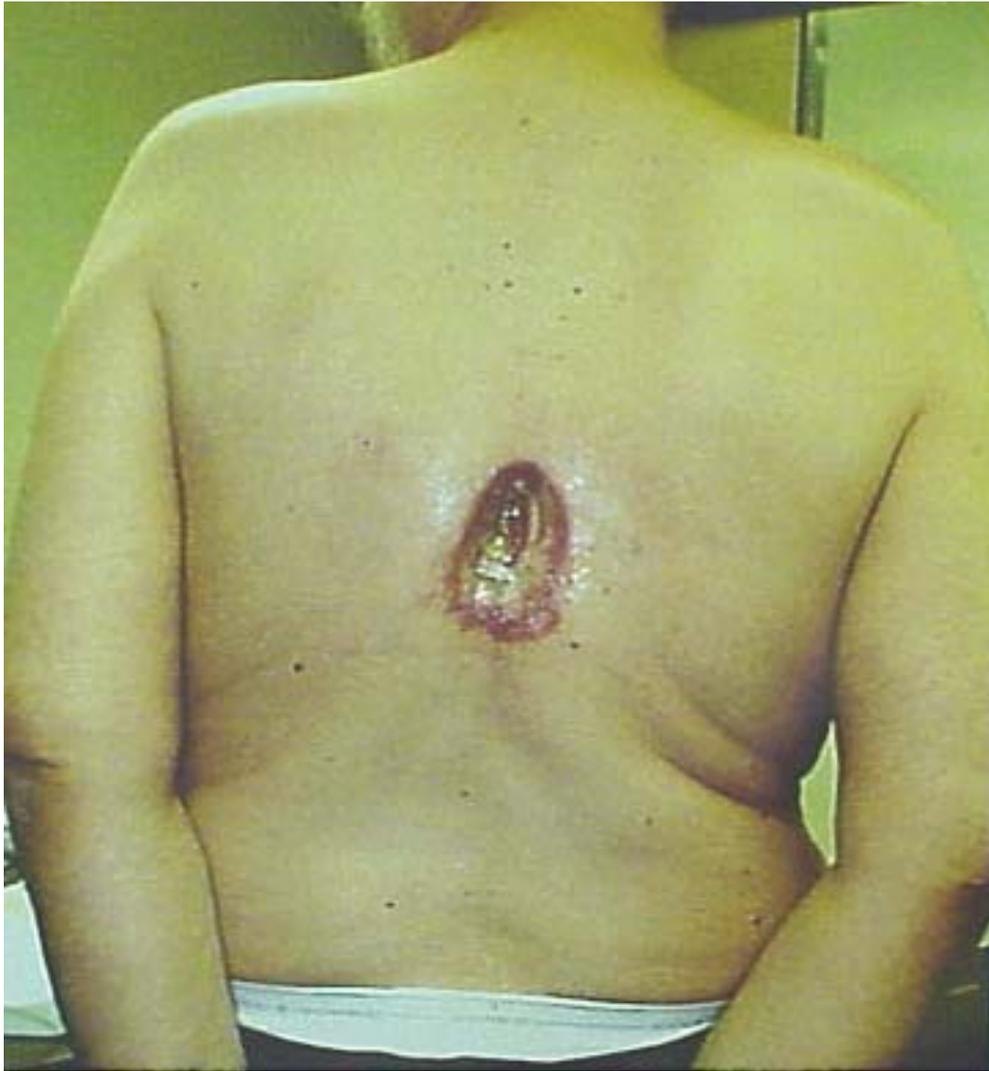
- Dose reduction in digital radiography
- Protection in Brachytherapy
- Protection in Paediatric radiology
- Release of Nuclear Medicine Patients.

There already exists a Task Group on *Doses to Patients from Radiopharmaceuticals*, which produced *Publications 53, 62* (the pertinent part), and

80 and which will continue to produce data for the future.

In addition, Working Parties are considering whether to establish Task Groups on:

- radiation protection in paediatrics,
- aspects of medical radioactive waste disposal,
- implications of genetic susceptibility for radiation exposure in medical practice
- quantities and units for Medical uses
- criteria for Biomedical Research.



ICRP Publication 85 discussed avoidance of radiation injuries in connection with interventional radiology. This patient received a cumulative skin dose of some 20,000 mGy to a limited area after coronary angiography and 2 instances of angioplasty. Note spinous process exposed at the base of the ulcer.

Committee 4 (Application of the Commission's Recommendations):

Committee 4 of the International Commission on Radiological Protection has the responsibility to consider the practical application of the Commission's recommendations.

The Committee comprises eighteen members drawn from fifteen countries (although, of course, people are elected to the Committees of ICRP in a personal capacity, not as national representatives). Membership covers expertise in dose assessment, regulation and radiological protection generally, reflecting experience in a wide range of countries. Observers from the European Commission (EC), the Nuclear Energy Agency of the OECD (NEA) and the International Atomic Energy Agency (IAEA) also attend.

Aside from its other functions the Committee acts as a major point of contact between the ICRP structure and other international organisations and professional bodies concerned with protection against ionising radiation. At each meeting those representatives and officers of international organisations present, provide a description of their current activities. This two-way exchange of information helps to promote the harmonious development of radiological protection philosophy within the international organisations.

The most important issues for Committee 4 are as follows:

- Definition of an individual member of the public for purposes of assessing

doses for protective action and demonstration of compliance;

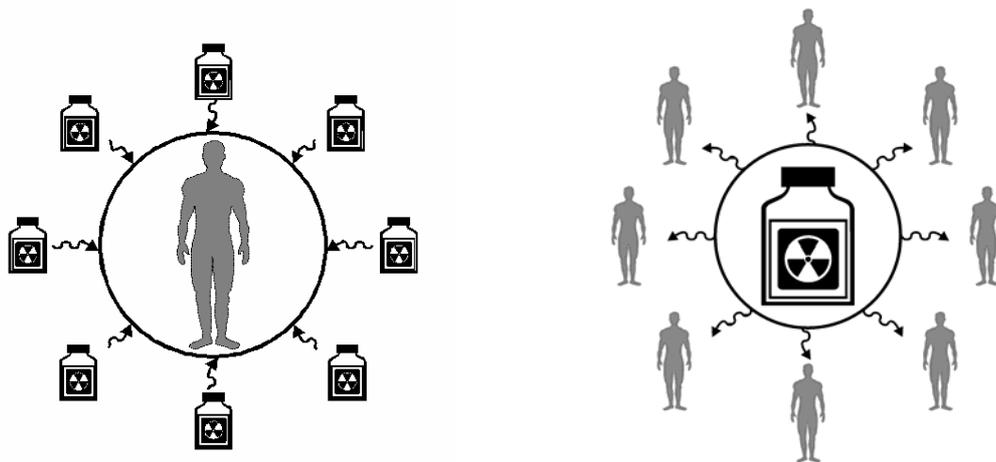
- Optimisation, particularly when involving stakeholder participation;
- Radiological protection in space flight;
- Treatment of natural radiation exposures in regulatory contexts;
- Regulatory guidance on radiological protection recommendations; and
- Assessment of the role and methods of justification in future protection issues.

There have been two Task Groups in existence with Committee 4, both of which have produced reports that have been adopted as *Publications 81 and 82* (see New Publications). New Task Groups of Committee 4 will be considering:

- Definition of an individual
- Demonstration of compliance
- ALARP - Stakeholder involvement
- Radiological Protection in Space Flight.

Working Parties have been established on:

- Regulatory guidance
- Justification
- Incorporation of natural radiation exposures.



This figure from ICRP Publication 82 illustrates the difference between individual-related protection of a person from radiation from all sources exposing that person (left side), and source-related protection of a number of exposed individuals from the radiation emerging from one particular source (right side). Dose limits apply to individuals, but for members of the public the only directly available option is source-related protection. Therefore, definition of a typical individual and modelling of pathways is necessary to assess whether the source-related actions are likely to also provide sufficient individual-related protection to ensure compliance with dose limits.

The Main Commission:

The Commission is now moving towards a more individual-based approach. This requires the establishment of criteria called Protective Action Levels, which can be justified in terms of the existence of natural background radiation. These would replace the present complex set of criteria that have been developed from the Recommendations of 1990. These include:

- Intervention Levels after accidents
- Guidance Levels in diagnostic radiology
- Dose Limits for workers
- Intervention Exemption Levels
- Action Levels for radon in homes or at work
- Clearance Levels
- Dose Limits for the public
- Exemption Levels
- Constraints
- Exclusion criteria

The initiative represents a genuine attempt to simplify the system of protection to one that is more coherent and easily explicable.

The Commission has already established, in its 1990 Recommendations, an added individual-related restriction on

the optimisation process for a single source by the introduction of the concept of a **constraint**. The constraint is an individual-related criterion, applied to a single source in order to ensure that the most exposed individuals are not subjected to excessive risk and to limit the inequity introduced by cost-benefit analysis.

In general, despite the complexity of the present protection philosophy, doses to individuals are kept below about ten times the average background dose. So, occupational dose limits in practices, or intervention levels for the public either in emergencies or for radon in homes, are set at some few tens of mSv. Added doses from environmental releases are kept to about one tenth of background. And, in many regions of the world, exemption from regulatory requirements is allowed if doses are below about one hundredth of background.

MEMORANDUM

A report on progress towards new recommendations: A communication from the International Commission on Radiological Protection

International Commission on Radiological Protection¹

ICRP, SE-171 16, Stockholm, Sweden

Received 2 March 2001

Abstract

Throughout the hundred-year history of the uses of ionising radiation in medicine and industry there has been advice on the need to protect people from the hazards associated with exposure. Protection standards have evolved throughout this period to reflect both the scientific understanding of the biological effects of exposure and the social and ethical standards to be applied. The Main Commission of ICRP is now considering a revised, simpler approach that is based on an individual-oriented philosophy and represents a potential shift by the Commission from the past emphasis on societal-oriented criteria. The initial proposals were promulgated through IRPA and an open literature publication was published in the *Journal of Radiological Protection* in June 1999. On the basis of comments received and the observations presented at the IRPA-10 Congress in May 2000, the Commission is beginning to develop the next recommendations. This article describes the issues involved in the preparation of the next recommendations and indicates the process that the Commission proposes to follow. The Commission wishes there to be an ongoing debate with an iteration of ideas over the next few years.

1. Historical background

Roentgen discovered x-rays in 1895, and in 1896 Grubbé described x-ray dermatitis of hands in the first paper to appear reporting radiation damage to the skin of the hands and fingers of the early experimental investigators. On the 12 December 1896, the American journal *Western Electrician* contained a paper by Wolfram Fuchs giving the first protection advice. This was:

- make the exposure as short as possible;
- do not stand within 12 inches (30 cm) of the x-ray tube; and
- coat the skin with Vaseline and leave an extra layer on the area most exposed.

Becquerel's identification of the phenomenon of radioactivity, also in 1896, and the Curies' separation of radium in 1898 soon led to the use of radioactive substances, together with x-rays, for therapy. In the next ten years, many papers were published on the tissue damage caused by radiation.

¹ Presented by the ICRP Chairman, Roger H Clarke. E-mail: roger.clarke@nrpb.org.uk

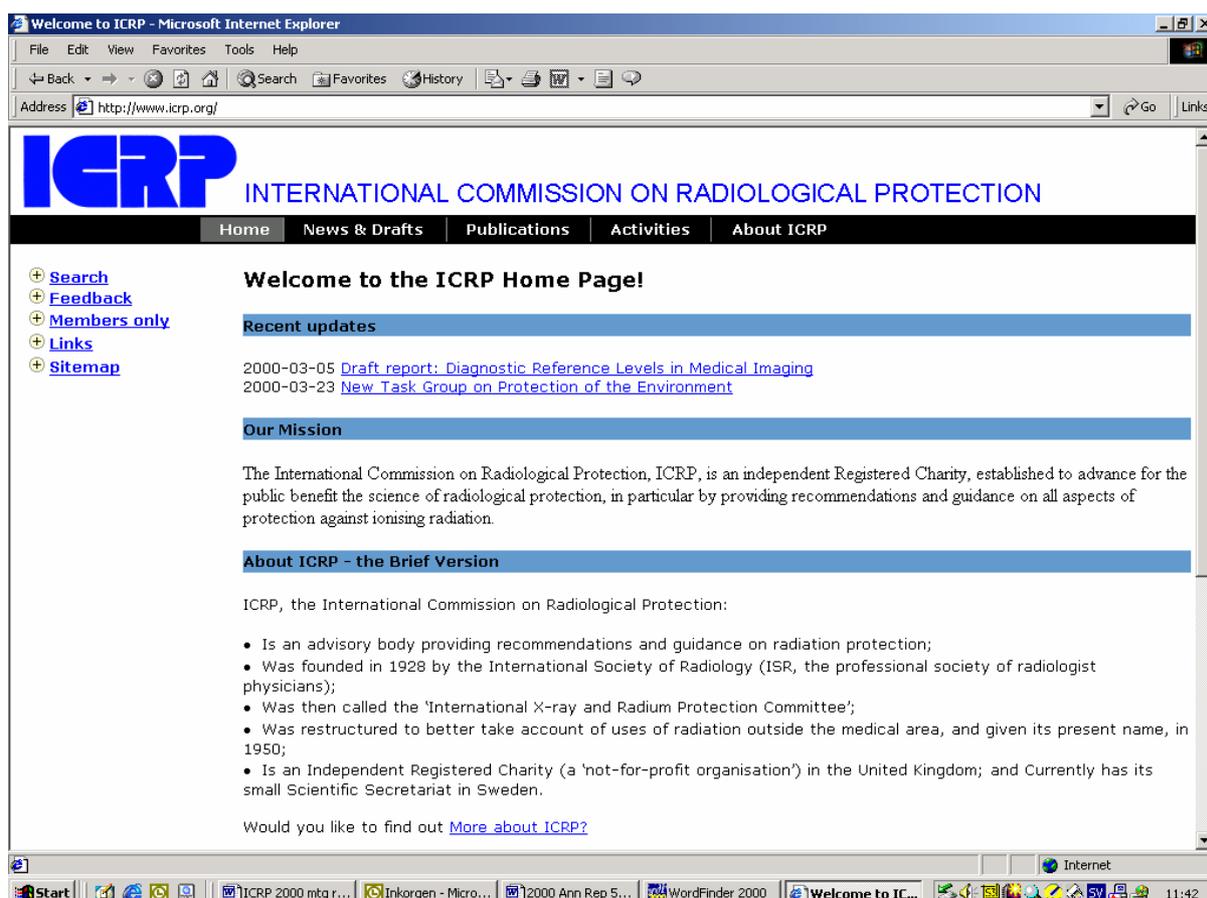
In the preparation of the next ICRP Recommendations, intended to be published in 2005, ICRP has paid great attention to ensuring an ongoing dialogue with future users and stakeholders. A series of conceptual reports including the above 2001 message have been published in the Journal of Radiological Protection, and through IRPA (the International Radiation Protection Association) and its associate societies, distribution and thorough discussion of ideas have been ensured before ICRP turns to drafting any details.

The Scientific Secretariat

The Scientific Secretariat is currently situated in Stockholm, Sweden. The seat of ICRP remains in the United Kingdom where ICRP is a Registered Independent Charity.

Tasks of the Secretariat include preparations for and organisation of meetings, final editing of reports for publication in the *Annals of the ICRP*, maintenance of contacts with all collaborating organisations, and administrative issues.

The Secretariat also devoted an increasing part of its efforts to running the ICRP Internet web site. Apart from providing general information about ICRP, the web site has proved particularly useful when ICRP wants to consult on its own draft documents. A drawback was that the resources of the Secretariat were not always quite commensurate with the demand for information and assistance generated through the web site, so that at times, considerable delays in attending to queries from the public were inevitable.



The ICRP web site at www.icrp.org provides an opportunity to disseminate information about ICRP activities and at the same time to receive comments and questions from interested organisations and persons.



The Scientific Secretary, Dr Jack Valentin (right), in conversation with the Committee 1 Chairman, Professor Roger Cox (left) during a break in the May 2002 meeting of the Main Commission in Chilton, UK.

Contacts, Meetings, etc.

As usual, numerous different contacts were maintained, formally and informally, during the year.

In addition to the many instances where the Chairman, Professor Clarke, represented the Commission as described in the Foreword, the Vice-Chairman, Dr Holm, the Scientific Secretary, Dr Valentin, and members of the Commission represented ICRP in meetings of various kinds.

Thus, contacts were held and continued with 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, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the World Congress on Medical Physics and Biomedical Engineering and the European Congress on Medical Physics, and the World Health Organization (WHO).

The persons mentioned also took part in many meetings with national regulatory

organisations, research establishments, and professional societies.

During the meeting of the Main Commission in Albuquerque, NM, USA, in October, an informal meeting was arranged with the considerable local community of experts interested in various aspects of ionising radiation and radiological protection.

ICRP also continued its relationship with the International Electrotechnical Commission (IEC) and the International Standards Organization (ISO), primarily through exchange of draft reports and information. On a number of occasions when ICRP was unable to send a formal representative, we arranged to obtain observers' reports so as to keep abreast with developments.

There was also a brisk demand for informal enlightenment and information via telephone, e-mail, and regular mail to the Secretariat.



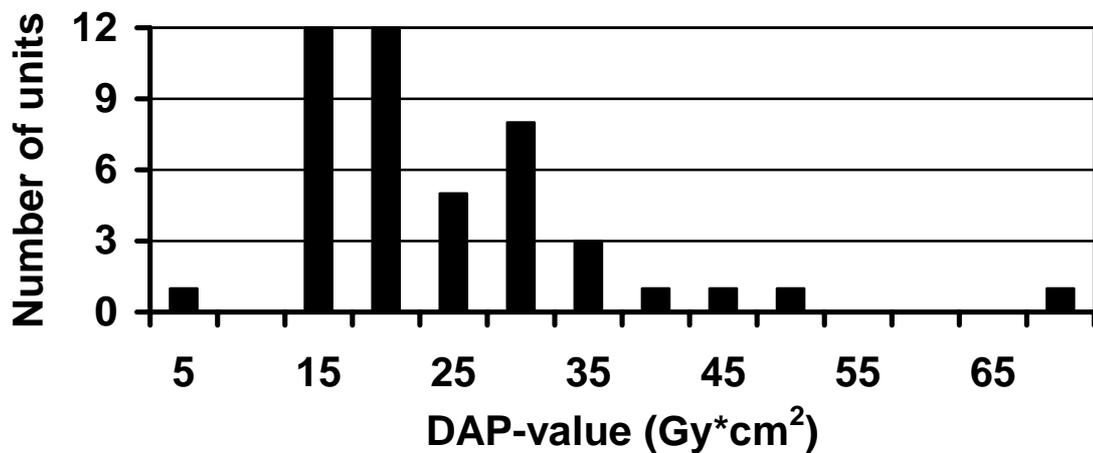
During the October meeting of the Main Commission in Albuquerque, NM, USA, a meeting had been arranged with the many experts living in that area. This took place at the famous Aquarium, where the Commission's hosts had kindly arranged a breath-taking demonstration of the art of Flamenco dancing.

ICRP Publications, etc., printed in 2002

ICRP. Radiation and your patient: A guide for medical practitioners. ICRP Supporting Guidance 2. *Annals of the ICRP* 31 (4), Elsevier Science Ltd, Oxford, UK.

ICRP. Diagnostic Reference Levels in medical imaging: Review and additional advice.. ICRP Supporting Guidance 2. *Annals of the ICRP* 31 (4), Elsevier Science Ltd, Oxford, UK.

ICRP. The ICRP Database of Dose Coefficients. ICRP CD-ROM 2. ISBN 0 08 044 1882. Distributed by Elsevier Science Ltd, Oxford, UK.



This diagram from 'Radiation and your patient' (ICRP Supporting Guidance 2) shows the distribution of patient dose-area product (DAP), for intravenous urogram examinations at 45 Swedish clinics. Distributions like this can be used to set Diagnostic Reference Levels for assessment of patient doses.

Contact Information

The address of the Commission's Scientific Secretary, Dr J Valentin, is

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E-mail: jack.valentin@ssi.se
Web site: www.icrp.org

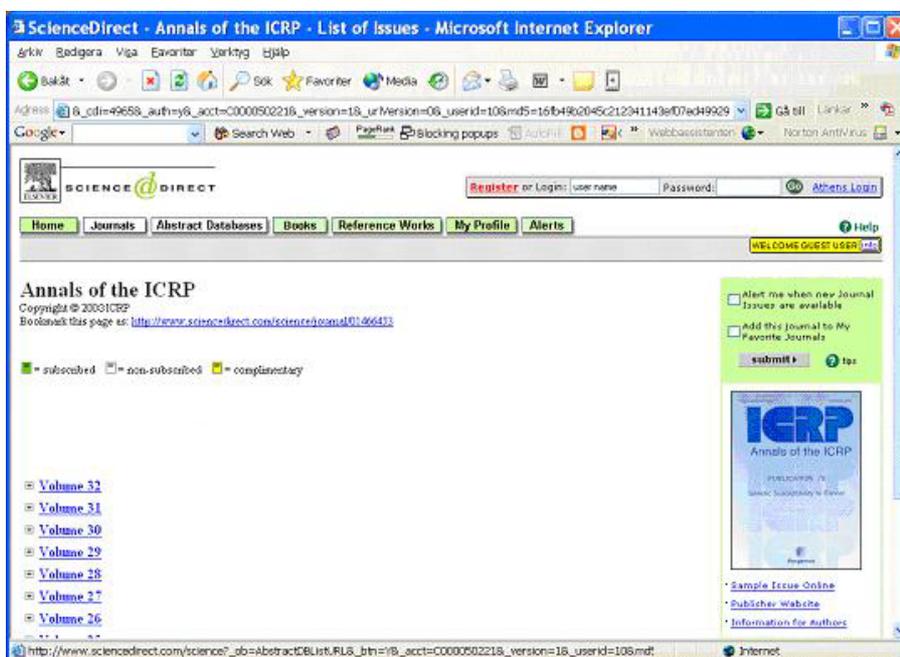
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The Annals of the ICRP are available electronically, for subscription and as pay-per-view downloads, at www.sciencedirect.com. Through the HINARI initiative, free access is being arranged for the 69 poorest countries in the world.

Organisations providing grants to ICRP in 2002

Unrestricted funds totalling about 269 000 US dollars were received from:

IAEA;
IRPA;
ISR;
OECD/NEA;
Australia: ARPANSA;
Canada: CNSC and Health Canada;
Denmark: NBH;
Finland: STUK;
Germany: Bundesmin UNR;
Iceland: GR;
Japan: JAERI and PNC;
Norway: NRPA;
Spain: CSN;
Sweden: Min. Env.;
Switzerland: Fed. Off. Energy;
UK: HSE;
USA: NIH and NRC.

CEC and France: IPSN, both regular contributors to ICRP, have indicated that unrestricted grants totalling about 45 000 US dollars which related wholly or partly to calendar year 2002 will be paid out in 2003.

No restricted funds were received in 2002.

Table 2. Composition of the International Commission on Radiological Protection and Committees, 2001 - 2005

MAIN COMMISSION

R H Clarke (*Chairman*)
R Alexakhin
J D Boice
R Cox (*Chairman C1*)
G J Dicus
A J González
L-E Holm (*Vice-Chairman*)
F A Mettler (*Chairman C3*)
Y Sasaki
C Streffer (*Chairman C2*)
A Sugier
B C Winkler (*Chairman C4*)
Z Q Pan

Emeritus Members:

D Beninson (*elected in 2001*)
H J Dunster
B Lindell
W K Sinclair
L S Taylor

Scientific Secretary:

J Valentin

COMMITTEE 1 (Radiation Effects)

R Cox (*Chairman*)
A Akleyev
M Blettner
J Hendry
A Kellerer
C Land
J Little
C Muirhead (*Secretary*)
O Niwa
D Preston
J Preston
E Ron
K Sankaranarayanan
R Shore
F Stewart
M Tirmarche
R Ullrich (*Vice-Chairman*)
P-K Zhou

COMMITTEE 2 (Doses from Radiation Exposure)

C Streffer (*Chairman*)
M Balonov
B Boecker
A Bouville
G Dietze
K F Eckerman
F A Fry
J Inaba
I Likhtarov
J Lipsztein
H Menzel
H Métivier
H Paretzke
A S Pradhan
J Stather (*Vice-Chairman*)
D M Taylor (*Secretary*)
Y Zhou

Cont'd next page

Table 2 cont'd: 2001-2005 members

COMMITTEE 3 (Protection in Medicine)

F A Mettler (*Chairman*)
J-M Cosset
C Cousins
M Guiberteau
I Gusev
K Harding (*Secretary*)
M Hiraoka
J Liniecki (*Vice-Chairman*)
S Mattsson
P Ortiz-Lopez
L Pinillos-Ashton
M Rehani
H Ringertz
M Rosenstein
C Sharp
E Vañó
W Yin

COMMITTEE 4 (Application of ICRP Recommendations)

B C Winkler (*Chairman*)
E d'Amato
D Cancio
M Clark (*Secretary*)
D Cool
J Cooper
T Kosako
J-F Lecomte
J Lochard
G C Mason (*Vice-Chairman*)
A McEwan
M Measures
M Savkin
J E Till
K Ulbak
W Weiss
Y Xia
C Zuur

