OCCUPATIONAL AND PUBLIC RADIATION SAFETY - A LEGACY

by

EDWARD P. GOLDFINCH

A thesis submitted to the University of Birmingham
for the degree of DOCTOR OF SCIENCE (DSc)

School of Physics and Astronomy
University of Birmingham
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DEDICATION

Dedicated to my late wife, Gill, my son and daughter, Richard and Clare and my grandchildren, Josie, Daniel and Lola.

ACKNOWLEDGEMENTS

There are many past colleagues and friends, too numerous to identify by name, who have unwittingly contributed to the content of this thesis and who deserve to be thanked. Of particular note are the past Editors-in-Chief, Consultant Editors and Members of the Editorial Board of the journal **Radiation Protection Dosimetry,** which features significantly in this thesis. In this context I would particularly like to thank Dr Joe McDonald (USA) and Professor Yigal Horowitz. (Israel), who persuaded the members of the Editorial Board of the time (2004), the top world radiation dosimetrists, to contribute scientific papers for publication in a Special Issue of the journal dedicated to my retirement as Executive Editor of the journal. Thesis **Reference Item 97** relates to the Special Issue**.**

I would also very much like to thank Professor Martin Freer of the School of Physics and Astronomy at the University of Birmingham for his help and support during the progress of my project and particularly his enthusiastic interest at the outset.

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ABSTRACT

An attempt has been made to give adequate justification for the application for a higher doctorate degree (DSc) by identifying contributions of originality and merit in three closely related fields, namely radiation dosimetry, the safe transport of radioactive materials and academic scientific publishing. The intent has been to demonstrate a sustained, consistent and substantial contribution to the advancement of knowledge in the profession of radiation protection, together with international authoritative recognition and standing over a period of many years.

In the area of radiation dosimetry the main contributions have been in the standardisation of aspects of thermoluminescence dosimetry and promoting clarity in radiation dosimetry understanding and terminology. I had the honour of giving the KEYNOTE address at the 14th International Solid State Dosimetry Conference in 2004.

In the area of safe transport of radioactive material contributions have been oriented towards to the developing and upgrading of the IAEA Regulations for the Safe Transport of Radioactive Materials, but in particular, in initiating and developing the Q system dosimetric modelling, leading to establishing essential quantitative control parameters for all radionuclides to be transported. The Q system still provides virtually all of the quantitative requirements of the international transport regulations, and national regulations in most countries of the world. The asests and rights of Nuclear Technology Publishing were sold to Oxford University Publiahing in 2004.

In the area of academic publishing major contribution have been the establishment of Nuclear Technology Publishing., the publishing of scientific text books and the founding and publication of three highly prestigious scientific journals, namely
a) **Radiation Protection Dosimetry,** arguably the lead world journal in the field of radiation protection. RPD will shortly enter its 40th year of publication, including 187 volumes, each of four issues, and having published papers from several thousand authors,
b) **The Journal of the ICRU** which has recently been sold on by Oxford University Press to another publisher.
c) The international journal **Packaging, Transport, Storage and Security of Radioactive Materials**, which reached its 25th year of publishing before publication ceased in 2015.

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LIST OF ABBREVIATIONS USED THROUGHOUT THIS DOCUMENT:

ALARA	As Low as is Reasonably (or Readily) Achievable
BNES	British Nuclear Engineering Society (Institution of Nuclear Engineers)
BNL	Berkeley Nuclear Laboratories, Gloucestershire, UK
BSI	British Standards Institute
CEGB	Central Electricity Generating Board.
HPA	Health Protection Agency (successor to the NRPB.
HPS	Health Physics Society
HSE	Health and Safety Executive
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
IRPA	International Radiological Protection Association
IEC	International Electrotechnical Commission
ICRU	International Commission on Radiological Units and Measurements
IJRMT	International Journal of Radioactive Materials Transport
ISO	International Organization for Standardization
ISSDO	International Solid State Dosimetry Organisation
JICRU	Journal of the ICRU
NRPB	National Radiological Protection Board
NTP	Nuclear Technology Publishing
OUP	Oxford University Press
PATRAM	Packaging and Transport of Radioactive Material (conference series)
PTSSRM	Packaging, Transport, Storage and Security of Radioactive Material (Journal)
RAM	Radioactive Materials
RAMTRANS	Radioactive Materials Transport
RPD	Radiation Protection Dosimetry (Journal)
SRP	Society for Radiological Protection
TLD	Thermoluminescence Dosimetry (or Dosemeter)
UKAEA	United Kingdom Atomic Energy Authority

OCCUPATIONAL AND PUBLIC RADIATION SAFETY - A LEGACY

INTRODUCTION

This submission thesis for a doctorate degree is somewhat unusual in that it does not derive from an academic or university research career, but is based principally on historical published applied physics papers. It is also unusual because it is based upon two different but closely related applied physics disciplines, namely radiation dosimetry at protection levels, and the safe transport of radioactive materials, together with and followed by a closely related career in academic scientific publishing. the latter resulting in the founding of three highly prestigious academic journals. Because the three careers were, in the main in parallel this led to a presentational dilemma for this thesis. A completely chronological presentation would have been confusing and would have lacked subject continuity. The chosen method of presentation, namely by subject, chronologically within each area does, however, result in some minor discontinuities

Rather than the normal process of submitting a highly specialised research project backed up by a history of related published papers, this submission relies upon demonstration of international authoritative standing and eminence in two parallel major scientific disciplines over many years, culminating in highlights in each field. In both cases a further career in scientific publishing, covering both fields has provided the radiation protection profession with seminal but authoritative series publications, including the international journal ***Radiation Protection Dosimetry***, the largest and arguably the best journal in the world in the field of radiation protection. The thesis includes about reference documents (referred to hereinafter as **Reference items**) the content of which is an essential part of the overall content of the submission. As a result, most of the scientific or technical content within the reference documents does not appear in the body of the text, although much of it is covered in the **Explanation Notes** for each **Reference Item.**

The situation is also somewhat unique in that one of the major tenets is that, if eminence can in any way be demonstrated by international scientific committee representation, then no other person could be identified as a national representative at the necessary expertise level from any country in both of the above disciplines in parallel. Because of the unusual nature of the application described above , a copy of my CV is also provided as a **Reference Item** at the end of Appendix 2 as background to this submission, showing the career development and achievements.

Appendix 1 gives a complete title list of published scientific work and other supporting documents identified as **Reference items**, that are included in Appendix 2, and which form the core content of this submission. The publications are listed in separate subject areas of the two principle disciplines, followed by relevant academic

publishing **Reference items**, essentially in chronological order in each section. The documents are listed under similar headings to those in the body of the submission. These are 'Introduction', 'Radiation Protection', 'Radiation Dosimetry (Solid State)', 'Radiation Dosimetry (General)', 'Nuclear Emergency Planning', 'Safe Transport of Radioactive Materials', 'General (Winston Churchill Fellowship)', Academic Publishing (General)'. and 'Books, CDs, DVDs and commissioned publications'. The documents in the Introductory section **(References Items 1, 2, 3 and 4)** were selected to show the international eminence and recognition achieved in the disciplines which form the basis of this submission. Most of the other section headings are self explanatory. Some of the contributions under the heading 'Academic Publishing (General)' are more related to the logistics of journal publishing than to science but have been included for completeness. Likewise the last section covers other publishing aspects such as text books, CDs, DVDs and other forms of special issues of journals, all contributing to the promotion of the science of radiation protection. All The titles listed in Appendix 1 are preceded by a numerical identifier. **Reference items** that are not readily available through normal library facilities are included in Appendix 2, each preceded by a blue titled divider page to aid access. Throughout this text, cross references to important **Reference items** in Appendix 2 are provided with the intention of highlighting the items of importance.

In any scientific discipline, great reliance is placed upon nomenclature and jargon, without which a full understanding of the discipline may be difficult. This is particularly true of the two major disciplines which form the roots of this submission. Commonly used words may take on very specific subject oriented meanings. To give but a few examples, in the RAM Transport section, the words 'package', 'move' and 'transport' have very specific meanings, the difference between 'move' and 'transport' relating to the difference between controlled workplace areas and uncontrolled areas in the public domain'. In the Radiation Dosimetry section the words 'equivalent' and 'quantity' are used in a way such that 'dose equivalent' is a completely different quantity to 'equivalent dose'. It is hoped that the **Explanation Notes** provided for each item in the list may help to get round some of the potential problems.

BACKGROUND

My career in radiation protection followed naturally from my MSc (Radioactivity) conferred in 1956 at the University of Birmingham. The various stages of career progression are detailed in **Reference Item** 97 (Curriculum Vitae) and can be referred to if necessary and some background early experience is provided as a prequel to the main sections of this submission.

My first appointment was as a theoretical physicist in the newly formed Nuclear Engineering Department at H.M. Hobsons Ltd, Wolverhampton, together with five other graduates in physics, chemistry, engineering and mathematics, all from Oxford or Cambridge Universities. This appointment resulted directly from me volunteering to

visit the company on behalf of the University of Birmingham MSc (Radioactivity) course members to find out what the company had to offer. H.M. Hobsons was a very successful precision engineering company working mainly for the military aircraft (e.g. TSR2) and mining (e.g. hydraulic pit props) industries and had decided to expand into the nuclear industry. The six graduates were initially given no terms of reference or effective supervision and were left to resolve any issues presented from within any part of the company. The nominal line manager was an experienced non-graduate engineer with no knowledge of the nuclear industry. His main function was in the area of quality control testing, (prototype and production testing), and he made best use of his newly appointed graduates on his test rigs. Opportunities also arose to liaise with design engineers and design draftsmen and on the machine production lines with much fundamental engineering knowledge accrued.

After the first few weeks the Head of the Nuclear Engineering Department decided that it was necessary to appoint a Section Leader over the group of graduates and I was so appointed. Ironically, my first management task was to inform my colleagues of the appointment since the Head of the Nuclear Engineering Department did not do this! Apart from this first few weeks of my working life, I never had any other time without managerial responsibilities. After about two years, and as new contracts with the UKAEA were drawn up, and also to acknowledge the increase in work and status within the company, I was appointed as the Nuclear Technology Group Leader, alongside two long standing Group Leaders covering the aircraft work. In making this promotion the company Technical Director had suggested a title of Chief Scientist but, rightly or wrongly I suggested that this may not be an appropriate title for the position or for my age at the time.

My group undertook the technical safety assessments of the designs of research reactor control and in-pile experimental equipment manufactured for the UK Atomic Energy Agency (UKAEA) establishments, but also including Dido/Pluto type heavy water reactors in Australia, Japan, and Italy. As Group Leader I was also a co-opted member of the Dounreay Reactor Safety committee for a period. As such, on one occasion, my neutron distribution calculations showed that the design of one of the Dounreay designed reactor plutonium test rigs would have caused reactor prompt criticality, if it had been built and used.(The project was immediately cancelled). Around that time the UKAEA and the nuclear power industry were considering the use of beryllium as a fuel cladding material for the Advanced Gas Cooled Reactor fuel rods. Negotiations for the design of research facilities were well in hand until the enormity of the toxicity problems was fully appreciated. However, the Hobsons precision engineering expertise proved to be lucrative for many years in using a highly accurate and specialised crush grinding process to produce the stainless steel AGR fuel cans.

Apart from work for the UKAEA Hobsons designed and installed the shielded cave and cell system and remote handling equipment for the Central Electricity Generating Board (CEGB) at the Berkeley (Gloucestershire) Nuclear Research Laboratories, for

which my group undertook all aspects of radiation safety and shielding design. This included an innovative torsion bar device to X-ray highly irradiated reactor fuel elements. Although Hobsons had then recently purchased an Elliot 803 analogue computer, the size of a large living room and then costing £30,000, but with less actual computing power and far less reliability than the cheapest of modern mobile telephone, it was reserved for aircraft design work and my team could not make use of it for shielding calculations.

RADIATION PROTECTION

After about two years in the interesting and challenging position as Group Leader at Hobsons, the UK government cancelled the TSR2 military aircraft design, one of the main income streams for Hobsons, and as I was unsure of the future of the company I decided that it was time to move on. I decided to move to the nuclear electricity supply industry to make best use of my qualifications and experience to date. I applied for and was appointed to the post as the Station Health Physicist (Head of Health Physics) at the Central Electricity Generating Board (CEGB) Dungeness Nuclear Power Station in Kent. As Head of the Health Physics Department during the construction of the nuclear power station my initial responsibilities were to set up and recruit for a department of some 50 professional and industrial staff to cover all aspects of radiation safety for the operational staff and members of the public. This included personal radiation dosimetry, radiation instrumentation, workplace and environmental monitoring. radioactive waste management and emergency planning, as well as establishing the training protocol for all of the 500 or so professional engineers and industrial staff in the essentials of radiation safety, almost all of whom initially had no knowledge of nuclear reactors or radiation protection. The Fleming Report following the Windscale reactor accident in 1957, gave the station health physicist the same grade status as other heads of departments, but higher than the shift duty managers, and also gave the right of direct access to the power station manager (bypassing his deputy) if ever necessary. At the age of 27 I was the youngest head of department within the whole of the commercial nuclear industry, (and probably the whole electricity supply industry), and would be working alongside engineers with extended experience in the electricity supply industry, mostly from conventional power stations. Once the reactors were commissioned and operational, my staff included 6 professional health physicists appointed at various grades including a deputy head, covering all of the routine work necessary for the radiation safety of staff members and the public, including the organisation of and implementation of major emergency plan exercises.

Prior to the start-up of the reactors, baseline environmental background radiation data had to be established, and the measurements led to techniques for identifying timelines for nuclear bomb tests prior to the international ban on testing. One of the early responsibilities was that, as a member of the formally appointed Local Liaison Committee, to give a presentation at each annual meeting. The committee comprised national and local government officials and local dignitaries, senior CEGB directors and

local power station heads of departments. Fortune was on my side following my first presentation because the CEGB Director of Health and Safety approached me after the presentation and asked if I undertook a lot of public speaking. This gave me a major confidence boost for the future.

One of the most important early tasks was to establish radiation safety control procedures, for both internal and external radiation doses, for a wide range of operational and maintenance functions in accordance with the established CEGB Radiological Safety Rules. The rules gave no routine executive authority to health physics staff. Their role was to provide formal advice to the shift engineering manager. All of the shift managers had extensive experience at conventional fuelled power stations, and certainly for the early CEGB power stations such as Dungeness, little or no nuclear power station experience. They had to be educated and trained to a point where they could be formally examined and appointed as 'Senior Authorised Persons' authorised to accept and implement formal health physics advice in the form of Work Permits (see below). Contrary to practice at earlier CEGB nuclear power stations, I ensured and insisted that I was given the authority to make the appointments when, and only when each had achieved a satisfactory knowledge.

I made significant contributions to the regular monthly meetings of station health physicists from each of the nuclear power stations, at the CEGB HQ in London. All of the other CEGB health physicists had previous extensive health physics experience within UKAEA establishments before joining the CEGB.

Once the reactors were commissioned and fully operational around 1965, opportunities occurred for attending and making presentation at national and international scientific conferences **[See Items 5- 9]** My general reading in the area of radiation protection was hampered by the wide range of published journals which included the odd relevant paper. I felt that a specialist abstracts journal would be very useful and decided to publish one as a hobby (See below for detail)

Around this time I was elected onto the Council for the Society for Radiological Protection (SRP), where I served for many years in various capacities including Scientific Secretary for the SRP International Conference in Malvern in 1989, before becoming President in 1992/3. The Society now has a Royal Charter.

In 1973 I was promoted to the post as Senior Health Physicist at the CEGB Headquarters in London, with coordinating responsibilities over the company for personal dosimetry (internal and external), radiation instrumentation, nuclear emergency planning **[see Reference items 32-34],** company radiation safety rules and specifically including transport of radioactive materials. The role was essentially a coordinating function over radiation protection practices at all the CEGB nuclear facilities, including nuclear power stations and research laboratories, and industrial radiography at conventional power stations.

At that time my responsibilities included the development and control of company wide radiological safety rules to assure compliance with national legislation. **[see item 10].** The electricity industry had well developed safety philosophies for electrical and mechanical hazards, the underlying principle being work permits backed by doubly controlled physical isolation. The control of most radiological hazards requires a different philosophy but one which must not cause conflict with conventional hazard control, and take account of professional radiological advice for each permit issued. The Safety Rules and Code of Practice cover external and internal personal radiation control by means four principles, namely working area controls, radiation source controls, radiation measurements and documentation. The Ionising Radiations Regulations (1985) introduced significant changes to practices requiring a complete review of the CEGB safety Rule structure and content,

It was from this time onwards that opportunities arose to give papers at international conferences and to publish in the open literature. International committee work followed, putting me in contact with many high level international radiation protection scientists, which later proved to be invaluable i the development of my international recognition.

One of my major corporate responsibilities was for personal dosimetry for the whole of the CEGB prior to privatisation and for Nuclear Electric, after privatisation. This entailed the establishment of a fully computerised dose record system, drawing together past records held at individual sites and setting up protocols for recording both external and internal radiation doses for all classified workers on an ongoing basis, in order to comply with statutory requirements. The paper **[Reference Item 25]** describes the development and operation of the system. The classic problem of any system computerisation is the interface between the software engineers and project commissioning manager, where the latter is ultimately accountable for success or failure of the project.

In 1981 I was asked by the IAEA, through the Dangerous Goods Branch of the UK Department of Transport, to present a paper on the radiation protection philosophy in the IAEA transport regulations, one of three papers in total, to the Japanese Nuclear Engineering Institution in Tokyo with an audience of about 1,000 members) **[see Reference Item 11)**]. The other two papers were presented by the Head of the IAEA Transport Division and his deputy. An unusual aspect was the use of consecutive translation into Japanese rather than concomitant translation. An unfortunate consequence was that all three papers overran by 50%.

1981 celebrated the 25th anniversary of the foundation of the Society for Radiological Protection(SRP). The fourth SRP International Symposium entitled RADIOLOGICAL PROTECTION - THEORY AND PRACTICE was held in Malvern (UK) to celebrate the event and I chaired the Scientific Programme Committee edited the Proceedings.**[see Reference Item 17]**.

During my time at the company HQ there were very significant developments in radiation protections standards and legislation both at international level (ICRP-Recommendations,IAEA Transport Regulations and Basic Radiation Protection Standards, Europe-Radiation Protection Directive), and national level-(Ionising Radiation Regulations under the Health & Safety at Work Etc. Act). My responsibilities entailed very significant committee representation requirements on behalf of the CEGB on national committees, (e.g. ionising radiation legislation) and on behalf of the UK on international committees, particularly covering radiation dosimetry (internal and external) and transport of radioactive materials). Other than RAM transport which is dealt with later, examples over many years included:

1) CEGB representative on HSE Ionising Radiations Regulations development committees
2) CEGB Expert on BSI NCE Thermoluminescence Dosimetry Standards Working Group and later Chairman
3) UK representative on EU committees developing the EU Ionising Radiations Directive
4) UK representative on International Electrotechnical Committee (IEC) sub committee 45B and Thermoluminescence Dosimetry Working Group (e,g. IEC/SC45B/WG1)
5) UK representative on the International Standards Organisation (ISO) sub committee SC2 and Working Group on Thermoluminescence Dosimetry (ISO/SC2/WG7) and later Chairman/Convener
6) Session Chairman at several of the International Radiation Protection Association (IRPA) four yearly Congresses including those held in Madrid, Hiroshima, Washington, Montreal etc.
7) Board Member of the International Solid State Dosimetry Organisation (ISSDO)
8) Member of the Scientific Programme Committee for the Solid State Dosimetry Conference series between 1984 and 2002

In anticipation of the privatisation of the electricity supply industry, in 1987 I was appointed as Corporate Health Physics Services Manager for the CEGB and this post continued after privatisation to Nuclear Electric (in other words the whole of the commercial UK nuclear generating industry at the time). My involvement in this radiation protection committee work continued throughout and until around 2005 demonstrated my eminence in the field of radiation protection.

RADIATION DOSIMETRY (Solid State)

One of major areas of my interest was thermoluminescence dosimetry, hereinafter abbreviated to TLD, and all other associated solid state variations. The interest started at Dungeness in the mid 1960s, where day to day personal and environmental radiation dose measurements used the technique to supplement the conventional film badge

measurements. The technology as a routine commercial technique was not far from its infancy at that time, with minimal standardisation in terms of dosemeter shapes, sizes and TL materials For example there was no commercial TL dosemeter for measuring extremity (finger) dose and so I designed and arranged for the tooling and production of a primitive finger ring device (probably the first in the world!). Around the same time I was nominated as the CEGB representative on the newly formed BSI/NCE2 TLD standards working group and subsequently served as the UK expert for many years on the International Electrotechnical Commission (IEC) working group set up to formulate, develop and finalise the standard covering TLD systems for the measurement of personal and environmental radiation doses. (A TLD system is defined as the combination of dosemeter and reader) The standard **[see Inference Item 22]** was first published in 1991 and updated in 2006. IEC standards are conventionally reviewed every five years but I am unaware of any further review since 2006. The current status is registered as replaced/withdrawn but I have been unable to determine the actual current situation or able to obtain a copy of the latest version.

In the late 1980s the intended division of standardising responsibilities was that the International Standards Organization would develop a standard for TL dosemeters and the IEC a corresponding standard for TLD readers. Dr Busuoli took the lead in the IEC group **[see Reference items 18 and 19]** and. I took the lead in the ISO working group and chaired it over several years to produce the dosemeter standard for extremities and eyes **[see Reference Item 21].** A copy of the British Standard is provided. (By convention, British Standards are identical to the corresponding ISO standards)

RADIATION DOSIMETRY (GENERAL)

Of necessity some of my scientific committee work required in depth knowledge of theories and developments in the fundamentals of radiation dosimetry for all types of radiation and energies. The International Commission on Radiation Protection (ICRP) and the International Commission on Radiation Units and Measurements (ICRU) each had roles to play. In short the ICRU makes fundamental recommendations on radiation protection and the ICRU interprets on how to make the necessary measurements. Over my working life major changes have taken place, even including the major change to SI units. (viz from roentgen, rad, rem, roentgen etc. to grey and sievert etc., with corresponding changes in symbols ('R' to 'H' and then to 'E'). Much confusion had reigned regarding radiation dose quantities, names and units. My situation as Executive Editor of the journal ***Radiation Protection Dosimetry*** at the time enabled me to use the journal to help to disseminate the complex issues, including expressing my own views in the form of Editorials. **[See for example Reference Item 25]** where attention is drawn to the potential for confusion in the ICRP 1990 recommendations, resulting from changes to existing terminology, the addition of new terms and some changes to radiation weighting factors. No time scale for implementation of the changes had been set, leaving this to individual national legislators. The potential for confusion, by adding

a dose quantity called equivalent dose to a scheme already including a quantity called dose equivalent is self evident. The lack of any set point in time for the changes to become effective meant that a lengthy overlap period could exist in the scientific publishing world. As Executive Editor for ***Radiation Protection Dosimetry***, with submitting authors originating from around the world, I was very conscious of the problems. Also relevant are publications **[Reference items 27-31]**, all relating to dose quantities, names, units and symbols.

The final major cross reference in this section is to **Reference Item 32**. This paper was the Invited Keynote Paper at the 14th International Solid State Dosimetry Conference held at Yale University in 2004 and, as such, was a highlight in my career in radiation safety, following, as it did, Keynote Papers in previous conferences given by the top world solid state dosimetry academic scientists. The paper describes the reasoning behind, the foundation of, and the development of, the journal ***Radiation Protection Dosimetry,*** which has now (2020) reached more than 185 volumes, each of four issues averaging 150 pages (including Special Issues), giving a total to date of more than 110,000 text pages over 40 years. Oxford University Press, the publishers, have recently told me that currently some 390 papers per year are published and given an estimate that about 1,400 authors have published in the journal over the last five years, some several times. The detail concerning the founding of the journal can be found later in this submission. **[See also Reference Item (97)]**.

NUCLEAR EMERGENCY PLANNING

Emergency planning for the CEGB nuclear power station sites was one of my corporate responsibilities from 1973 to 1990, following on from earlier the requirements at one site, namely Dungeness Nuclear Power Station. Three papers **[see Reference items 33, 34 and 35)]** describe and discuss the philosophies and detail incorporated into the plans, which, whilst fundamentally consistent within the company, must take account of local factors at each power station. Plans are regularly tested by means of full scale exercises, which inevitably involve the Corporate Health Physics Services Manager, as would any real accident. Planning had to take care of the different postulated failures and resultant release of radioactive materials from effectively three types of reactor, namely steel and concrete pressure vessel, MAGNOX fuel canned gas cooled reactors and the concreted pressure vessel advanced gas cooled (AGR) reactors. At the time of my involvement the Sizewell water cooled reactors (PWR) had not been built. Planning must take account of the possible consequences of a 'maximum credible accident'.

TRANSPORT OF RADIOACTIVE MATERIALS

At the point in my career that I moved to the CEGB headquarters (1973), I took on responsibility for the company policy regarding the safety assessment of the transport of

radioactive materials, especially spent irradiated fuel from the CEGB nuclear reactors, dispatched for reprocessing to Windscale. This entailed assessment of the safety analysis of the designs of irradiated spent fuel transport flasks and close liaison with the Dangerous Goods Branch of the UK Department of Transport. Within a few months of my first contact the head of that branch invited me to join the UK team, as industry representative, on the International Atomic Energy Agency Advisory and Regulatory Panels developing and updating the international regulations. These panels included representation from many of the United Nations Member States, almost exclusively from government departments or agencies. It was rare for any IAEA Member State to nominate a representative from a user industry. Representation in the main was from government or regulatory bodies. My position and experience resulted in extensive national and international committee work in the field of RAM Transport over many years including:

1) CEGB representation on the United Kingdom Atomic Energy (UKAEA) led UK Radioactive Materials (hereinafter RAM) Transport Committee.

2) UK representative and UK Expert on many International Atomic Energy Agency (IAEA) Advisory Groups and Regulations Committees developing the IAEA International Regulations for the Safe Transport of Radioactive Materials. A listing is provided to demonstrate the extent of my involvement in developing the international transport regulations, in particular as leader of the radiation protection group at the third meeting of the Advisory Group for the Comprehensive Review of the IAEA Regulations for the Safe Transport of Radioactive Materials (AG-406 in November 1983). The IAEA regulations, of course, form the basis of all concomitant national regulations in IAEA Member States, (almost every country in the world)
3) Session Chairman at many of the three yearly international Packaging and Transport of Radioactive Materials (PATRAM) International Conferences held around the world. **[see Reference Item 47].**

My involvement in the IAEA work in the area of transport regulations again continued throughout and until around 2005, and again demonstrated my eminence in this second field.

The first IAEA Transport Regulations had been issued in 1961, followed by revisions in 1967 and 1973. Some of the quantitative requirements incorporated into the regulations had been derived, principally in the UK, on a somewhat pragmatic basis, particularly the limiting quantities in the various types of transport packages. (identified as A1 for non dispersible package contents such as sealed sources and A2 for dispersible materials). Under a contract with the IAEA, staff at the CEGB nuclear Research Laboratories (BNL) at Berkeley (Gloucestershire) had been working on the radiological consequences of releases from irradiated fuel transport casks following potential accidents. It seemed logical at the time to extend this work and to develop a system of radiological modelling to evaluate A1 and A2 for a very wide range of individual

radioisotopes. In this context my published work, together with Dr H.F. Macdonald (now deceased) from the CEGB Berkeley Nuclear Laboratories, formed the basis for all the quantitative RAM package limits in the IAEA transport regulations. The package contents limits and external dose rate limits were calculated using pragmatic behavioral models covering both routine transport and accident conditions, and became known as the Q System. The system, with some updating, still forms the basis of the current international regulations and is due for further review and expansion at an IAEA WG meeting in June 2020, to which I have been invited as the 'historical founder'. A number of published papers that are provided relate either directly or indirectly to the Q system. **[See Reference items 36, 49, 41, 45, 48, 49, 53 and 67]**.Of these **Reference Item 49** results from a Research Agreement (2291/RF/CF) between the IAEA and the CEGB Berkeley Nuclear Laboratories (BNL) in the UK). The original purpose of the agreement was to research data on individual and collective radiation doses associated with the routine transport of irradiated nuclear reactor fuel. **Reference Item 67** covers a brief review of the Q system as applied to A1 and A2 values but also covers a major expansion relating to calculation of Exemption Values for individual radionuclides

At that point Dr Macdonald was the research officer involved at BNL. However, because of my involvement with the development of the IAEA transport regulations and particularly within the IAEA Co-ordinated Research Programme, as the UK representative, the research agreement was extended to cover the derivation of A1 and A2 values for a very wide range of radionuclides, and became known as the Q system. At that point I formally took the lead role. The IAEA report covering the covering the summaries of all of the Research Contracts and Research Agreements is identified as the Co-ordinated Research Programme (IAEA-TECDOC 375). Relevant extracts are provided including the CEGB Research Agreement Summary Report covering both its original purpose and the Q system. The original document is provided in the form of Appendix 1 to IAEA SAFETY SERIES No 7 (1985) entitled EXPLANATORY MATERIAL FOR THE IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS, followed by the introductory pages of an updated version prepared by an IAEA Working Group in 2012 **[see Reference items 53 and 54]**

In 1978 I was invited to chair the opening session of this conference (held in Las Vegas), in place of the Head of the IAEA Transport Safety Division (G.E. Swindell), who was unavoidably unavailable. My introductory remarks are attached to the typescript of my submitted paper. [see **Reference Item 37**]. Later that year, as a Consultant to the IAEA I was asked to prepare a position paper on the question of the allowable activity release levels from Type(B) and Type B(U) packages and in particular to review the factor of 1,000 difference between the allowable releases between the two types of package. The recommendations thus discussed and approved by the Advisory Group were provided in tabular form **[See Reference Item 44]**. It was rare or even unheard of for a representative from industry to be nominated as the lead expert in the UK team and appointed as a Consultant to the IAEA, but the Head of the UK

Department of Transport Dangerous Goods Branch did so in 1981 because of my expertise in both radiation protection and the transport of radioactive materials.

Various other related papers are also provided covering a wide range of topics within the radiation protection aspects of the safe transport of radioactive materials. **[See Reference items 42, 43, 50.51, 52. 56. 57, 58, 59, 60, 52, 64 and 66].**

GENERAL (WINSTON CHURCHILL FELLOWSHIP)

I was awarded a 1970 Winston Churchill Travel Fellowship to travel to and around the USA and Canada in the field of radioactive waste management, within the overall category of 'waste disposal'. At that time it was entirely up to individual Fellows to make all the arrangements for visits to relevant establishments to cover the scope of their intended studies. To this end I was greatly assisted in obtaining detailed contact details for each of the establishments that I wanted to visit, by the Executive Editor of the journal Nuclear Engineering. During my Fellowship I visited almost every nuclear facility in the USA over a period of three months, including Federal Research Laboratories (such as Los Alamos, Fermi etc.) and nuclear power stations, both operational and under construction, giving seminars and lectures at most of the locations that I visited, describing UK reactor designs and practices, in return for the information for my Fellowship. The US nuclear programme was based on water cooled reactors, whereas the UK programme was based upon gas cooled reactors and so the interchange was useful on both sides. **[see Reference items 68 and 69]**. I made an 8 mm ciné film covering my travels and visits. This was shown publicly on my return. I found my Fellowship to be so useful in later life that 1990 I sponsored another Churchill Fellow (20 years after mine) and in 2020 I will be sponsoring another one to mark 50 years.

ACADEMIC PUBLISHING (GENERAL)

In 1974, mainly because of my reading in the radiation protection published journals I found that there was no published abstracts journal to facilitate searches. I therefore decided, purely as a (hopefully lucrative) hobby to publish such a journal. I had experience in preparing individual abstracts in other fields. I thus established Nuclear Technology Publishing (NTP), which was a trading name only. I contacted all of the sources of published information that I had used for my own studies (journal publishers, national laboratories etc.) for regular free copies of all relevant journals and laboratory reports and permission to publish the abstracts in my specialist journal. My extensive listing of international contacts was very useful in this context. I used various local typists to type these into a standard format, designed a cover and made arrangements with a local printer to print copies. I advertised the forthcoming journal to be entitled **APPLIED HEALTH PHYSICS ABSTRACTS AND NOTES** in other journals. I set a subscription cost of £14 per year in the UK and $US35 outside the UK. At that time the

exchange rate was 2.5:1, compared with today's rate not far from parity. The intention was to publish 4 issues per year. To my great relief the idea worked and the subscription level soon reached over 400. This was well before the current digital electronic era with the use of computers, which meant a great deal of manual tasking during many evenings and at weekends. At that time I was commuting daily between Ashford in Kent and London. Publication continued for many years until around 1990 when the journal was re-launched and retitled as ***Radiation Protection Abstracts.*** but eventually internet access removed the necessity for hard copy abstracts journals and the journal was withdrawn from publication. It had served a very useful purpose until overtaken by modern technology, as happened with all hard copy abstracts journals.

It had became clear for some while that published articles in the area of radiation protection dosimetry appeared over quite a wide range of individual journals. I investigated the possibilities of publishing a specialist journal covering this subject matter which was to be entitled ***Radiation Protection Dosimetry.*** My international committee work, especially in thermoluminescence dosimetry,had put me into contact with most of the top scientists in all areas of radiation protection, and particularly the various aspects of measuring and assessing radiation dose, both in internal and external dosimetry. I assembled a list of some 20 of the top scientists in the world in the area of ***Radiation Protection Dosimetry***, and who had all enthusiastically agreed to form the Editorial Board. Most were academics, many at professorial level. They were the top people in the UK, USA, Canada, USSR, China, Japan, Germany, France, Italy, Poland, Czechoslovakia, Hungary and Australia, most of whom I knew from my representational activities. I selected an Honorary Editor in Chief and I gave myself the post as Executive Editor (and publisher). The intention was to establish an efficient refereeing system as independent from the publisher as practical, but giving me the logistical control to minimise processing and publication delays. The refereeing policy of the journal has always required two members of the Editorial Board to referee each submitted paper. In addition to providing detailed comments on the text, the referees are asked to give advice in the form of one of four options, namely "accept" (as it is), "amend" (make minor amendments in the expectation that it will then be acceptable), "revise" (major changes necessary) or "reject". As Executive Editor, my role was to act as a funnel through which all this information would pass. If both referees gave the same recommendation I would implement that. If there was a difference of opinion between the referees, I would refer to the Editor-in-Chief for guidance. All papers requiring "revision" are returned to the referees and to the Editor-in-Chief after revision for further review, with the Editor-in-Chief making the final decision on the outcome, after the authors have made the necessary changes. These procedures were set up on the foundation of the journal because of my unique situation of owning the journal and acting as its Executive Editor, with a potential conflict of interests. I wanted to be sure that the journal was, and was seen to be, a truly scientific journal. As the journal expanded both in terms of the number of submitted papers and the subject area, I decided to appoint three Consultant Editors to take on much of the work previously done by the Editor-in-Chief. They covered external dosimetry (G. Dietze, Germany now deceased) internal dosimetry (J Rundo, USA, now

deceased) and solid state dosimetry (Y. Horowitz, Israel, still in post). A further Consultant Editor covering radon was appointed later. At the time of sale to OUP, the number of medical papers was starting to increase and now (2019 under OUP) is one of the main subject areas. Under OUP the refereeing system is essentially the same but the Editor-in-Chief also takes on the work I did as Executive Editor. It should be borne in mind that all of the positions mentioned above are honorary but whilst I owned the journal no scientist ever declined an invitation to join the Editorial Board.

For a significant number of years in the early days of the journal, there were no PCs, no internet and no E-mail. Everything was done by typewriters, a few word processors and the postage system, although I was able to make use of an AMSTRAD Word processor with its integral LOCOScript software. Some while later the LOCOScript database/word processing software package for PCs was introduced and from that time onwards NTP was very reliant upon its wide ranging database capabilities. It was used for subscription control, sales control, financial accounting, and manuscript progressing, and at a later time for web-site updating (see below).

At the outset the Editorial Board members contributed the papers for the first issue of the new journal ***Radiation Protection Dosimetry***, and which was published in early 1981. Initial promotion was achieved by sending complimentary copies to the 400 or so subscribers to the above mentioned abstracts journal, covering a very large proportion of the relevant establishments world wide. Initially one volume of four issues per year was published but the journal became so popular that this increased to five volumes per year by about 1995, including special issues covering papers on specialist radiation protection topics..

The scope broadened with time into all aspects of radiation protection including medicine but limited to protection aspects (i.e. not therapy). It became necessary to increase the size of the Editorial Board and to appoint 4 Consultant Editors to assist the Honorary Editor-in-Chief as detailed above. By the year 2000 ***Radiation Protection Dosimetry*** was the biggest, (and arguably the best) journal in the world in the field of radiation protection. The logistics development of the journal can be seen in **Reference items 70-85.**

In 1990 I took early retirement from Nuclear Electric to concentrate on the journal publishing and repeated the processes used to initiate ***Radiation Protection Dosimetry*** by starting the **International Journal of Radioactive Materials Transport**, having a similar range of contacts for an Editorial Board as with RPD. However, in this case, there was some bias towards commercial aspects as opposed to academic. Because of this, there was less peer pressure on authors to publish papers in the open literature because of commercial confidentiality and although the journal was successful it did not flourish to the same extent as RPD. Initially an Honorary Editor-in-Chief was appointed but on his retirement I acted as Editor-in-Chief as well as Executive Editor. A good flow of submitted papers was achieved by suggesting to authors of PATRAM (see

abbreviations list above) papers to prepare and submit expanded versions of their conference papers. In 2002 the scope of the journal was widened to include both storage and security of RAM transport in line with the profession interests. It was re-titled to become **Packaging, Transport, Storage and Security of Radioactive Material**.

In 1995 I set up an internet web site for Nuclear Technology Publishing at a time when few publishers had web sites. At that time there were very few commercial web site builders and little software to assist. The web site was built from scratch using a primitive framework given to me by a friend. The web site construction with all of its requisite file interlinking utilised the LOCOScript software capabilities extensively. All of the information to be displayed on the web site, such as paper titles, author details, journal issue identity, abstract texts etc., was entered into a database. The HTML display codings and interlinking requirements were incorporated into merge extract electronic files and after merging with the database the resulting electronic file was exported to ASCII format and the file extension changed to "html". The resulting files would then be uploaded to the web directory structure and uploaded to the NTP web site. At an early stage the site included author and subject indexes [see for example **Reference Item 92]**, abstracts of all articles published to date in each of the NTP journals. At this time a LOCOScript database of about 65,000 individuals and organisations with radiation protection interest had been accumulated. For marketing purposes a point-of-time copy of the web site was put onto CD and distributed to the 65,000 addresses on an address database covering worldwide research laboratories, relevant government departments, universities, nuclear power stations and, of course many individual radiation protection scientists.

By 1999 ***Radiation Protection Dosimetry*** was available on-line but on-line manuscript submission was not made available until Oxford University Press owned the journal **[see Reference items 82 and 83].**

BOOKS, CDs, DVDs, and SPECIAL COMMISSIONED PUBLICATIONS

The reputation of Nuclear Technology Publishing in the field of radiation protection was such that I was approached by potential authors to publish scientific text books. Over the years we published 4 books **[see Reference items 86-89]**. In addition I was approached by the International Commission on Radiation Units (ICRU) to publish their series of reports. As a consequence we commenced publishing the **Journal of the ICRU** on behalf of the Commission in 1998 **[see Reference Item 99(93)]**. To further promote the journals, both from the point of view of encouraging subscriber numbers and manuscript submissions, a variety of compilation CDs and DVDs were prepared and marketed covering cumulative sets of back issues and the various sets of specialist topics issues of the journals including all of the international Solid State Dosimetry conferences from 1989 to 1995 **[see Reference items 90-95].**

By the early part of 2003 I was almost 70 and my wife's health was failing. It would have been impractical to attempt to employ somebody to take over all my roles within NTP since I was personally fulfilling every scientific and technical aspect of the venture, including being Executive Editor, undertaking the regular web site updating and on-line article access and marketing. I had three full time clerical employees and used freelance copy editors and proof readers. I decided to sell to sell Nuclear Technology Publishing and very soon found that there was strong interest from most of the major science publishers, including the Institute of Physics Publishing (IOPP), Elsevier, Taylor and Francis and Oxford University Press. The purchase Oxford University Press was completed at the end of 2003. Up to that point 105 volumes of four issues of ***Radiation Protection Dosimetry***, 12 volumes of the transport journal, 5 volumes of the ICRU journal, more than 25 volumes of the abstracts journal and four text books had been published.

The sale to OUP excluded the journal **Packaging, Transport, Security of Radioactive Materials** because it was outside the range of OUP journals. I continued with this journal until it was purchased by Maney Publishing in 2005. Because the trading name Nuclear Technology Publishing and all of its rights had been part of the sale to OUP, I established the trading name RAMTRANS Publishing for the purpose of publishing the journal. **[See Reference Item 72A(109)**

OTHER HIGHLIGHTS OR ACHIEVEMENTS

I was elected as an Associate (in 1960) and Fellow (in 1966) of the Institute of Physics at the minimum possible ages at the time 26 and 32, respectively.

I was elected as President of the Society for Radiological Protection for the year 1992/93. During my year as President I initiated the process, with the Privy Council, for the grant of a Royal Charter to the SRP. This was eventually achieved in 2007. I also initiated the significant change from having the AGM and annual scientific meeting in a single day into making it a two or three day annual event with great success.

I am very proud of the Commemorative issue of ***Radiation Protection Dosimetry*** published in 2004 on my retirement from my academic publishing career, which included papers from most of the members of the Editorial Board and I have enclosed a copy in support of my application **[see Reference Item 97]**. I am now a lifelong Emeritus Member of the Board.

Also in 2004 I presented the Keynote Invited Paper at the 2004 International Conference on Solid State Dosimetry, held at Yale University, an honour only previously granted to the top academics in the field.

In 2011 I was granted the honour of being made an Honorary Fellow of the Society of Radiological Protection, which by that time had been granted a Royal Charter.

SUMMARY and CONCLUSIONS

This thesis is my justification for the application for a higher doctorate degree (DSc) by identifying contributions of originality and merit in three closely related fields, namely radiation protection dosimetry, the safe transport of radioactive materials and academic scientific publishing. The intent has been to demonstrate a sustained, consistent and substantial contribution to the advancement of knowledge in the profession of radiation protection, together with international authoritative recognition and standing.

In the area of radiation dosimetry the main contributions have been in the field of thermoluminescence dosimetry and promoting clarity in dosimetric understanding and terminology. I had the honour of giving the KEYNOTE address at the 14th International Solid State Dosimetry Conference in 2004.

In the area of safe transport of radioactive material contributions have been oriented towards the updating and upgrading of the IAEA Regulations for the Safe Transport of Radioactive Materials, but in particular in developing the Q system dosimetric modelling leading to essential quantitative parameters, A1 and A2 regulations, for all radionuclides likely to be transported. The Q system still provides virtually all of the quantitative requirements of the international transport regulations, and national regulations in most countries of the world.

In the area of academic publishing major contributions have been the founding of three highly prestigious scientific journals, (as well as four specialist text books}, namely
a) ***Radiation Protection Dosimetry*** **(RPD)**, arguably the lead world journal in the field of radiation protection. RPD will shortly enter its 40th year of publication, including 187 volumes, each of four issues, in total amounting to more than 110,000 text pages, and having published papers from several thousand authors,
b) The **Journal of the ICRU (JICRU)**, which has recently been sold on by Oxford University Press to another publisher.
c) The international journal **Packaging, Transport, Storage and Security of Radioactive Materials (PTSSRM)**, which reached its 25th year of publishing before publication ceased in 2015.

APPENDIX 1

LISTING OF PUBLISHED PAPERS AND OTHER RELEVANT DOCUMENTS (REFERENCE ITEMS)

Titles and publication citation details for all of the **Reference items** are listed under the following topic headings, and essentially in chronological order within each section of the listing. **Reference items** themselves are included in Appendix 2.

Introduction
Radiation Protection
Radiation Dosimetry (Solid State)
Radiation Dosimetry
Nuclear Emergency Planning
Transport of Radioactive Materials
General (Winston Churchill Fellowship)
Academic Publishing (General)
Books, CDs, DVDs and commissioned publications

Most of the section headings are self explanatory. Some of the contributions under the heading 'Academic Publishing (General)' are more related to the logistics of journal and book publishing than to science but have been included for completeness. Likewise the last section covers other publishing aspects such as text books, CDs, DVDs and other forms of special issues of journals, all contributing to the promotion of the science of radiation protection. There are cross references within the text and within the Explanatory Notes to many of the **Reference items** themselves, where appropriate.

INTRODUCTION

Reference Item 1

SRP HONORARY FELLOW CITATION
AUTHORS. ***Society for Radiological Protection***
SRP WEB-SITE

Explanatory Note: The citation is taken from the Society for Radiological Protection web-site. It gives an insight into some of the reasoning behind my application for a DSc by giving recognition to my contributions to the advancement of science in two major areas in addition to the legacies in the form of founding major prestigious scientific journals.

Reference Item 2

DEDICATION
AUTHORS. ***J.C. McDonald and Y. Horowitz***
RADIATION PROTECTION DOSIMETRY **109** (4) 265 **2004**

Explanatory Note: The Special Issue of Radiation Protection Dosimetry was published on my retirement as Executive Editor of the journal. It was organised by Dr Joe McDonald (USA), who was then the Editor-in-Chief and Professor Yigal Horowitz, then, and still now, the Consultant Editor covering all aspects of solid state radiation dosimetry. Over many months, and without my knowledge until near completion, they had invited many of the top radiation dosimetrists in the world, most of whom were or had been, members of the Editorial Board, to prepare papers for publication in a special issue of the journal, in recognition of my retirement as Executive Editor. This is something that I feel very proud of and could not resist the temptation to include this dedication, and the following response, in the listing of papers, together with the a copy of the issue of Radiation Protection Dosimetry, in which they were published,[see **Reference Item 97**]. I regard it as an honour in recognition of the founding of the journal in 1980.

Reference Item 3

DEDICATION RESPONSE
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **109** (4) 267 **2004**

Explanatory Note: See also the previous item.

Reference Item 4

YOUR JOURNAL HAS ARRIVED (PACKAGING, TRANSPORT, STORAGE AND SECURITY OF RADIOACTIVE MATERIAL) EDITORIAL
AUTHORS. ***R.B. Pope***

***PACKAGING,TRANSPORT, STORAGE AND SECURITY OF RADIOACTIVE MATERIALS* 18** 1 1-2 **2007**

Explanatory Note: When the Nuclear Technology Publishing journals were sold in 2003, the journal PACKAGING, TRANSPORT, STORAGE AND SECURITY OF RADIOACTIVE MATERIAL was purchased by Maney Publishing. Immediately before this I had invited Mr R.B. Pope from the USA to become the Editor. He was then, and still is now, one of the leading international figures in the world of radioactive materials transport, He continued in the role as Editor for about five years. Unfortunately, his successor was not so successful and the journal ceased publication in 2015, its 25th anniversary year. The title and rights were then purchased by Taylor and Francis Scientific Publishers and some back issues are available through their web-site..

RADIATION PROTECTION

Reference Item 5

EXPERIENCE IN THE CONTROL OF RADIATION DOSE IN THE UNITED KINGDOM CIVIL NUCLEAR POWER STATIONS.
AUTHORS. ***B.W. Emmerson, E.P. Goldfinch AND B.W. Skelcher***
PROCEEDINGS OF THE SECOND IRPA INTERNATIONAL CONGRESS OF THE INTERNATIONAL RADIATION PROTECTION ASSOCIATION,
BRIGHTON, ENGLAND. MAY 1970 19-38 **1970**

Explanatory Note: The paper was my first presentation at an international conference and apart from being published in the conference proceedings, was later accepted by, and published in, the journal HEALTH PHYSICS, the journal of the United States Health Physics Society. At that time it was virtually the only significant journal in the field of radiation protection. It was quite difficult for a non-US scientist to have a paper accepted. The three authors were, at the time, the Station Health Physicists at the CEGB Bradwell, Dungeness and Sizewell nuclear power stations, respectively. (also see next item).

Reference Item 6

EXPERIENCE IN THE CONTROL OF RADIATION DOSE IN THE UNITED KINGDOM CIVIL NUCLEAR POWER STATIONS
AUTHORS. ***B.W. Emmerson, E.P. Goldfinch and B.W. Skelcher***
***HEALTH PHYSICS* 21** 643-649 **1971**

Explanatory Note: See previous item.

Reference Item 7

THE CONTROL OF LOW LEVEL AIRBORNE CONTAMINATION IN WORKING AREAS
AUTHORS. ***E.P. Goldfinch***
PROCEEDINGS OF AN IRPA SYMPOSIUM ON HEALTH PHYSICS PROBLEMS OF INTERNAL CONTAMINATION**, BUDAPEST, HUNGARY. MAY 1972** 529-533 **1972**

Explanatory Note: This was my second international conference presentation. At the time environmental monitoring revealed significant fallout from atomic bomb testing, prior to the ban. An area of highest risk, at the time was, of course' jet aircraft engine maintenance, although the paper only covers working areas in nuclear power stations.

Reference Item 8

ENVIRONMENTAL AIR MONITORING USING 'TACKY-SHADE' COLLECTORS
AUTHORS. ***B. Cox, T.W. Evett, E.P. Goldfinch, G. Lewis, M. Owers and B.W. Skelcher.***
PROCEEDINGS OF A CEGB SYMPOSIUM ON THE DETERMINATION OF RADIONUCLIDES IN ENVIRONMENTAL AND BIOLOGICAL MATERIALS**, LONDON. APRIL 3-4, 1973 1973**

Explanatory Note: A typescript of the submitted paper is available but not the published proceedings. The paper covered environmental monitoring around all of the CEGB nuclear sites. The lead author was M. Owers from one of the CEGB regional laboratories. At the time routine environmental monitoring around nuclear sites revealed significant fallout from atomic bomb testing, prior to the ban. but the purpose of the routine monitoring was to maintain records of background radiation levels against which to be able to detect any unintended emissions from the CEGB nuclear sites.

Reference Item 9

A REVIEW OF THE FIRST SEVEN YEARS OF OPERATIONAL HEALTH PHYSICS AT DUNGENESS 'A' (MAGNOX) NUCLEAR POWER STATION
AUTHORS. ***E.P. Goldfinch***
PROCEEDINGS OF THE THIRD IRPA INTERNATIONAL CONGRESS OF THE INTERNATIONAL RADIATION PROTECTION ASSOCIATION,
WASHINGTON DC, USA. SEPT. 9-14 1973 364-368 **1974**

Explanatory Note: No copy of the proceedings is available and so only the typescript of the submitted paper is available.

Reference Item 10

DEVELOPMENT OF RADIOLOGICAL SAFETY RULES WITHIN THE CEGB
AUTHORS. ***E.P. Goldfinch***
PROCEEDINGS OF A BNES SYMPOSIUM ON RADIATION PROTECTION IN NUCLEAR POWER PLANTS AND THE FUEL CYCLE, **LONDON. 1978** 31-36 **1978**

Explanatory Note: At that time my corporate responsibilities included the development and control of company wide radiological safety rules to assure compliance with national legislation. The electricity industry had well developed safety philosophies for electrical and mechanical hazards, the underlying principle being the use of work permits backed by doubly controlled physical isolation. The control of most radiological hazards requires a different philosophy but one which must not cause conflict with conventional hazard control. It must take account of professional radiological advice for each permit issued. The rules and code cover external and internal personal radiation control by means four principles, namely working area controls, radiation source controls, radiation measurements and documentation. A copy of the paper is available, together with a photograph of the rules and code of practice.

Reference Item 11

RADIATION PROTECTION PHILOSOPHY IN IAEA SAFETY SERIES 6
AUTHORS. ***E.P. Goldfinch***
PROCEEDINGS OF AN IAEA SEMINAR ON RADIOACTIVE MATERIALS TRANSPORT, **TOKYO, JAPAN. SEPTEMBER 30, 1981** 42-63 **1981**

Explanatory Note: I was asked by the IAEA, through the Dangerous Goods Branch of the UK Department of Transport, to present a paper on the radiation protection

philosophy in the IAEA transport regulations to the Japanese Nuclear Engineering Institution in Tokyo (Audience of 1,000 members). My paper was one of three papers in total. The other two papers were presented by the Head of the IAEA Transport Division and his deputy. An unusual aspect was the use of consecutive translation into Japanese rather than concomitant translation. An unfortunate consequence was that all three papers overran by about 50%.

Reference Item 12

RADIATION PROTECTION - THE EMPLOYER
AUTHORS. ***E.P. Goldfinch***
PROCEEDINGS OF A SYMPOSIUM 'RADIATION PROTECTION - THE EMPLOYER' 0RGANISED BY THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AND THE HSE**, LONDON. JANUARY 7, 1983**
1983

Explanatory Note: If my memory serves me correctly this paper was presented in the Royal Society lecture hall. The Proceedings were published in the NRPB Bulletin Supplement 1983 but no copy is available so only a typescript is available.

Reference Item 13

CUMULATIVE OCCUPATIONAL DOSE EQUIVALENT LIMITS.
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **12** (4) 317-318 **1986**

Explanatory Note: The history of the ICRP dose limitation philosophy from the 1960s is outlined. Dose limits ranged from an annual limit of 50 mSv per year, with 30 mSv in any individual quarter, but subject to a cumulative limit to the age N of 50(N-18) mSv, in 1965, to the more recent limit of 15 mSv per year. The Commission had specifically rejected the concept of any form of cumulative dose limit in 1977 on its view of the practicability. The Editorial, published in 1986, prior to publication of the 1990 ICRP recommendations, argued from an operational viewpoint that a cumulative limit to the age of N of the form X(N-16)2 could be practicable, where X could be set to give any overall level of risk recommended. The formula takes account of the greater levels of radiation risk, both genetic (child bearing age) and somatic (latent period), early in life compared with later inn life. Clearly, the suggestion was too controversial to be accepted by the ICRP.

Reference Item 14

ALARA - CONCEPTION AND MISCONCEPTION
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **14** (3) 206 **1986**

Explanatory Note: The title for this Editorial is self explanatory. In particular it identifies historical confusion in the acronym ALARA caused by ICRP changing from 'readily' to 'reasonably'. The editorial discusses the various semi-synonymous similar terms and their acronyms and considers the possible different understandings of radiation and non-radiation risks between scientists and non-scientists. In the latter case it is usually the perceived risks that dominate over the real risks.

Reference Item 15

A REVIEW OF ICRP RECOMMENDATIONS
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **18** (3) 131-132 **1987**

Explanatory Note: The Editorial pleads for clarity in ICRP recommendations. It suggests the sole use of cumulative with age dose limits, but that collective radiation doses, both occupational and to the public, should be kept as low as reasonably achievable, judged on quantitative economic grounds. It further suggests the setting of a level of probability for serious reactor accidents which may be disregarded in planning. The editorial recognises that the concepts suggested may be seen as contentious but were made to stimulate thoughts and comments.

Reference Item 16

RADIATION RISKS
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **25** (2) 83-84 **1988**

Explanatory Note: The complexity of issues arising from the then recognised increase in radiation risks from high doses of radiation are discussed. The balance between risks to individuals and collective work force risks are considered in the context of a potential reduction in the recommended dose limits. The previous annual dose limit of 5 mSv had been partially justified by the ICRP on the basis that the resulting average occupational dose was 0.5 mSv. Reduction of the dose limit as the sole measure of recognising the increases risk factors would be more likely to increase collective dose than reduce it.

Reference Item 17

RADIOLOGICAL PROTECTION - THEORY AND PRACTICE (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
PROCEEDINGS OF THE 25TH ANNIVERSARY SYMPOSIUM OF THE SOCIETY FOR RADIOLOGICAL PROTECTION**, MALVERN, ENGLAND.**
JUNE 4-9 1989 xiii **1989**

Explanatory Note: I was Chairman of the Scientific Organising Committee, Chairman of the opening session and Proceedings Editor. A copy of the published Proceedings is available if required but a copy of cover is available, together with some relevant pages.

RADIATION DOSIMETRY (Solid State)

Reference Item 18

THE ROLE OF STANDARDISATION IN THERMOLUMINESCENCE DOSIMETRY
AUTHORS. ***G. Busuoli and E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **6** (1-4) 284-286 **1983**

Explanatory Note: The historical development of international standards for thermoluminescence dosemeters and dosemeter readers by the ISO and the IEC is traced and the likely way ahead discussed.

Reference Item 19

THE ROLE OF INTERNATIONAL STANDARDS IN THERMOLUMINESCENCE DOSIMETRY
AUTHORS. ***G. Busuoli and E.P. Goldfinch***
NUCL. SCI. J. **22** (2) 133-136 **1985**

Explanatory Note: See also **Reference Item 18.**

Reference Item 20

INDIVIDUAL THERMOLUMINESCENCE DOSEMETERS FOR EXTREMITIES AND EYES
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **47** (1-4) 347-351 **1993**

Explanatory Note: The paper disseminates the information in what was then a near final draft of the ISO standard of the same title and gives background to the technical requirements. [See also **Reference Item 21**].

Reference Item 21

NUCLEAR ENERGY - RADIATION PROTECTION -INDIVIDUAL THERMOLUMINESCENCE DOSEMETERS FOR EXTREMITIES AND EYES
AUTHORS. ***E.P. Goldfinch (as Chairman of ISO/TC85/SC2/WG7)***
ISO STANDARD ISO 12794: **2000**

Explanatory Note: I chaired the ISO working group over several years to produce the standard. A copy of the British Standard is available. By convention, British Standards are identical to the corresponding ISO standards).

Reference Item 22

THERMOLUMINESCENCE DOSIMETRY SYSTEMS FOR INDIVIDUAL AND ENVIRONMENTAL MONITORING
AUTHORS. ***G. Busuoli et. al. (including E.P. Goldfinch as a member of the IEC/SC45B/WG2 working group)***
IEC STANDARD 61066 :2006 (formerly 1991)

Explanatory Note: I served as the UK expert for many years on the IEC working group set up to formulate, develop and finalist the standard covering TLD systems for the measurement of personal and environmental radiation doses. (A TLD system is defined as the combination of dosemeter and reader) The standard was first published in 1991 and updated in 2006. IEC standards are conventionally reviewed every five years but I am unaware of any further review since 2006. The current status is registered as replaced/withdrawn but I have been unable to determine the actual current situation or able to obtain a copy. of the latest version.

RADIATION DOSIMETRY (General)

Reference Item 23

OCCUPATIONAL DOSE EQUIVALENT LIMITS
AUTHORS. ***E.P. Goldfinch***
PROCEEDINGS OF THE FIFTH IRPA INTERNATIONAL CONGRESS OF IRPA**, JERUSALEM, ISRAEL. MARCH 1980** 393-396 **1980**

Explanatory Note: A copy of an unbound reprint is available but giving no identification other than page numbers

Reference Item 24

A DOSE IS A DOSE IS A DOSE
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **15** (4) 223-224 **1986**

Explanatory Note: The editorial identifies some of the problems in the interface between SI Units and radiation dose quantity terminology, whereby the same 'unit' is used to quantify a wide range of dose 'quantities', some of which are effectively abstract. and cannot be measured directly.

Reference Item 25

NUCLEAR ELECTRIC'S CENTRAL DOSE RECORDS SERVICE (CDRS)
AUTHORS. ***E.P. Goldfinch, D.T. Mullarkey,. McWhan, G. Risk and L. Vaughan***
PROCEEDINGS OF A BNES SYMPOSIUM ON OCCUPATIONAL RADIATION PROTECTION**, LONDON 1990** 225-230 **1991**

Explanatory Note: One of my major corporate responsibilities was personal dosimetry for the whole of the CEGB prior to privatisation and for Nuclear Electric after privatisation. This entailed the establishment of a fully computerised dose record system, drawing together past records held at individual sites and setting up protocols for recording both external and internal radiation doses for all classified workers on an ongoing basis, in order to comply with statutory requirements. The paper describes the

development and operation of the system. The classic problem of any system computerisation is the interface between the software engineers and project commissioning manager, where the manager is ultimately accountable for success or failure of the project.

Reference Item 26

NEW ICRP RECOMMENDATIONS
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **37** (3) 147 **1991**

Explanatory Note: Attention is drawn to the potential for confusion, in the ICRP 1990 recommendations resulting from changes to existing terminology, the addition of new terms and some changes to radiation weighting factors. No set time scale for implementation of the changes had been set, leaving this to individual national legislators. The potential for confusion, by adding a dose quantity called equivalent dose to a scheme already including a quantity called dose equivalent is self evident!! The lack of any set point in time for the changes to become effective meant that a lengthy overlap period could exist in the scientific publishing world. As Executive Editor for RADIATION PROTECTION DOSIMETRY, with submitting authors originating from around the world, I was very conscious of the problems.

Reference Item 27

MEASUREMENT 'QUANTITY' FOR EXTREMITY DOSE - WHAT'S IN A NAME?
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **69** (3) 163-164 **1997**

Explanatory Note: The editorial discusses one of the aspects of the international standard that led to much discussion during working party meetings, namely the name for the dose quantity to be measured. The problem lies in the definition of the quantity "personal dose equivalent", designated as Hp(d), in relation to skin dose on the extremity. Neither ICRP nor ICRU specifically included or specifically excluded the extremity dose within the definition of personal dose equivalent at a depth of 0.07 mg/cm2. The working group decided by majority vote, mainly because calibration must be done with a different phantom to the body, that the quantity to be measured, namely dose equivalent at a depth of 0.07 mg.cm2 on the extremity, is not Hp(07). This name would only apply to the skin on the body. [See also **Reference Item 30**].

Reference Item 28

PERSONAL NEUTRON DOSIMETRY FOR THE TRUNK, EYES AND EXTREMITIES -PERFORMANCE AND CALIBRATION REQUIREMENTS.
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **71** (3) 163-164 **1997**

Explanatory Note: Performance requirements for, and calibration of, personal neutron radiation dosemeters, are discussed in the context of the intention of the ISO to try to develop an International Standard, specifying all of the necessary performance requirements. The standard, of necessity, would have to cover a wide range of energies and neutron doses, utilising several different measurement techniques.

Reference Item 29

A CONFUSION OF UNITS - THE NAMING OF NAMES
AUTHORS. ***K. O'Brien, E.P. Goldfinch AND J.C. McDonald***
RADIATION PROTECTION DOSIMETRY **78** (4) 247-248 **1998**

Explanatory Note: Confusion following the latest ICRP recommendations still existed in 1998, aggravated by the coexistence of old dose quantities designated with the letter 'H' and new dose quantities designated with the letter 'E', and the change by ICRP to recommend the new quantities as the limiting quantities. Both sets of quantities are expressed in the same units (sievert).

Reference Item 30

ON THE NEED FOR GUIDANCE REGARDING EXTREMITY DOSIMETRY
AUTHORS. ***E.P. Goldfinch and J.C. McDonald***
RADIATION PROTECTION DOSIMETRY **102** (1) 3-5 **2002**

Explanatory Note: Even in 2002 there was a great deal of confusion and misunderstanding regarding the interface between radiation protection quantities recommended by the ICRP and operational measurement quantities considered by the ICRU. This was particularly the case regarding personal extremity dosimetry. [see also **Reference Item 35**]

Reference Item 31

THE ICRP AND DOSIMETRY:(GLASNOST) REDUX.
AUTHORS. ***R.H. Thomas, J.C. McDonald and E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **102** (3) 195-200 **2002**

Explanatory Note: Although submitted for publication as an Editorial, the paper digs deeply into radiation dosimetry theory. It identifies some of the flaws in past ICRP publications, and makes very specific recommendations for future ICRP recommendations. [See also **Reference items 16, 26, 30 and 81**].

Reference Item 32

RADIATION PROTECTION DOSIMETRY - FROM AMATEUR TO PROFESSIONAL (KEYNOTE INVITED PAPER)
AUTHORS. ***E.P. Goldfinch***
PROCEEDINGS OF THE 14TH ISSDO SOLID STATE DOSIMETRY CONFERENCE- PUBLISHED AS RADIATION PROTECTION DOSIMETRY VOL 119 (1-4), **NEW HAVEN (YALE UNIVERSITY), USA. JUNE 27-JULY 2 2004** 8-14 **2006**

Explanatory Note: This paper was the Invited Keynote Paper at the 14th International Solid State Dosimetry Conference held at Yale University in 2004 and, as such, was a highlight in my career in radiation safety, following, as it did, Keynote Papers in previous conferences given by the top world solid state dosimetry academic scientists. The paper describes the reasoning behind, the foundation of, and the development of, Radiation Protection Dosimetry, which has now reached 184 volumes, each of four issues averaging 150 pages (including Special Issues), giving a total of more than 110,000 text pages over 40 years. [See also **Reference Item 97**].

NUCLEAR EMERGENCY PLANNING

Reference Item 33

DEVELOPMENT AND CURRENT STATUS OF EMERGENCY MONITORING PROCEDURES AT CEGB NUCLEAR POWER STATIONS
AUTHORS. ***H.F. Macdonald, P.J. Ballard, I.M.G. Thompson, E.P. Goldfinch and H.C. Orchard***
J. BR. NUCL. ENERGY SOC. **16** (2) 177-186 **1977**

Explanatory Note: Emergency planning for the CEGB nuclear power station sites was one of my corporate responsibilities from 1973 to 1990. This paper and the

following two **Reference items** describe and discuss the philosophies and detail incorporated into the plans, which, whilst fundamentally consistent within the company, must take account of local factors at each power station. Plans are regularly tested by means of full scale exercises, which inevitably involve the corporate Health Physics Services Manager, as would any real accident.

Reference Item 34

A REVIEW OF THE EMERGENCY ARRANGEMENTS FOR THE CENTRAL ELECTRICITY GENERATING BOARD NUCLEAR POWER STATIONS FOLLOWING THE THREE MILE ISLAND ACCIDENT
AUTHORS. ***E.P. Goldfinch and H. C. Orchard.***
PROCEEDINGS OF THE 14TH JOINT CONFERENCE OF THE FACHVERBANDES FUR STRAHLENCSCHUTZ EV AND SOCIETE FRANCAISE DE RADIOPROTECTION, **LAUSANNE, SWITZERLAND. SEPT. 30 - OCT. 2, 1981** 650-660 **1982**

Explanatory Note: [See also **Reference Item 35]**

Reference Item 35

EMERGENCY ARRANGEMENTS FOR CEGB NUCLEAR POWER STATIONS- CHANGES INTRODUCED FOLLOWING THE ACCIDENT AT THREE MILE ISLAND
AUTHORS. ***S. Glover, E.P. Goldfinch, H.C. Orchard AND B.W. Wilcox***
PROCEEDINGS OF AN IAEA INTERNATIONAL SYMPOSIUM ON EMERGENCY PREPAREDNESS FOR NUCLEAR FACILITIES **, ROME, ITALY. 4-8 NOVEMBER, 1986** 107-118 **1986**

Explanatory Note: Also see **Reference Item 34.**

TRANSPORT OF RADIOACTIVE MATERIALS

Reference Item 36

THE Q SYSTEM FOR THE CALCULATION OF A1 AND A2 VALUES WITHIN THE IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS.
AUTHORS. ***H.F. Macdonald and E.P. Goldfinch***
BNL REPORT TPRD/B/340/R83 **1983**

Explanatory Note: It has not proved possible to obtain a copy of the original research report. The contract for the work was between the IAEA and the CEGB BNL laboratories. The laboratories no longer exist and attempts to obtain a copy through the British Library and the IAEA have so far failed. However the technical content, if not the wording in detail, is the same as in **Reference Item 53**. My co-author Dr H.F. Macdonald died more than 10 years ago.

Reference Item 37

SOME THOUGHTS ON TEST STANDARDS FOR LARGE PACKAGES FOR THE TRANSPORT OF IRRADIATED FUEL
AUTHORS. ***E.P. Goldfinch***
PROCEEDINGS OF THE FIFTH PATRAM INTERNATIONAL SYMPOSIUM ON PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS, **LAS VEGAS, USA. 1978 1978**

Explanatory Note: Typescript of the submitted paper is available. (Proceedings page numbers unknown). In addition to presenting the paper I was invited to chair the opening session of this conference (held in Las Vegas), in place of the Head of the IAEA Transport Safety Division (G.E. Swindell), who was unavoidably unavailable. My introductory remarks are attached to the typescript of my submitted paper.

Reference Item 38

DOSIMETRIC ASPECTS OF TYPE A PACKAGE CONTENTS LIMITS UNDER THE IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS
AUTHORS. ***H.F. Macdonald and E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **1** (1) 29-42 **1981**

Explanatory Note: The paper details the dosimetric modelling used to derive the quantitative limits in the international regulations for the safe transport of radioactive materials, prior to actual incorporation into the IAEA regulations in the form of the Q system. See also the next three **Reference items.**

Reference Item 39

DOSIMETRIC ASPECTS OF TYPE A PACKAGE CONTENTS LIMITS UNDER THE IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS- SUPPLEMENTARY LIST OF ISOTOPES
AUTHORS. ***H.F. Macdonald and E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **1** (3) 199-201 **1981**

Explanatory Note: [See **Reference Item 38**] . This paper adds further radioisotopes to those in the original paper.

Reference Item 40

ACTIVITY RELEASE FROM B(M) AND B(U) PACKAGES. REVIEW PAPER FOR THE IAEA TRANSPORT REGULATIONS,
AUTHORS. ***E.P. Goldfinch***
CONSULTATIVE REVIEW PAPER PREPARED IN THE CAPACITY AS A CONSULTANT TO THE IAEA FOR THE IAEA ADVISORY GROUP ON THE BASIC PRINCIPLES AND TEST STANDARDS., **VIENNA, AUSTRIA MAY 1979 1979**

Explanatory Note: The consultant's brief or terms of reference was to prepare a position paper on the question of the allowable activity release levels from Type(B) and Type B(U) packages and the in particular to review the factor of 1,000 difference between the allowable releases between the two types of package. The recommendations thus discussed and approved by the Advisory Group were provided in tabular form.

Reference Item 41

AN ALTERNATIVE APPROACH TO THE A1/A2 SYSTEM FOR DETERMINING PACKAGE CONTENTS LIMITS AND PERMITTED RELEASES OF RADIOACTIVITY FROM TRANSPORT PACKAGES
AUTHORS. ***H.F. Macdonald and E.P. Goldfinch***
PROCEEDINGS OF THE PATRAM 80 INTERNATIONAL SYMPOSIUM ON PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS, **BERLIN, GERMANY. NOVEMBER 10-14, 1980** 48-57 **1981**

Explanatory Note: The early paper details the dosimetric modelling used to derive the quantitative limits in the international regulations for the safe transport of radioactive materials, prior to actual incorporation into the IAEA regulations in the form of the Q system. Values of A1 are based upon external radiation doses and values of A2 are based upon internal doses, for each radionuclide.

Reference Item 42

ENVIRONMENTAL IMPACT OF TRANSPORTING RADIOACTIVE MATERIALS
AUTHORS. ***J.C. Chicken, E.P. Goldfinch and W.G. Milne***
PROCEEDINGS OF A BNES SYMPOSIUM ON THE ENVIRONMENTAL IMPACT OF NUCLEAR POWER, **LONDON. APRIL 1981** 187-214 **1981**

Explanatory Note: The paper is of a general nature.

Reference Item 43

EXPERIENCE IN THE APPLICATION OF THE IAEA TRANSPORT REGULATIONS WITHIN THE CEGB
AUTHORS. ***E.P. Goldfinch***
JOURNAL OF THE SOCIETY FOR RADIOLOGICAL PROTECTION **1** 1 31-36 **1981**

Explanatory Note: This paper was invited for the very first issue of the Journal of the Society for Radiological Protection in 1981, ironically the same year that I founded Radiation Protection Dosimetry.

Reference Item 44

A BASIS FOR DETERMINING RADIATION PROTECTION CRITERIA (IN THE IAEA TRANSPORT REGULATIONS)
AUTHORS. ***E.P. Goldfinch***
PAPER PREPARED IN THE CAPACITY AS A CONSULTANT FOR THE IAEA ADVISORY GROUP ON THE BASIC SAFETY PHILOSOPHIES AND RADIATION PROTECTION IN THE IAEA TRANSPORT REGULATIONS,,
VIENNA, AUSTRIA JULY 1981 1981

Explanatory Note: It was rare or even unheard of for a representative from industry to be nominated as the lead expert in the UK team and appointed as a Consultant to the IAEA. The Head of the UK Department of Transport Dangerous Goods Branch did so because of my expertise in both radiation protection and the transport of radioactive materials, apparently, much to the irritation of the NRPB Director at the time, who wanted to nominate a member of the NRPB.

Reference Item 45

DOSIMETRIC ASPECTS OF PERMITTED ACTIVITY LEAKAGE RATES FOR TYPE B PACKAGES FOR THE TRANSPORT OF RADIOACTIVE MATERIALS
AUTHORS. ***E.P. Goldfinch and H.F. Macdonald***
RADIATION PROTECTION DOSIMETRY **2** (2) 75-83 **1982**

Explanatory Note: The paper considers the allowable permitted leakage limits for transport packages containing very large quantities of radioactive materials using similar modelling to that used to determine the A1 and A2 values for individual radioisotopes.

Reference Item 46

A REVIEW OF SOME RADIOLOGICAL ASPECTS OF THE IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS
AUTHORS. ***E.P. Goldfinch and H.F. Macdonald***
PROCEEDINGS OF THE THIRD SRP INTERNATIONAL SYMPOSIUM,
INVERNESS, SCOTLAND. JUNE 6-11, 1982 205-212 **1982**

Explanatory Note: A photocopy from the published Proceedings is available, together with a contents list for the papers in the conference to put it in perspective.

Reference Item 47

IAEA COMMITTEE REPRESENTATION FOR THE IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS.
AUTHORS. ***E.P. Goldfinch***
THE LIST COVERS MANY OF THE COMMITTEES ON WHICH I REPRESENTED THE UK IN DEVELOPING THE IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS AND SUPPORTING REPORTS **1983**

Explanatory Note: This list has been provided to demonstrate the extent of my involvement in developing the international transport regulations, in particular as Leader of the radiation protection group at the third meeting of the Advisory Group for the Comprehensive Review of the IAEA Regulations for the Safe Transport of Radioactive Materials (AG-406 in November 1983). The IAEA regulations, of course, form the basis of all concomitant national regulations in IAEA Member States (i.e. almost every country in the world).

Reference Item 48

IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS - REVISED A1 AND A2 VALUES
AUTHORS. ***E.P. Goldfinch and H.F. Macdonald***
PROCEEDINGS OF THE PATRAM 83 INTERNATIONAL SYMPOSIUM ON PACKAGING AND TRANSPORTATION OF RADIOACTIVE MATERIALS, **NEW ORLEANS. USA. MAY 15-20 1983** 42-55 **1984**

Explanatory Note: This publication, together with **Reference items 38,40 and 42** provided the main input to the IAEA Special Working Group which prepared the IAEA Safety Series 7 Explanatory Material (see attached cover and reference list), together with item 53. Note that A1 considers risks arising from external radiation from the relevant radioactive isotope and A2 the risks due to internal radiation.

Reference Item 49

RADIOACTIVE MATERIAL TRANSPORT PACKAGE ACTIVITY RELEASE LIMITS (WITHIN THE IAEA CO-ORDINATED RESEARCH PROGRAMME ON THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS (1980-1985))
AUTHORS. ***H.F. Macdonald and E.P. Goldfinch***
INTERNATIONAL STUDIES ON CERTAIN ASPECTS OF THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS, **1986**

Explanatory Note: This paper results from a Research Agreement (2291/RF/CF) between the IAEA and the CEGB Berkeley Nuclear Laboratories (BNL) in the UK). The original purpose of the agreement was to research data on individual and collective radiation doses associated with the routine transport of irradiated nuclear reactor fuel. At that point Dr H.F. Macdonald was the research officer involved at BNL. However, because of my involvement with the development of the IAEA transport regulations and particularly within the IAEA Co-ordinated Research Programme, as the UK representative, the research agreement was extended to cover the derivation of A1 and A2 values for a very wide range of radionuclides, and became known as the Q system. At that point I formally took the lead role.
The IAEA report covering the covering the summaries of all of the Research Contracts and Research Agreements is identified as the Co-ordinated Research Programme (IAEA-TECDOC 375). Relevant extracts are provided, including the CEGB Research Agreement Summary Report covering both its original purpose and the Q system.

Reference Item 50

30 YEARS ON (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT **1** (2) 67-69 **1990**

Explanatory Note: An abbreviated history of the very early international regulations for the transport of radioactive materials, well prior to the development of the quantitative Q system by E.P. Goldfinch and H.F. Macdonald is provided. The Editorial was also published on-line in July 2013 by Taylor and Francis scientific publishers.

Reference Item 51

PUBLICATION OF ICRP 60 AND 61.
AUTHORS. ***E.P. Goldfinch***
INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT **1** (3) 143-144 **1990**

Explanatory Note: The likely effects of the publication of ICRP Reports 60 and 61 on the international transport regulations are reviewed, including any affects on the Q system and reductions in recommended dose limits. For example, potential reductions to package contents limits may simply lead to a need for an increase in the required number of packages with no reduction in total collective radiation risks or alternatively, increased costs not commensurate with any reduced radiation risks.

Reference Item 52

COMMENTS FROM THE EDITOR
AUTHORS. ***E.P. Goldfinch***
INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT **1** (1) 5-6 **1990**

Explanatory Note: Comments in response to the Editorial provided by Mr R. O'Sullivan, then Head of the UK Department of Transport Dangerous Goods Branch, on the establishment of the International Journal of Radioactive Materials Transport. A copy is provided, together with the Editorial.

Reference Item 53

THE Q SYSTEM FOR THE CALCULATION OF A1 AND A2 VALUES
AUTHORS. ***E.P. Goldfinch and H.F. Macdonald***
APPENDIX 1 TO THE IAEA SAFETY SERIES NUMBER 7 - EXPLANATORY MATERIAL FOR THE IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIAL (1985 EDITION) **STI/PUB/769, 1987, Amended 1990**

Explanatory Note: The formal incorporation of the Q system into the IAEA Transport Regulations took place in the 1985 edition of the regulations via an Appendix in IAEA Safety Series No 7, (The Explanatory Material document). published in 1987 and 1990 in amended form. The version available on-line is marked as no longer valid.

As is normal practice IAEA Safety Series publications are subject to regular review. further expansion and review took place in 2012 [see reference Item 54)].

Reference Item 54

THE Q SYSTEM FOR THE CALCULATION AND APPLICATION OF A1 AND A2 VALUES
AUTHORS. ***L. Bologna, k. Eckerman and S. Hughes***
APPENDIX 1 TO THE ADVISORY MATERIAL FOR THE IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS (2012 EDITION) **SSG-26 (2012)**

Explanatory Note: In anticipation of the 1996 edition of the IAEA Transport Regulations a review of the Q system was undertaken by the IAEA with the express purpose of incorporating the latest ICRP Recommendations and Dose Coefficients (1990 and 1996, respectively). The original dose modelling remains unchanged. It is not unusual for there to be long time delays between the completion of technical assessments and the final incorporation into published documents to occur. The introductory pages of the 2012 publication are available rather than the whole document since the vast majority would be very similar to **Reference Item 58**. A further ongoing review is taking place currently at the time of writing, with the next WG meeting due to take place in Vienna in June 2020. I have been invited to participate.

Reference Item 55

DIRECTORY OF TEST FACILITIES FOR RADIOACTIVE MATERIALS TRANSPORT PACKAGES
AUTHORS. ***E.P. Goldfinch (EDITOR)***
INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT **2** (4-5) Special Issue **1991**

Explanatory Note: My role was as Commissioning Editor. A slightly mutilated copy of the front cover, the Editorial Board listing, the contents list and a Preface by Dr H. A. Selling, the then Head of the Transport Section of the IAEA Division of Nuclear Safety, are provided. Dr Selling explains the support from the IAEA for the Directory, which supersedes an earlier IAEA Directory published by the IAEA as TECDOC-295.

Reference Item 56

TRANSPORT OF LOW LEVEL RADIOACTIVE WASTE
AUTHORS. ***E.P. Goldfinch***
INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT **3** (2/3) 95-9644 **1992**

Explanatory Note: The Editorial was prepared to disseminate information relating to the specific problems of the transport of low level waste materials, being either materials of low specific activity or radioactively contaminated non radioactive materials. Categorisation of such materials had always been a subject of controversy.

Reference Item 57

CATEGORIES OF RADIOACTIVE MATERIALS
AUTHORS. ***E.P. Goldfinch***
PROCEEDINGS OF THE SECOND BNES INTERNATIONAL CONFERENCE ON TRANSPORT FOR THE NUCLEAR INDUSTRY, **BOURNEMOUTH, ENGLAND. 8-10 OCTOBER 1991** 200 **1991**

Explanatory Note: This trivial item is included to draw attention to the fact that the complete Conference Proceedings were published in the INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT.

Reference Item 58

TRANSPORT CATEGORIES FOR RADIOACTIVE WASTE
AUTHORS. ***E.P. Goldfinch***
INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT **4** (3/4) 181-189 **1993**

Explanatory Note: This paper reviewed historical and then current regulatory requirements for the transport of radioactive waste materials. It made specific proposals for three major groups, for consideration by future IAEA Regulatory Review Panels.

Reference Item 59

IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS REVIEW PROCESS - RADIOLOGICAL ISSUES
AUTHORS. ***E.P. Goldfinch***
INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT **6** (1) 95-96 **1995**

Explanatory Note: The brief paper highlights the radiological issues that were dealt with within the overall IAEA formal review process. The journal formed a very effective vehicle for widely disseminating information resulting from the review process.

Reference Item 60

1996 REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS
AUTHORS. ***E.P. Goldfinch***
INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT **7** (1) 3-5 **1996**

Explanatory Note: I represented the UK on almost every IAEA Technical Committee and Regulatory Panel developing, updating and refining the IAEA Regulations for the Safe Transport of Radioactive Materials between 1980 and 1996, either as UK adviser or UK expert. The Editorial reviews and comments on some of the major issues, changes and decisions to make no change, in the content of the regulations. One of the most controversial issues was the fundamental definition of radioactivity in the context of transport of radioactive materials [See also **Reference Item 43].**

Reference Item 61

PACKAGING, TRANSPORT, STORAGE AND SECURITY OF RADIOACTIVE MATERIAL (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT **14** (3/4) 3-4 **2003**

Explanatory Note: The editorial in the sister journal to RADIATION PROTECTION DOSIMETRY, namely the INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT, announces the then forthcoming revised scope and title to

become PACKAGING, TRANSPORT, STORAGE AND SECURITY OF RADIOACTIVE MATERIAL.

Reference Item 62

SUPPORTING DOCUMENT FOR THE IAEA REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIAL
AUTHORS. ***E.P. Goldfinch***
INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT **7** (4) 255-256 **1996**

Explanatory Note: This Editorial highlights my personal involvement in the development of the IAEA regulations over more nearly two decades, in particular as UK expert and chairman of an IAEA Consultants Services Meeting (CSM) which met in October 1995 with the task of formulating a comprehensive supporting document to the IAEA Regulations for the Safe Transport of Radioactive Materials.

Reference Item 63

2001 DIRECTORY OF TEST FACILITIES FOR RADIOACTIVE MATERIALS TRANSPORT PACKAGES
AUTHORS. ***E.P. Goldfinch (Commissioning Editor***
INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT **12** (2/3) Special Issue **2001**

Explanatory Note: A copy of the front cover, the Editorial Board listing, the contents list and an Editorial by the then Editor in Chief, Mr M.S.T. Price, from the UKAEA, Winfrith Heath Establishment, are provided. It is understood that the Directory was also put on-line by Taylor and Francis Scientific Publishers some years after original publication.

Reference Item 64

TRANSPORT AND STORAGE OF RADIOACTIVE MATERIAL (EDITORIAL)
AUTHORS. ***E.P. Goldfinch, F. Nische and T. Saegusa***
PACKAGING, TRANSPORT, STORAGE AND SECURITY OF RADIOACTIVE MATERIAL **15** (3/4) 163-164 **2004**

Explanatory Note: The Editorial discusses the topic of storage of radioactive materials, particularly irradiated nuclear reactor fuel, in juxtaposition with the corresponding transport of such materials. Apart from its original publication in 2004

the Editorial was also published on-line in 2013 by the then publishers of the journal, Taylor and Francis.

Reference Item 65

PACKAGING, TRANSPORT, STORAGE AND SECURITY OF RADIOACTIVE MATERIAL (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
PACKAGING, TRANSPORT, STORAGE AND SECURITY OF RADIOACTIVE MATERIAL **15** (1) 3-4 **2004**

Explanatory Note: The editorial is the first in the newly titled journal and gives some detail of the intentions for the future, including the appointment of Consultant Editors.

Reference Item 66

THE Q SYSTEM FOR THE CALCULATION OF A1 AND A2 VALUES
AUTHORS. ***Wikipedia***
WIKEPEDIA **2012**

Explanatory Note: I came upon this summary of the Q system in Wikipedia purely by chance.

Reference Item 67

REVIEW OF METHODOLOGIES TO CALCULATE A1 AND A2 VALUES AND EXEMPTION VALUES
AUTHORS. ***K.A. Jones, T. Cabianca, M.P. Harvey, J.S. Hughes, I.K. Brown and T Anderson***
Report HPA-CRCE-027 **October 2011**

Explanatory Note: In recent years the Q system modelling and methodologies has been subject to review and extension. I have not been directly involved in this work although I have now been invited to participate in an IAEA group updating this work at a meeting to be held in June 2020 in Vienna. The attached abstract of a report published in 2011 covers a brief review of the Q system as applied to A1 and A2 values but also covers a major expansion relating to calculation of Exemption Values for individual radionuclides.

GENERAL (Winston Churchill Fellowship)

Reference Item 68

RADIOACTIVE WASTE MANAGEMENT IN THE UNITED STATES AND CANADA- A GENERAL REPORT
AUTHORS. ***E.P. Goldfinch***
REPORT SUBMITTED TO THE WINSTON CHURCHILL MEMORIAL TRUST FOLLOWING MY 1970 CHURCHILL FELLOWSHIP, **1971**

Explanatory Note: One of a number of reports written following my 1970 Winston Churchill Fellowship three month visit to the USA and Canada in 1970.

Reference Item 69

NUCLEAR POWER STATION MANPOWER IN THE UNITED STATES AND CANADA
AUTHORS. ***E.P. Goldfinch***
REPORT SUBMITTED TO THE WINSTON CHURCHILL MEMORIAL TRUST FOLLOWING MY 1970 CHURCHILL FELLOWSHIP, **1971**

Explanatory Note: One of a number of reports written following my 1970 Winston Churchill Fellowship three month visit to the USA and Canada in 1970.

ACADEMIC PUBLISHING (GENERAL)

Reference Item 70

NUCLEAR TECHNOLOGY PUBLISHING/RAMTRANS PUBLISHING
AUTHORS.

Explanatory Note: Pages from the 2003 web site and the 2004 web site are included, indicating the change in the trading name at the time of sale to Oxford University Press.

Reference Item 71

RADIATION PROTECTION DOSIMETRY - SPEED OF PUBLICATION OF SUBMITTED MANUSCRIPTS (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **3** (4) 194-195 **1982**

Explanatory Note: The editorial gives a statistical review of publication timescales during the very early life of RADIATION PROTECTION DOSIMETRY, including comparisons between papers whose authors have English as their mother tongue and those that do not.

Reference Item 72

PREPARATION OF MANUSCRIPTS (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **15** (3) 151 **1986**

Explanatory Note: The editorial provided guidance to potential authors.

Reference Item 73

RADIATION PROTECTION DOSIMETRY - PUBLICATION PERFORMANCE (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **16** (3) 194 **1986**

Explanatory Note: The editorial gives a statistical update review of publication time scales and notes that papers have been submitted from 26 of the 48 countries that the journal is circulated to. More than 40% of submitted papers were from authors whose mother tongue is not English up to and including the 6th year of publication of the journal.

Reference Item 74

CONFERENCE PROCEEDINGS (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **18** (2) 73-74 **1987**

Explanatory Note: RADIATION PROTECTION DOSIMETRY is the first journal that I am aware of that included proceedings of specialist workshops, seminars and

conferences (starting in 1987) in the journal series. A number of other publishers copied the idea subsequently. The intention was to give wider and timely access to very topical information with the consequent and intended side effect of encouraging scientists to submit papers for publication in regular issues of the journal. This was achieved in some cases (small meetings) by providing free copies of the published proceedings for the participants at the relevant meeting when published. In other cases, especially with very large conferences such as the series of Solid State Dosimetry conferences, a cost for the proceedings would be included in the conference fee.

Reference Item 75

SUBMISSION OF MANUSCRIPTS (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **27** (4) 213-214 **1989**

Explanatory Note: This editorial covers the RADIATION PROTECTION DOSIMETRY editorial policy of requiring the spelling of dosEmeter (English) as opposed to dosImeter (American), as a condition of acceptance for publication. This was done for consistency in presentation throughout each issue of the journal. No author objected. [but see **Reference Item 75**]. As a result of considerable research and correspondence the Oxford English Dictionary eventually included the spelling DosEmeter.

Reference Item 76

SPELLING OF DOSEMETER VERSUS DOSIMETER
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **30** (1) 51-52 **1990**

Explanatory Note: A copy of a "Reply" to a "Letter-to-the-Editor" (of RADIATION PROTECTION DOSIMETRY by Dr K. Becker is provided, together with the "Letter-to-the-Editor" and a further letter by Dr Becker to the Health Physics Society Newsletter. The journal policy was to require the English spelling of dosEmeter, as opposed to the American DosImeter. Dr Becker was, at that time, the Director of the IEC and enforced the American spelling within the IEC. The ISO would not follow suit and to this day, so far as I am aware, the two parallel international standards bodies follow different rules on this spelling. No authors submitting papers to the journal had previously objected to the spelling policy, which had been introduced from the first issue of the journal in 1980. Because of the controversy, I had extended correspondence with the lexicography department of the Oxford English Dictionary (OED), as a result of which, dosEmeter became the primary spelling and dosImeter the secondary in the OED. The OED policy on such conflict issues was apparently to accept the most commonly used worldwide

spelling, despite the use of the English spelling in relevant UK legislation. The statistics at the time showed that dosEmeter was more common than dosImeter in scientific journals, influenced, no doubt, by the use in Radiation Protection Dosimetry, being the foremost journal in its field in the world. That policy has continued with Oxford University Press as publisher.

Reference Item 77

RADIATION PROTECTION DOSIMETRY EDITORIAL BOARD
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **30** (1) 3 **1990**

Explanatory Note: This brief editorial marks an important step in the development of RADIATION PROTECTION DOSIMETRY, namely the need to appoint Consultant Editors to give support to the Editor-in-Chief. The refereeing policy of the journal has always required two members of the Editorial Board to referee each submitted paper. In addition to providing detailed comments on the text, the referees are asked to give advice in the form of one of four forms, namely "accept" (as it is), "amend" (make minor amendments in the expectation that it will then be acceptable), "revise" (major changes necessary) or "reject". As Executive Editor, my role was to act as a funnel through which all this information would pass. If both referees gave the same recommendation I would implement that. If there was a difference of opinion between the referees, I would refer to the Editor-in-Chief for guidance. All papers requiring "revision" are returned to the referees and to the Editor-in-Chief after revision for further review, with the Editor-in-Chief making the final decision on the outcome, after the authors have made the necessary changes. These procedures were set up on the foundation of the journal because of my unique situation of owning the journal and acting as its Executive Editor, with a potential conflict of interests. I wanted to be sure that the journal was, and was seen to be, a truly scientific journal. As the journal expanded both in terms of the number of submitted papers and the subject area, I decided to appoint three Consultant Editors to take on much of the work previously done by the Editor-in-Chief. They covered external dosimetry (G. Dietze, Germany now deceased) internal dosimetry (J Rundo, USA, now deceased) and solid state dosimetry (Y. Horowitz, Israel, still in post). A further Consultant Editor covering radon was appointed later. At the time of sale to OUP, the number of medical papers was starting to increase and now (2019 under OUP) is one of the main subject areas. Under OUP the refereeing system is essentially the same but the Editor-in-Chief also takes on the work I did as Executive Editor. It should be borne in mind that all of the positions mentioned above are honorary but whilst I owned the journal no scientist ever declined an invitation to join the Editorial Board.

Reference Item 78

RADIATION PROTECTION DOSIMETRY (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **32027** (4) 217 **1990**

Explanatory Note: Progress in the journal development is reported including the increase from four volumes, (each including a nominal four issues), to five volumes per year.(i.e. one issue every two and a half weeks) The first 10 years of publication saw the submission of more than 800 papers. Of these, only 2-3% pass through the referees without comment, some 50% require amendments before acceptance for publication about 40% need significant or major revisions and about 15% of the total number submitted are ultimately rejected or withdrawn.

Reference Item 79

RADIATION PROTECTION DOSIMETRY EDITORIAL BOARD (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **59** (3) 163-164 **1995**

Explanatory Note: During the passage of 15 years from first publication, the spectrum of the subject matter of submitted papers had changed and widened. Since its foundation in 1980 the refereeing policy had always been that, almost without exception, all refereeing was done by members of the Editorial Board (EB) and therefore some changes and additions were necessary. One of the objectives of the editorial was to give praises to the Board members, without whom the journal could not have flourished. In particular the response time for returning refereeing comments was very important in minimising publication times. To further emphasise the importance of the EB a statistical comparison of publication times for RPD and another major publication, showing superior timings for RPD.

Reference Item 80

A CHANGE IN EDITOR-IN-CHIEF AND A SECOND RETIREMENT FOR JOHN DENNIS (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **74** (3) 135-136 **1997**

Explanatory Note: The editorial is effectively a dedication to the outgoing Editor-in-Chief, Dr John Dennis. John had been Editor-in Chief for some 5 years, but during that

time the number of papers submitted was almost exactly the same as during the previous 12 years, a natural consequence of the expansion of the journal.

Reference Item 81

THE MILLENNIUM (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **86** (3) 165-166 **1999**

Explanatory Note: The editorial, published towards the end of 1999 highlights some aspects of the first 20 years of publication of RADIATION PROTECTION DOSIMETRY. The year 2000 saw the publication of the 2000th published regular paper since foundation, the subscription cost per text page was cheaper than any other journal in the field whether purely commercial or published on behalf of a society and a CD-ROM covering all back issues was made available.

Reference Item 82

CITATION INDEXING AND SUBJECT CLASSIFICATION
AUTHORS. ***E.P. Goldfinch***
WORKSHOP REPORT ON A MEETING ORGANISED BY THE SWEDISH RADIATION PROTECTION INSTITUTE ON 'INFORMATION ON RADIATION PROTECTION'**, STOCKHOLM, SWEDEN JUNE 16, 2000**

Explanatory Note: A copy of the Workshop report published in the Journal of Radiological Protection Vol. 20 No. 4 p 471 (2000) is available.

Reference Item 83

A LIMITED STUDY OF ON-LINE ACCESS AND USER PREFERENCES
AUTHORS. ***E.P. Goldfinch***
LEARNED PUBLISHING **13** (4) 241-245 **2000**

Explanatory Note: The paper resulted from my investigations at the time with regard to making Radiation Protection Dosimetry available on-line. This actually happened around 2001 but in order to provide comprehensive cover of all back issues it was necessary to make use of scanned copies of some 200 individual journal issues (16,000 pages) which had been typeset and printed before the availability of fully electronic techniques.

Reference Item 84

TIME MARCHES ON (EDITORIAL)
AUTHORS. ***E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **93** (4) 201-292 **2001**

Explanatory Note: The editorial identifies some changes, including Editorial Board membership, the Nuclear Technology Publishing web-site and the changing subject spectrum of submitted papers, which simply result from the passage of time.

Reference Item 85

REFLECTIONS ON THE PAST YEAR (EDITORIAL)
AUTHORS. ***J.C. McDonald and E.P. Goldfinch***
RADIATION PROTECTION DOSIMETRY **98** (2) 171-172 **2002**

Explanatory Note: As the title suggests the editorial reflects on events both inside and outside the world of radiation protection, including the events of September 11 2001 in New York.

BOOKS, CDs, DVDs AND COMMISSIONED SPECIAL PUBLICATIONS

Reference Item 86

A GUIDE TO RADIATION AND RADIOACTIVITY LEVELS NEAR HIGH ENERGY ACCELERATORS
AUTHORS. ***A.H. Sullivan***
TEXT BOOK 162 PP **1992**

Explanatory Note: The reputation of Nuclear Technology Publishing resulting from the journals published was such that a number of authors submitted textbook manuscripts with a request for publication. Four books were published over a period of about 4 years. Cover and imprint pages are available.

Reference Item 87

A HISTORY OF ACCELERATOR RADIATION PROTECTION
AUTHORS. ***H. Wade Patterson and Ralph H, Thomas***
TEXT BOOK 450 PP **1994**

Explanatory Note: The reputation of Nuclear Technology Publishing resulting from the journals published was such that a number of authors submitted textbook manuscripts with a request for publication. Four books were published over a period of about 4 years. Cover and imprint pages are available.

Reference Item 88

THERMOLUMINESCENCE DOSIMETRY MATERIALS: PROPERTIES AND USES.
AUTHORS. ***S.W.S. McKeever, M. Moscovitch AND P. D. Townsend***
TEXT BOOK 204 PP **1995**

Explanatory Note: The reputation of Nuclear Technology Publishing resulting from the journals published was such that a number of authors submitted textbook manuscripts with a request for publication. Four books were published over a period of about 4 years. Cover and imprint pages are available.

Reference Item 89

THE PHYSICS OF RADIATION PROTECTION
AUTHORS. ***B. Dorschel, V, Schuricht and J. Steuer***
TEXT BOOK 310 PP **1995**

Explanatory Note: The reputation of Nuclear Technology Publishing resulting from the journals published was such that a number of authors submitted textbook manuscripts with a request for publication. Four books were published over a period of about 4 years. Cover and imprint pages are available.

Reference Item 90

RADIONUCLIDE AND RADIATION PROTECTION DATA HANDBOOK 2002
AUTHORS. ***D. Delacroix, J.P. Guerre, P. LeBlanc and C. Hickman (Commissioned by E.P. Goldfinch)***
RADIATION PROTECTION DOSIMETRY **98** (1) 104 pp **2002**

Explanatory Note: The journal included and. still includes many special issues on selected topics, including proceedings of highly specialised workshops, seminars and symposia. As an example a copy of the cover of a highly specialised data handbook and some example pages are provided. Although my name is not included in the list of authors, the function as Executive Editor for the journal resulted in me re-writing much of the descriptive text in the handbook to make it sufficiently clear for potential users, because the lead author's mother tongue was English. The handbook was, and still is, widely used.

Reference Item 91

RADIATION PROTECTION DOSIMETRY - PROCEEDINGS AND SPECIAL ISSUES
AUTHORS. ***Commissioned***
RADIATION PROTECTION DOSIMETRY - SPECIAL PUBLICATIONS BETWEEN 1986 AND 2001 UNDER THE NUCLEAR TECHNOLOGY PUBLISHING IMPRINT

Explanatory Note: Special issues devoted to selected topics were a regular feature of the journal. A listing is provided.

Reference Item 92

RADIATION PROTECTION DOSIMETRY BACK ISSUES 1981-2002 (VOLUMES 1-102 INCLUSIVE)
AUTHORS. ***Many***
ISSUED AS A DVD GIVING COMPLETE TEXTS. **2003**

Explanatory Note: The full texts of all published papers up to and including 2002 were drawn together and published on DVD, fully hyper-linked with author and subject indices. The early papers had been published before the modern digital age and were scanned to pdf files. Full details of the DVD are provided, including the author index for

G to Gq, to demonstrate the claim that the journal was and still is the lead journal in radiation protection in the world. It is clear, from the very small proportion of the published authors provided, how extensive the total number is, even in 2003, demonstrating the journal's contribution to the scientific world.

Reference Item 93

INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT BACK ISSUES 1990-2003 (VOLUMES 1-14 INCLUSIVE)
AUTHORS. ***Many***
ISSUED AS A DVD GIVING COMPLETE TEXTS. **2003**

Explanatory Note: The full texts of all published papers up to and including 2003 were drawn together and fully hyper-linked with author and subject indices. Full details are provided, including the full author index, to demonstrate the claim that the journal was the lead journal (indeed the only exclusive journal) in the field of radioactive materials transport in the world, and its contribution to science and technology.

Reference Item 94

TRANSPORT OF RADIOACTIVE MATERIALS - PROCEEDINGS AND SPECIAL ISSUES
AUTHORS. ***Commissioned***
INTERNATIONAL JOURNAL OF RADIOACTIVE MATERIALS TRANSPORT (LISTING EXTRACTED FROM 2003 NTP WEB-SITE) **2003**

Explanatory Note: Special issues devoted to selected topics were a regular feature of the journal. A listing is provided, together with contents list for two examples.

Reference Item 95

INTERNAL DOSIMETRY CONFERENCE PROCEEDINGS COMPILATION ON CD
AUTHORS. ***Many***
RADIATION PROTECTION DOSIMETRY (ISSUED AS A CD) **2003**

Explanatory Note: A listing, taken from the NTP 2003 web-site, of special issues of the journal covering one of many specialised topics in radiation safety is provided. Also provided is a photocopy of some of the CDs that were available

Reference Item 96

JOURNAL OF THE ICRU
AUTHORS. ***E. P. Goldfinch (Executive Editor) and M. Inokuti (Scientific Editor)***
JOURNAL OF THE ICRU **1** 1 96 pp **2001**

Explanatory Note: Details of the first issue of the Journal of the ICRU, founded in 1998 and published by Nuclear Technology Publishing (NTP) are included to show the relationship between the new journal and the long history of individual report publication by the ICRU since 1964..

Reference Item 97

DEVELOPMENTS IN RADIATION PROTECTION DOSIMETRY
AUTHORS. ***Guest Editor J.C. McDonald***
Special Issue RADIATION PROTECTION DOSIMETRY **109** 4 265-432 **2004**

Explanatory Note: A copy of the issue of Radiation Protection Dosimetry, founded in 1980, that was dedicated to my retirement as Executive Editor [see also **Reference Item 2**] is provided to show the high quality of journal publications by Oxford University Press after its purchase of Nuclear Technology Publishing. All of the contributing authors are the top world experts and almost all were or still are on the journal Editorial Board.

Reference Item 98

CURRICULUM VITAE (2020)
AUTHORS. ***E. P. Goldfinch***
N/A

Explanatory Note: The CV has been provided as a **Reference Item** for convenience.

APPENDIX 2 - REDACTED

This thesis was submitted to the University of Birmingham for the degree of DSc as a compilation of significant original publications by the author. The original submitted version includes an appendix (Appendix 2) containing the full text of a substantial number of the 97 Reference Items submitted as a justification for award of the degree. For copyright purposes, those full texts have been removed from this publicly available version of the thesis. The references and explanatory notes remain intact in Appendix 1.