

MPORU NEWSLETTER

Medical Physics Organized Research Unit
Physics Department, Carleton University

Editor Dave Rogers

Number 2, June 1990

Contents

1 The First Year of the MPORU	2
2 Seminar Series	3
2.1 MPORU Seminars	3
2.2 Carleton University Physics Dept Seminars	4
3 MPORU Executive	4
4 Membership Directory of the MPORU	5
5 Graduate Courses in Medical Physics at Carleton University	7
6 Graduate Students Enrolled in the Medical Physics Program	10
7 EGS4 Course at NRC	11
8 Kudos	11
9 Scientific Societies of Relevance to Medical Physics	11
10 Graduate Student Openings	12
11 CVs of Members of the MPORU	14

1 The First Year of the MPORU

A Note from the Chairman

The Medical Physics Organized Research Unit (MPORU) has completed its first year of operation. It is with pride that all members and students can say it was a very successful year. A large number of academic and research activities (some of which are highlighted below) were shared by the members of the MPORU and made the year a very busy but successful one. These activities allowed the further development of the academic program which will provide Medical Physics graduates for the needs of today and tomorrow. The first two students from the program are expected to graduate in the fall of 1990 making this a major milestone for the MPORU and the Medical Physics community.

Some of the accomplishments and ongoing programs of the MPORU are highlighted below:

- The number of graduate students in the program has increased to 13.
- Five major research grants are funded and support Medical Physics Research and graduate students in the program.
- Four courses in Medical Physics (at the graduate level) were completed and a new course in radiobiology is being developed.
- A very active seminar program was carried out throughout the academic year.
- Several research papers were published.
- Several of the graduate students within the program were successful in receiving graduate student fellowships.
- The first Eastern Canada Medical Physics Conference (organized by members of the Ottawa Cancer Centre) was held at Carleton University.
- The importance of the Medical Physics program was recognized and it received a priority one for the acquisition of an additional Medical Physicist at Carleton University when a vacancy becomes available.

These and many other accomplishments and ongoing activities have indeed made the first year of the MPORU an exciting one. With the active participation of the members of the Medical Physics community we are looking forward to an even more exciting year in 1991. It is with pride that the Medical Physics community in Ottawa has developed the Medical Physics program as an excellent platform for graduate students training and research in Medical Physics. I wish to thank all the participants who have actively participated in making the program such a success.

Peter Raaphorst

2 Seminar Series

2.1 MPORU Seminars

One of the main vehicles of the MPORU for developing and maintaining contacts is through a seminar series in which all the members and the graduate students in Medical Physics are asked to make a presentation.

Seminars take place at 3:30 p.m. on a fixed day. Donuts and coffee are available in the seminar room prior to the meeting.

In 1989/90 the following MPORU Seminars were held:

Sept. 13 - Paul Johns *X-ray Imaging Research at Carleton*

Oct. 11 - Peter Raaphorst *The Use of Hyperthermia in the Treatment of Cancer*

Nov. 8 - Bruce Faddegon *Thick target electron bremsstrahlung spectra: calculation and measurement* and David Rogers *Monte Carlo Simulation of Radiation Transport for Clinical Treatment Planning*

Dec. 13 - Dave Wilkins *Techniques for Localized in vivo NMR Spectroscopy* and D.A. Morrison *Non-Ionizing Radiation Research Activities*

Jan. 10 - Dennis Akyurekli *Modelling the Vascular Effects of Hyperthermia: Experimental Design* and Robert Clark *Progress in Ultrasound Lesioning*

Feb. 21 - Dennis Heller *Low Dose Rate Studies In Vitro* and Bog Jarosz *Ultrasonic Interstitial Hyperthermia*

Mar. 14 - Patrick Rapley *Study of Effect of Water Concentration on Dielectric Response of Phospholipid Water Mixtures* and Alan Mortimer *Investigations of the Safety of Pulsed Doppler Ultrasound*

Apr. 11 - Mazen Soubra *Simultaneous "Thermo-Radiotherapy" Treatment System* and Alex Bielajew *New insights into an old subject - Ionisation chamber theory.*

2.2 Carleton University Physics Dept Seminars

Carleton University Physics Department runs a regular seminar series on Monday afternoons at 3:30 in Rm 252 of the Herzberg Building. The following seminars of interest to Medical Physics were held in 1989/90:

Oct. 23 - Jerry Battista, London Regional Cancer Centre, *Radiation Therapy: Do You Know Where Your Particles Are?*

Nov. 13 - R. Mark Henkelman, Dept. Med. Biophysics, University of Toronto, *M.R. Imaging: More Than A Pretty Picture*

Nov. 27 - Clive Greenstock, Radiation Biology Branch, CRNL, *Biological Studies of Radiation Damage and Its Biological Consequences*

Dec. 15 - Paul C. Johns, Carleton University, *Correction of Pulse-Height Spectra for Peak Pileup Effects*

Jan. 22 - John Saunders, Division of Biological Sciences, NRC, *Problems and Strategies in the Use of MRI/MRS for the Study of Stroke*

Feb. 12 - Rod Taylor, Physics Division, NRC, *Excimer Laser Angioplasty*

Feb. 13 - Walter Huda, Manitoba Cancer Treatment and Research Foundation, *Revised Radiation Dosimetry for Hiroshima and Nagasaki Survivors: Changes in Risk Estimates.*

Fall Graduate Student Seminar Day, November 21, 1989

Five Methods of Measuring Blood Flow - Andrew Weber;

Thermal Dose Determination in Cancer Therapy: Time-Temperature Relationships - Elias Zakhour.

Winter Graduate Student Seminar Day, May 15, 1990

High Electric Field Effects on Micro-organisms - Vikas Chaudhary.

3 MPORU Executive

The formal executive of the MPORU consists of a Director (Peter Raaphorst), Secretary (David Rogers), and Academic Officer (Paul Johns) and a Graduate Student rep (Dennis Heller). Members are elected for two year terms. The executive meets about once a month and has observers from other groups involved (John Saunders, Gary Kramer and Bog Jarosz).

4 Membership Directory of the MPORU

Name	Telephone (Fax)	e-mail	Address
Alex Bielajew	993-2197 (952-9865)	BLIF at NRCVM01	Division of Physics, M-35 N.R.C. Ottawa K1A 0R6
Stephen Bly	954-0308 (957-2486)		Acoustics Unit, Room 66 Health Protection Bldg. Tunney's Pasture Ottawa K1A 0L2
Robert Clarke	788-4375 (788-4389)		Physics Department, Rm. 416 Carleton University Colonel By Drive Ottawa K1S 5B6
Joanna Cygler	725-6267 (725-6320)		Ottawa Regional Cancer Centre Department of Medical Physics Civic Division 190 Melrose Avenue Ottawa K1Y 4K7
Pavel Dvorak	954-0319 (952-7767)		X-Ray Section, Room 257A Health Protection Building Tunney's Pasture Ottawa, K1A 0L2
Lee Gerig	737-6862		Ottawa Regional Cancer Centre General Division 501 Smyth Road Ottawa, K1H 8L6
Clive Greenstock	584-3311 ext 6053 (584-4024)	05011 at AECLRC	Radiation Biology Branch A.E.C.L. Research Chalk River, Ontario K0J 1J0
Boguslaw Jarosz	788-4318 (788-4389)	BOG@ NRC.HEP.CA	Physics Department, Room 350A Carleton University Colonel By Drive Ottawa K1S 5B6
Paul Johns	788-4317 (788-4389)	JOHNS at NRCHEP.NRC.CA	Physics Department, Rm. 420 Carleton University Colonel By Drive Ottawa K1S 5B6

Name	Telephone (Fax)	e-mail	Address
Norman Klassen	993-2715 (952-9865)	KLASSEN at NRCVM01	Division of Physics, Bldg M-35 N.R.C. Ottawa K1A 0R6
Gary Kramer	954-6668		Bureau of Radiation and Medical Devices 775 Brookfield Road Ottawa K1A 1C1
Deirdre Morison	957-7910 (954-2468)		Department of National Health and Welfare Rm 137, Environmental Health Centre Tunney's Pasture Ottawa K1A 0L2
Alan Mortimer	993-1609 (952-7988)		Div. of Electrical Engineering, M-50 NRC, Montreal Rd Ottawa K1A 0R6
Peter Raaphorst	725-6228 (725-6320)		Ottawa Regional Cancer Centre 190 Melrose Avenue Ottawa, K1Y 4K7
Dave Rogers	993-2715 (952-9865)	IRS @NRCVM01	Division of Physics, Bldg M-35 N.R.C. Ottawa K1A 0R6
Carl Ross	993-9352 (952-9865)		Division of Physics, Bldg M-35 N.R.C. Ottawa K1A 0R6
John Saunders	993-8582 (954-7368)		Biological Sciences, M-40 NRC, Ottawa K1A 0R6
Ken Shortt	993-2715 (952-9865)	IRS at NRCVM01	Division of Physics, Bldg M-35 N.R.C. Ottawa K1A 0R6
Ian Smith	990-0884 (952-0583)		Div. of Biological Sciences NRC, Ottawa K1A 0R6

5 Graduate Courses in Medical Physics at Carleton University

The Carleton medical physics program has 3 specializations: imaging, therapy, and biophysics. Shown below is a menu of courses for each. Required courses are marked → ; the others are recommended.

Carleton courses are numbered with the prefix "75" indicating Physics, followed by a 400-series number if Fourth Year, or either a 500- or 600-series number for graduate courses.

Depending on the thesis weighting, the MSc typically requires 6 half-courses in addition to the thesis; the PhD requires 4.

PhD students who lack any of the relevant courses (or their equivalents) required for the MSc must complete them in their PhD.

MSc students may be permitted to take up to 2 Fourth-Year half-courses and credit them towards the degree. PhD students can credit only graduate courses.

SPECIALIZATION IN IMAGING

<u>Fall Term</u>	→ 75.427	Modern Optics (prerequisite to 75.524; additional to degree if PhD)
	→ 75.523	Medical Radiation Physics
<u>Winter Term</u>	→ 75.524	Physics of Medical Imaging
	75.526	Medical Radiotherapy Physics
<u>Fall or Winter</u>	List below	Appropriate half-course in Anatomy, Physiology, Cell Biology, or Radiobiology (ANA 7301, PHS 5210, etc.).
	→ 75.5xx/6xx	Appropriate physics half-course outside of medical physics (permission may be given for 75.4xx if MSc)
	75.591/691	Directed Studies

SPECIALIZATION IN THERAPY

<u>Fall Term</u>	→ 75.523	Medical Radiation Physics
<u>Winter Term</u>	75.524	Physics of Medical Imaging
	→ 75.526	Medical Radiotherapy Physics
<u>Fall or Winter</u>	List Below	Appropriate half-course in Anatomy, Physiology, Cell Biology, or Radiobiology (ANA 7301, PHS 5210, etc.).
	→ 75.5xx/6xx	Appropriate physics half-course outside of medical physics (permission may be given for 75.4xx if MSc)
	75.591/691	Directed Studies

SPECIALIZATION IN BIOPHYSICS

<u>Fall Term</u>	→ 75.523	Medical Radiation Physics (optional for MSc, required for PhD)
<u>Winter Term</u>	75.524 75.526	Physics of Medical Imaging Medical Radiotherapy Physics
<u>Fall or Winter</u>	→ List Below	Appropriate half-course in Anatomy, Physiology, Cell Biology, or Radiobiology (ANA 7301, PHS 5210, etc.).
	→ 75.5xx/6xx	Appropriate physics half-course outside of medical physics (permission may be given for 75.4xx if MSc)
	75.591/691	Directed Studies

Course Descriptions

75.427 - Modern Optics (1/2 course, Fall) - Diffraction theory, coherence, Fourier optics, spatial filtering; holography and its applications; laser theory: stimulated emission, cavity optics, modes; gain and bandwidth; design and characteristics of atomic and molecular gas lasers.
[This is a Fourth-Year half-course which covers material prerequisite to the Physics of Medical Imaging graduate course].

Lecturer: M.K. Sundaresan

75.523 - Medical Radiation Physics (1/2 course, Fall) - Basic interaction of electromagnetic radiation with matter. Sources: x ray, accelerators, nuclear. Charged particle interaction mechanisms, stopping powers, kerma, dose. Introduction to dosimetry. Units, measurements, dosimetry devices.

Lecturer: P.C. Johns.

75.524 - Physics of Medical Imaging (1/2 course, Winter) - Outline of the principles of transmission x-ray imaging, computerized tomography, nuclear medicine, magnetic resonance imaging, and ultrasound. Physical descriptors of image quality, including contrast, resolution, signal-to-noise ratio, and modulation transfer function are covered and an introduction is given to image processing.

Prerequisites: 75.427, 75.523

Lecturers: P.C. Johns, J. Saunders

75.526 - Medical Radiotherapy Physics (1/2 course, Winter) - Terminology and related physics concepts. Bragg-Gray, Spencer-Attix cavity theories, Fano's Theorem. Dosimetry protocols, dose distribution calculations. Radiotherapy devices, hyperthermia.

Prerequisite: 75.523

Lecturers: J. Cygler, D.W.O. Rogers, K.R. Shortt, L.H. Gerig

Appropriate half-course in Anatomy, Physiology etc. - The following 3 courses are available. Courses (ii) and (iii) are taught at the University of Ottawa.

- (i). Radiobiology (1/2 course, Fall) - Introduction to basic physics and chemistry of radiation interactions, free radicals, oxidation and reduction, G values. Subcellular effects, cellular effects, endpoints, killing, repair, sensitization, protection, survival curve analysis. Measurement methods. Tissue effects, genetic and carcinogenic effects, mutations, hazards. Cancer therapy. Radiation protection considerations.
Lecturers: G.P. Raaphorst, others to be announced.

- (ii). ANA 7301 - Anatomy for Medical Physics Graduate Students (1/2 course, extends through Fall + Winter) - A basic course in anatomy for medical physics students utilizing the systemic approach to emphasize practical and clinical aspects of the gross structure of the human body. The course consists of lectures, laboratory demonstrations with dissected materials and a series of audio-visual presentations involving imaging techniques.
- (iii). PHS 5210 - Mammalian Physiology (full course, extends through Fall + Winter) - A comprehensive study of mammalian physiology with an emphasis on regulating mechanisms. The course includes the biophysical basis of excitable tissues, and the physiology of the central nervous system, blood and cardiovascular system, respiratory system, endocrine system, G.I. tract and renal physiology. It is assumed that students have a basic knowledge of chemistry, physics, and biology.

Appropriate physics half-course outside of medical physics - A half-course in an area of physics outside of medical physics is required. Appropriate possibilities include nuclear, theoretical, quantum, particle, solid state, and computational physics.

75.591/691 - Directed Studies - Detailed study of a medical physics topic may be offered as Directed Studies. This provides a means of covering topics other than those described above, and in the last 2 years has been a vehicle for introducing new graduate courses.

Note that the intent of the course requirements is to impart a solid grounding in medical physics overall, with detailed subjects in the student's own research area being learned as part of the MSc or PhD project. Therefore, depending on the other courses taken and the thesis project, a Directed Studies course in the area of the student's own research may be an additional course beyond those required towards the degree if otherwise the student would be left with too narrow a focus.

Paul Johns
Academic Officer, MPORU

1 May 1990

6 Graduate Students Enrolled in the Medical Physics Program

24 May 1990.

<u>STUDENT</u>	<u>YEAR</u>	<u>PROG</u>	<u>SUPERVISOR</u>	<u>SPECIALIZATION</u>
Faddegon, Bruce	1986	PhD	Rogers	Therapy
Wilkins, David	1986	PhD	Raaphorst	Biophysics
Heller, Dennis	1988	PhD	Raaphorst	Biophysics
Soubra, Mazen	1988	PhD (P.T.)	Gerig	Therapy
Akyurekli, Dennis	1/89	PhD	Gerig	Therapy
Rapley, Patrick	1989	PhD	Saunders	Imaging
Wallace, Julia	1989	PhD	Raaphorst	Biophysics/Imaging
Dohkt, Reza	1987	MSc (P.T. to 1989)	Clarke	Imaging
Weber, Andrew	1988	MSc	Gerig	Therapy
Zakhour, Elias	1988	MSc	Raaphorst	Therapy
Older, Julia	1989	MSc	Johns	Imaging
Akyuz, Bunyamin	1989	Qualifying	Johns	Imaging

7 EGS4 Course at NRC

The Ionizing Radiation Standards section at NRC is holding a four-day course on the *Use of EGS4 for Electron Monte Carlo Transport Calculations* from September 24-27, 1990. It will include hands-on laboratory sessions. For further information, contact Alex Bielajew (993-2715) at NRC.

8 Kudos

Paul Johns and Mazen Soubra became Fellows of the Canadian College of Physicists in Medicine in June 1990.

9 Scientific Societies of Relevance to Medical Physics

The following scientific societies are of interest to students in medical physics. For further information contact the individuals shown:

COMP - Canadian Organization of Medical Physicists, Paul Johns, Ken Shortt.

CAP - Canadian Association of Physicists, Dave Rogers, Bob Clarke.

SMRI - Society for Magnetic Resonance Imaging, John Saunders.

CRPA - Canadian Radiation Protection Association, Gary Kramer, Dave Rogers.

AAPM - American Association of Physicists in Medicine, Dave Rogers, Paul Johns.

HPS - Health Physics Society (US), Dave Rogers.

10 Graduate Student Openings

Graduate Student Openings in Medical X-Ray Imaging

Medical imaging physics is undergoing a period of sustained growth and excitement which parallels the growth of radiotherapy physics several decades ago. High-calibre students are sought for graduate studies at Carleton in medical physics leading to the MSc or PhD in Physics. Graduates of this program with imaging specialization will find that there is a strong demand for physicists trained in the basic sciences of imaging in hospitals, industry, and universities.

In the *X-Ray Laboratory*, two projects are currently open. The first involves the production of monoenergetic x rays using secondary fluorescence. Conventional x-ray tube bremsstrahlung spectra make imaging inefficient in terms of patient dose, cause energy subtraction to be severely limited, and create artefacts in CT images. The potential impact of this project is large: a revolution in the design of x-ray tubes and a dramatic increase in the precision and dose-efficiency of x-ray imaging. The second project is to investigate the use of coherently-scattered radiation for medical diagnosis. Coherent or elastic scattering is the basis of x-ray diffraction analysis, but has received relatively little attention in medical imaging. The coherent scattering cross section varies with scattering angle and photon energy in a complicated way for amorphous materials such as tissue and bone; this is the diffraction signature of the material. The dependence on atomic number and chemical structure suggests the use of coherent scatter as a means of obtaining chemical information about tissues within the patient, opening up another dimension to x-ray diagnosis.

The X-Ray Lab at Carleton is equipped with two x-ray systems (single phase and constant potential), 2 high-purity germanium photon spectrometers, radiation dosimetry and other instrumentation, vax computer with image display system, and access to excellent machining and electronic support facilities. The thesis projects will entail a mix of experimental measurements, theoretical analysis, and computation.

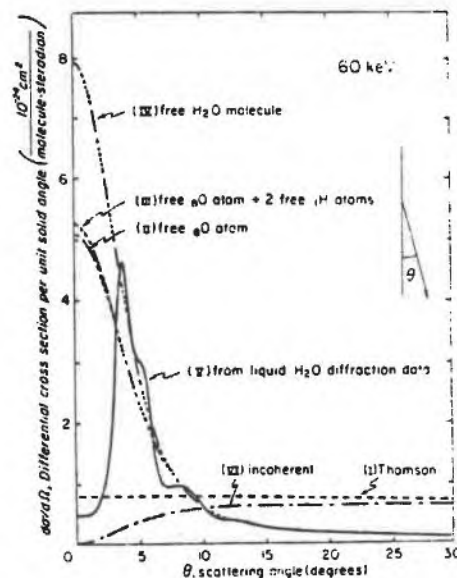
Suitable undergraduate preparation includes a Bachelor's degree in Physics or in Engineering Physics/Engineering Science.

For further information on these projects, contact

Dr. Paul Johns,
Assistant Professor,
Department of Physics
Carleton University,
Ottawa, Ontario
K1S 5B6

(613) 788-4317

28 May 1998



The OMEGA Project

Graduate Student Openings in Medical Physics

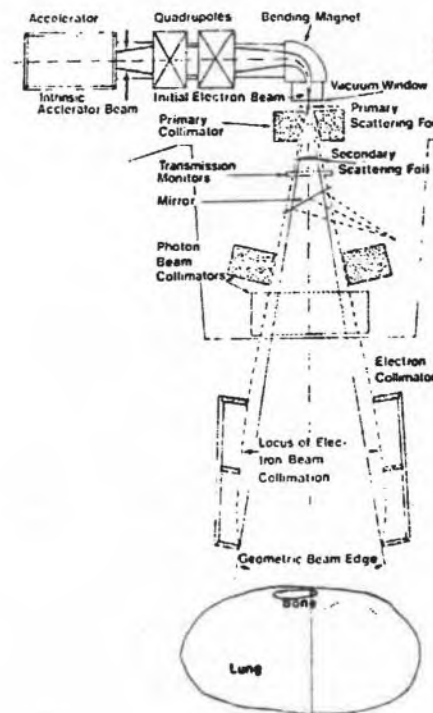
Applications to the MSc and PhD programs in the Medical Physics Program in the Physics Department at Carleton University are invited from students wishing to take part in the OMEGA Project. This is a project to develop a fully 3-dimensional clinical treatment planning package for external electron beam radiotherapy using Monte Carlo simulation of the electron transport. It is hoped that this three year project will produce the definitive technique for clinical treatment planning.

The project has many challenging and exciting components such as: developing a user friendly code to simulate the radiation field from a clinical electron accelerator; using physics tricks to increase the speed of traditional Monte Carlo simulations as done by the EGS4 code (which is widely used in particle physics and medical physics); harnessing the necessary computing power in a cost effective manner (the equivalent of 15 Cray X-MPs working together is needed); integrating the code into a 3-dimensional unix-based clinical package and experimentally verifying the results.

The OMEGA project (Ottawa-Madison-Electron-Gamma-Algorithm) is a collaborative project among NRC, Carleton University and the Ottawa Regional Cancer Clinic in Ottawa and the University of Wisconsin Medical Sciences Center in Madison, Wisconsin.

For further information, contact
D.W.O. Rogers
 Division of Physics
 National Research Council of Canada
 Ottawa, Ontario K1A 0R6

Telephone: 613-993-2715
 BITNET: IRS at NRCVM01



11 CVs of Members of the MPORU

Alex F. Bielajew

POSITION: Research Officer, Division of Physics, National Research Council of Canada, Ottawa K1A 0R6
Tel: (613)993-2197 FAX: (613)952-9865 e-mail: BLIF @ NRCVM01.BITNET

EDUCATION: Stanford University, California, Ph.D. (1982) in Theoretical Physics

RESEARCH AND PROFESSIONAL EXPERIENCE:

- Employed in the Ionizing Radiation Standards Section of the Basic Standards Laboratory as a radiation transport and dosimetry theorist.
- Development of Monte Carlo simulation theory for electron-photon transport in the energy range 10 keV-50 MeV. In particular, extending and improving the lower energy range.
- Development of the EGS4 (Electron Gamma Shower) Monte Carlo computer code system as well as "user" codes and geometry packages for EGS4 code in VAX, IBM 3090, FPS-264, IBM/PC, Sun and Silicon Graphics environments.
- Development of fundamental dosimetry theory, Monte Carlo methods for radiation dosimetry and radiotherapy applications, and integration of Monte Carlo methods into new treatment planning algorithms.
- Development of saturation theory for ion chambers in continuous and pulsed beams.

AWARDS:

- Sylvia Fedoruk Prize in Medical Physics. CAP(DBMP) London, Ontario, 1989.
- Farrington Daniels Award. AAPM, Seattle 1985.

SAMPLING OF PUBLICATIONS:

1. "Theoretical and experimental investigation of dose enhancement due to charge storage in electron irradiated phantoms" *Med. Phys.* 11(1984)814.
2. "Calculated buildup curves for photons with energies up to ^{60}Co " *Med. Phys.* 12(1985)738.
3. "Ion chamber response and A_{wall} correction factors in a ^{60}Co beam by Monte Carlo simulation" *PMB* 30(1985)429.
4. "The Monte Carlo simulation of ion chamber response to ^{60}Co —resolution of anomalies associated with interfaces" *PMB* 30(1985)419.
5. "The effect of free electrons on ionization chamber saturation curves" *Med. Phys.* 12(1985)197.
6. "Energy-loss straggling in electron Monte Carlo transport" in "Transactions of the American Nuclear Society", 52, American Nuclear Society Press, 1986, 380-2.
7. "Ionization cavity theory—a formal derivation of perturbation factors for thick-walled ion chambers in photon beams" *PMB* 31(1986)161.
8. "Electron beam dose distributions near small inhomogeneities" *PMB* 31(1986)235.
9. "The dependence of mass energy absorption coefficient ratios on beam size and depth in a phantom" *Med. Phys.* 13(1986)496.
10. "Differences in electron depth-dose curves calculated with EGS and ETRAN and improved energy-range relationships" *Med. Phys.* 13(1986)687.
11. "PRESTA—the "Parameter Reduced Electron-Step Transport Algorithm" for electron Monte Carlo transport" *NIM B18*(1987)165.
12. "Generation of photon dose spread arrays using the EGS Monte Carlo code" *PMB* 33(1988)1.
13. Six Chapters:
 - "Electron step-size artefacts and PRESTA"
 - "20 MeV electrons on a slab of water"
 - "Experimental benchmarks of EGS"
 - "A comparison of EGS and ETRAN"
 - "Variance-reduction techniques"
 - "Electron transport in \vec{E} and \vec{B} fields"
 in "Monte Carlo Transport of Electrons and Photons", Plenum Press, New York, 1989.
14. "Monte Carlo techniques of electron and photon transport for radiation dosimetry, Vol.III" in "The Dosimetry of Ionizing Radiation", Academic Press, 1990, (in press).

UNPUBLISHED NRCC REPORTS:

1. "Use of ICRU-37/NBS Radiative Stopping Powers in the EGS4 System" PIRS-0177, 1989.
2. "Use of ICRU-37/NBS Collision Stopping Powers in the EGS4 System" PIRS-0173, 1989.
3. "Photoelectron angle selection on the EGS code system" PIRS-0058, 1986.
4. "Calculation of the contamination of the ^{60}Co beam from an AECL therapy source" PXNR-2710, 1985.
5. "The use of EGS for Monte Carlo calculations in medical physics" PXNR-2692, 1984.

Stephen Howard Perry Bly

Phone: (613) 954-0308

Mail: Health Protection Building, Room 66, Tunney's Pasture,
Ottawa, Ontario K1A 0L2

Fax: (613) 957-2486

Position: Physicist, Acoustics Unit
Bureau of Radiation and Medical Devices
Health and Welfare Canada

Research Interests:

Development and characterization of instrumentation for ultrasonic exposure measurements and dosimetry.

Potential Research Projects for Graduate Students (beginning September 1990):

- (i) Measurement of temperature rise in tissue mimicking phantoms for diagnostic pulses and beams as a function of total power.
- (ii) Ultrasonic characterization of biomaterials.
- (iii) Use of ultrasound to regulate implantable drug delivery systems.

Current Professional Appointments/Memberships:

- (i) Member Working Group 8 of Technical Committee 87 Ultrasonics of the International Electrotechnical Commission.
- (ii) Liaison Member of the Bioeffects Committee of the American Institute for Ultrasound in Medicine.
- (iii) Member of the American Institute of Ultrasound in Medicine
- (iv) Member of the Acoustical Society of America.

Past Education:

National Cancer Institute Postdoctoral Fellowship held at the Ultrasonics Group at the Ontario Cancer Institute under Dr. John Hunt (1982-1984). Ph.D. in Chemistry Department of the University of Toronto under Dr. John Polanyi. "Studies in Electronic Chemiluminescence" (1976-1982) supported by NSERC Scholarship and University of Toronto Open Scholarship. B.Sc. in Chemical Physics at the University of Toronto (1972-1976).

Typical Publications:

1. Quantitative contrast measurements in B-mode images: comparison between experiment and theory. S.H.P. Bly, D. Lee-Chahal, D.R. Foster, M.S. Patterson, F.S. Foster and J.W. Hunt. *J. Ultrasound in Medicine and Biology*, Vol.12, pp.197-208, 1986.
2. A portable ultrasonic power meter for routine calibration of ultrasonic therapy devices. R.G. Hussey and S.H.P. Bly. *J. Clinical Engineering*, Vol.13, pp.109-113, 1988.
3. Sensitivity of effective radiating area measurement for therapeutic ultrasound transducers to variations in hydrophone scanning technique. *Health Physics*, Vol.57, pp.637-643, 1989.
4. A portable radiation force balance for routine calibration of ultrasonic therapy devices, S.H.P. Bly, R.G. Hussey, P. Marr, Proc. of the Canadian Medical and Biological Engineering Society Conference, available from: Canadian Medical and Biological Engineering Society, 837 Eastvale Drive, #134, Gloucester, Ontario, Canada K1J 7T5, 1989.
5. Biophysical mechanisms in the formulation of Canadian guidelines for diagnostic ultrasound devices, S.H.P. Bly, D.A. Morison, J. Acous. Soc. Am., Suppl. 1: 86:S41, 1989.

Robert L. Clarke

Education:

University of Alberta, B.Sc., Physics 1943
 McGill University, Ph.D., Nuclear Physics, 1948

Employment:

1943 - 1945 National Research Council of Canada
 1948 - 1968 Atomic Energy of Canada, Chalk River, Ont
 1962 - 1963 Rutherford Laboratory, Harwell, U.K.
 1968 - 1987 Carleton University, Ottawa
 1987- Retired, Adjunct Professor, Carleton University

Visiting Positions at Royal Marsden Hospital, Sutton Surrey, U.K.

1978 - 1979, 1980 (summer), 1982 (brief), 1985 (summer)
 1986 (1/2 year), 1989 (1/2 year)

Research Interests:

Optics
 Fast neutron physics, nuclear reactions, reactor physics
 Polarised proton scattering
 Gamma ray imaging
 Ultrasound tissue characterisation, imaging, hyperthermia,
 high intensity effects

Teaching:

Nuclear physics for reactor physicists (A.E.C.L.)
 Elementary physics, first and second year
 Reactor physics, nuclear physics
 Advanced physical optics, sensing and imaging

Other:

Chairman, Physics Department (1972 - 78)
 Carleton Senate, etc.
 Carleton Board of Governors
 C.A.P.: D.M.B.P., Editor Physics in Canada (1975 - 78),
 Hon Sec-Treas (1987 -89)
 Chairman Local Committee, Congress 1972
 I.O.M.P.: Chairman Local Committee, Congress 1976
 I.U.P.E.S.M. vice Sec.Gen. 1985-1988
 Sec. General 1988 - (to 1991)

Joanna Cygler

- ADDRESS:** Ottawa Regional Cancer Centre,
Department of Medical Physics,
Civic Division,
190 Melrose Avenue,
Ottawa, Ontario K1Y 4K7
TEL: (613) 725-6267 **FAX:** (613) 725-6320
- CURRENT POSITION:** Medical Physicist
- IN SERVICE AREA DUTIES INCLUDE:** Radiation dosimetry in external beam therapy and brachytherapy, supervision of treatment planning procedures, Quality assurance of treatment machines and other clinical equipment.
- TEACHING RESPONSIBILITIES:** Coordination of educational activities of the Ottawa Regional Cancer Centre Medical Physics Department, coordination of the Medical Radiotherapy Physics course (75.526) at Carleton University, teaching of residents and technologists, teaching of graduate students and medical physics residents
- RESEARCH INTERESTS:** Electron Beam Dosimetry
Radiobiology
Brachytherapy
- EDUCATION:** MSc. in experimental physics, 1972, University of Lodz, Lodz, Poland, Ph.D. in radiation chemistry, 1978, Technical University of Lodz (Polytechnika), Lodz, Poland.
- RECENT PUBLICATIONS:**
1. Cygler, J., Klassen, N.V. and Teather, G.G.,
Trapped Electrons in Tert-Butanol-Water glasses. *Rad. Phys. Chem.*, 27, 47, (1986)
 2. Cygler, J., Klassen, N.V. and Ross, C.K.,
Pulse Radiolysis Studies of the Solvated Electron in Tertiary Butanol-Water Solutions
Can. J. Chem., 64, 1548 (1986)
 3. Cygler, J., Battista, J.J., Scrimger, J.W., Mah, E., Antolak, J.,
Electron Dose Distributions in Experimental Phantoms: A Comparison with 2D Pencil Beam Calculations. *Phys. Med. Biol.*, 32, 1073 (1987)
 4. Bielajew, A.F., Rogers, D.W.O., Cygler, J., Battista, J.J.,
"A Comparison of Electron Pencil Beam and Monte Carlo Computational Methods", in *Use of Computers in Radiation Therapy*. I.A.D. Bruinvis et al, p. 65-68, North-Holland, 1987
 5. Cygler, J., Lavigne, B., Raaphorst, G.P.,
Modification of the Selectron Standard Applicator for the Gynecological Treatments
British Journal of Radiology. 60, 1238, (1987)
 6. Cygler, J., Copeland, F.,
Role of CT Scanning in Radiation Therapy with Electron Beam
Medical Dosimetry. 13(2), 69, (1988)
 7. Cygler, J., Ross, J.,
Electron Dose Distributions in an Anthropomorphic Phantom - Verification of Theraplan Treatment Planning Algorithm
Medical Dosimetry. 13, 155, 1988
 8. Cygler, J., Szanto, J., Soubra, M., Rogers, D.W.O.
"Effects of Gold and Silver Backings on the Dose Rate Around an 125I Seed"
Med. Phys. 17, 172-178 (1990)

Pavel Dvorak

Telephone: 1-613-954-0319 (office) 1-613-226-4188 (home)
Telefax: 1-613-952-7767

Address: X-Ray Section, Rm. 275A
Health Protection Building
Tunney's Pasture
OTTAWA, Ontario
K1A 0L2

Current Position: Head, X-Ray Section, Bureau of Radiation and Medical Devices

Research Interests: X-ray doses in medical diagnostic procedures, risk/benefit evaluations, computer simulations of X-ray interactions; currently not able to supervise graduate students

Current Professional Appointments: Chairman, Canadian National Committee for IEC Subcommittees 62B and 62C; Chairman, CSA Technical Committee for Equipment in Radiology and Nuclear Medicine

Past Jobs: Assistant Professor, Dept. of Physics, Faculty of Technical and Nuclear Physics, Prague, Czechoslovakia (1960-69); Research Physicist, Picker X-Ray Mfg. Ltd., Bramalea, Ontario (1972-76)

Education: M.Sc., Experimental Nuclear Physics, Czech Technical University, Prague, Czechoslovakia, 1960

Professional Affiliations: Division of Medical and Biological Physics; Canadian Radiation Protection Association; Association of Professional Engineers of Ontario

No major publications (most of work done in industrial research and regulatory field); typical papers:

P. Dvorak, E. Kairiss: Bremsstrahlung Spectra from Diagnostic X-Ray Generators, CAP Congress 1973, Montreal, Quebec

P. Dvorak: A Comparison of Relative Effect on the Image Quality of the Object Motion and the Focal Spot Geometry, CAP Congress 1975, Toronto, Ontario

P. Dvorak, L. Szegedi and D.K. Friend: A Comparison of Integral Absorbed Dose in Panoramic and Conventional Dental X-Ray Examinations, Proc. HPS Fourteenth Mid-Year Topical Symposium, Hyannis, Mass. 1980

P. Dvorak et al: A Study of X-Ray Dose to Scoliosis Patients, Proc. 3rd SRP International Symposium, Inverness, Scotland, 1982

Lee H. Gerig

- CONTACT:** Ottawa Regional Cancer Centre
General Division
501 Smyth Road
Ottawa, Ontario K1H 8L6
(613) 737-6862
- PRESENT POSITION:** Senior Physicist
Head, Section of Clinical Physics
Ontario Cancer Treatment and Research Foundation
Ottawa Regional Cancer Centre
- Adjunct Professor
Carleton University
Department of Physics
- Lecturer, University of Ottawa
Department of Radiology
- EDUCATION:** BSc. University of Western Ontario 1975
Ph.D. University of New South Wales 1985
- AFFILIATION:** -Radiation Research Society
-Canadian Association of Radiation Oncology
-North American Hyperthermia Group
- TYPICAL PUBLICATIONS:** Intra Cranial Volume Response During the Treatment
of Gliomas.
M.D. Riding, L.H. Gerig, A. Girard, D. Stewart
Proceedings of Symposium Neuroradiologium, June
1986
- Prognostic Significance of Endometrial Extension
in Carcinoma of the Cervix.
L. Grimard, P. Genest, A. Girard, L. Gerig,
M. Prefontaine, P. Drouin, R.C. Nair
Accepted in Gynecologic Oncology, 1987
- A Computerized Thermocouple Based Clinical
Thermometry System.
L. Gerig, C.E. Danjoux, G.P. Raaphorst,
Z. Hauderowicz, S. Holford
Endocurietherapy/Hyperthermia Oncology, an
International Journal, 4:31-37, January 1988.
- Impact of Local Radiation in the Management of
Salivary Gland Carcinomas.
L.J. Eapen, L.H. Gerig, G.E. Catton, C.E. Danjoux,
A. Girard
Head & Neck Surgery - Mar/Apr:239-245, 1988.

Clive Lewis Greenstock, Radiation Biology Branch, AECL Research, Chalk River, Ont. K0J 1J0 (613)584-3311, ext. 6053, FAX (613)584-4024, E-mail 05011 @ AECLGR

Position: Research Officer, Adjunct Professor, Department of Biochemistry, University of Ottawa Medical School.

Research Interests: Accelerators and radiation sources, dosimetry and radiological protection, carcinogenesis and risk/benefit analysis, cancer diagnosis and treatment, radiobiology and radiation chemistry/physics, free radicals and chemical kinetics, chromatography, polarography, calorimetry, electrophoresis, spectroscopy (absorbance, fluorescence, AA, ESR & NMR), oncogenes, monoclonal antibodies, cell transformation and cancer screening.

Graduate Student Projects: Develop biological dosimeters of low-level damage by radiation and other environmental threats, assess biophysical techniques for cancer screening, cancer proneness, radiosensitivity and early diagnosis of cancer, implement strategies for radiation protection and cancer prevention, and monitor conformational changes in DNA and cell membranes associated with cell growth and regulation, differentiation, and the induction of biochemical and immunological defences.

Education: B.Sc. hon. (Physics) University of Leeds, M.Sc. St. Bartholomew's Hospital Medical College, University of London, Ph.D. University of Toronto. Adjunct Professor (Physics) University of Manitoba.

Employment: Medical Physicist Cardiff Radiotherapy Centre UK, Medical Physics Appointee Ontario Cancer Institute, Radiological Physicist National Physical Laboratory, Post-doctoral fellow Mount Vernon Hospital, Medical Biophysicist Whiteshell Nuclear Research Establishment, Visiting Scientist NRC, Sabbatical Christie Hospital and Holt Radium Institute, Visiting Scientist Wallac Oy Finland.

Awards: National County Scholar, Scientific Research Council grant, Canadian Cancer Research award, National Cancer Institute of Canada Fellow 69-70, LH Gray Memorial Trustee, Commission of the European Communities grant, Radiation Research Society Travel award, International Union of Pure and Applied Biophysics award, Radiation Research Society Travel award, Heineman Foundation Fellow, Royal Society Commonwealth Research award, NATO Advanced Study Institute award, Canadian Cancer Society grant, President's Fund Medical Research Council of Canada 85, NSERC Industrial award, International Union against Cancer Technology Transfer award.

Appointments: Councillor, Biophysical Society of Canada, Radiation Chemistry Data Center Advisory Committee, Notre Dame 1N, Radiosensitizer/Radioprotector working group member, ROTC, US National Cancer Institute, Associate editor for Radiation Research 1977-81, Science in the Schools Programme and Speakers Bureau AECL, International Cancer Research delegation to South Africa 1985.

Funding: AECL, AECB, COG, CFFTP, NSERC.

Certification: Fellow of the Institute of Physics (FInstP), Chartered Physicist (CPhys), American Association for Cancer Research, Association for the Advancement of Science in Canada, Association for Radiation Research, Biophysical Society of Canada, British Institute of Radiology, Chemical Institute of Canada, Canadian Association of Physicists, Institute of Physics, Radiation Research Society, Sigma Xi, Society for Free Radical Research.

Publications: Over 100 papers, 14 review articles, 45 reports.

Greenstock, C.L. Oxygen radicals and ions and their control in biology. In "Advances in Oxygen Radicals and Radioprotectors", eds. A. Breccia, C.L. Greenstock and M. Tamba, Lo Scarabeo, Bologna, 1984, pp 29-45.

Greenstock, C.L. Free radical processes in radiation and chemical carcinogenesis in "Advances in Radiation Biology, Vol. 11", ed. J.T. Lett and H.I. Adler, Academic Press, New York, 1984, pp 269-294.

Greenstock, C.L. Oxy radicals and the radiobiological oxygen effect, *Israel J. Chem.*, **24**, 1-10, 1984.

Greenstock, C.L. and Whitehouse, R.F. The effect of additives on irradiated and autoxidized phospholipids. *Life Chem. Report.* **2**, 49-56, 1985.

Greenstock, C.L. and Whitehouse, R.F. Radiosensitizers as probes of DNA damage and cell killing. *Int. J. Radiat. Biol.* **48**, 701-710, 1985.

Greenstock, C.L. Radiation-chemical aging, and induction and promotion of biological damage. In "Free Radicals, Aging and Degenerative Diseases", Alan R. Liss Inc., New York, 1986, pp 197-221.

Greenstock, C.L. The Role of Free Radicals in Radiation Chemical Aging. *Progress in Reaction Kinetics*, Vol. 14, eds. K.R. Jennings and R. B. Cundall, Pergamon Press, Ltd., Oxford, 1986, pp 249-265.

Greenstock, C.L., Jinot, C.P., Whitehouse, R.F. and Sargent, M.D. DNA Radiation damage and its modification by metallothionein. *Free Radical Res. Commun.* **2**, 233-239, 1987.

Buxton, G.V., Greenstock, C.L., Helman, W.P. and Ross, A.B. Critical review of rate constants for reactions of hydrated electrons, hydrogen atoms and hydroxyl radicals (·OH/O₂·) in aqueous solution. *J. Phys. Chem. Ref. Data* **17**, 513-886, 1987.

Greenstock, C.L. Radiation Chemical Considerations for the Radioprotection of Cellular Targets. *Pharmacol. & Ther.* **12**, 139-

Boguslaw Jan Jarosz

Carleton University, Department of Physics
Colonel By Drive
Ottawa, Ontario K1S 5B6
Tel. (613) 788-4318, 788-4312
Fax: Faculty of Science, (613) 788-4389
E-mail: Bog@NRC.HEP.CA

2. Current position: Lecturer.

Research in physics of medical ultrasound: Current interests incorporate laser generated ultrasound on solids, optical fibre sensor of ultrasonic fields, interaction of sonic waves with tissue, mode conversion in tissues, and methods of interstitial generation of local hyperthermia.

3. Member of MPORU.

4. Polish Ministry of Science Award for Individual Research.

Four Rector of Warsaw Technical University Awards for Research.

Four Rector of Warsaw Technical University Awards for Excellence in Teaching.

Carleton University Award for Professional Achievement.

5. Education: Ph.D. in Physics with Distinction, 1975, Warsaw Technical University, Poland.

M.Sc. in Physics, 1966, Warsaw University, Poland.

Employment: Sessional Lecturer/Research Associate; Instructor II, Carleton University, September '83 -

Assistant Professor, Port Harcourt University, Nigeria, March '77 - August '83.

Assistant Professor, Warsaw Technical University, December '74 - March '77.

Research and Teaching Associate, Warsaw Technical University, September '66 - December '74.

6. Professional Affiliations: Member of IEEE Engineering in Medicine and Biology Society, and of IEEE Ultrasonic, Ferroelectrics, and Frequency Control Society.

7. Recent Publications in Medical Physics:

Ultrasonic Interstitial Heating in Phantoms, *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, vol. 11, 1451, 1989.

Ultrasonic Interstitial Heating in Tissue Phantom and in Tissue *in vitro*, *6th Annual Meeting of American Society of Clinical Hyperthermic Oncology*, Portland, OR, 1989.

Rate of Heating by Interstitial Ultrasonic Hyperthermia Applicator, *10th CCPM/DMBP Annual Symposium*, London, Ontario, 1989.

Ultrasonic Hyperthermia by Invasive Technique, *1987 CAP Congress*, Toronto, Ontario, (with R. L. Clarke).

Paul C. Johns

Mail: Department of Physics
Carleton University
Ottawa, Ontario
K1S 5B6

Telephone: 788-4317
FAX: 788-4389
E-Mail: JOHNS@NRCHEP.NRC.CA

- Current Position:** Assistant Professor, Department of Physics, Carleton University
- Research Interests:** The basic physics of medical x-ray imaging, specifically: artefacts in CT images due to scatter and x-ray energy spectrum effects, the production of mono-energetic x rays, and the extraction of diagnostic information from scattered radiation.
- Professional Activities & Appointments:** Lecturer, Department of Radiology, University of Ottawa
Consulting Scientific Research Staff, Radiological Sciences, Ottawa Civic Hospital
Reviewer for the journal Medical Physics
- Previous Employment:** 1986-1988 Ontario Cancer Treatment & Research Foundation: Medical Physicist attached to Radiological Sciences, Ottawa Civic Hospital
1977-1979 Atomic Energy of Canada Ltd., Mississauga, Ontario: Nuclear Generating Station Safety Analyst
- Education:** 1982-1986 PhD } Medical Biophysics, U of Toronto
1979-1982 MSc } Supervisor: Dr. Martin J. Yaffe
1973-1977 BAsc Engineering Science, U of Toronto
Nuclear & Thermal Power Option
- Professional Affiliations:** AAPM American Association of Physicists in Medicine
CAP Canadian Association of Physicists
COMP Canadian Organization of Medical Physicists
IRPS International Radiation Physics Society
- Professional Certifications:** FCCPM Fellow, Canadian College of Physicists in Medicine
P.Eng. Professional Engineer
- Awards and Honours:** Charles E. Ives Engineering Award, for an outstanding paper published in the J of Applied Photographic Engineering in 1983 (with M.J. Yaffe).
Sylvia Sorkin Greenfield Award, for best paper published in Medical Physics in 1983 (with M.J. Yaffe).
2nd place in the Young Investigators' Symposium, AAPM Annual Meeting, Chicago, July 1984.
- Some Typical Publications:** P.C. Johns and M.J. Yaffe, "X-Ray Characterisation of Normal and Neoplastic Breast Tissues", Physics in Medicine and Biology 32, 675-695 (1987).
P.C. Johns, D.J. Drost, M.J. Yaffe, and A. Fenster, "Dual-Energy Mammography: Initial Experimental Results", Medical Physics 12, 297-304 (1985).
P.C. Johns and M.J. Yaffe, "Coherent Scatter in Diagnostic Radiology", Medical Physics 10, 40-50 (1983).

11 June 1990

Norman V. Klassen

Address: National Research Council of Canada
Ionizing Radiation Standards, Bldg. M-35
Ottawa, Ontario K1A 0R6 Canada

Telephone: 613-993-9352
Fax: 613-952-9865
BITNET: KLASSEN at NRCVM01

Position and Research Interests: Senior Research Officer

Member of the Ionizing Radiation Standards Section of the Basic Standards Laboratory working primarily on radiation chemistry problems.

Pulse radiolysis of aqueous liquids, glasses and crystals from 2K to room temperature, with a special interest in e_{tr}^- , a type of trapped electron discovered by this group.

Pulse radiolysis of liquid and glassy hydrocarbons with a special interest in the decay kinetics of the trapped electron and the initial positive ion.

Currently involved in a comparison of final products in alkanes irradiated at low and high dose rates with a view to quantifying certain free radical processes.

Currently involved in a comparison of mammalian cell survival following irradiation at low and high dose rates, aerated and hypoxic.

Currently involved in the development of water calorimetry as a standard for absorbed dose to water, with a special interest in the radiation chemistry of dilute aqueous solutions.

Committees:

Advisory Board of the Radiation Chemistry Data Center, University of Notre Dame

Education:

Ph.D. - McGill University, Montreal (1957) Physical Chemistry

Ph.D. - University of London, London U.K. (1961) Physical Organic Chemistry

Honours:

Fellow of the Chemical Institute of Canada

Representative Publications:

1. "A study of trapped electrons in LiCl/D₂O and other aqueous glasses at temperatures down to 2K by radiolysis, pulse radiolysis, photolysis and stimulated luminescence", J. Phys. Chem. 57 1488-1499 (1979).
2. "Cations and electrons in hydrocarbon glasses and liquids studied by pulse radiolysis", J. Phys. Chem. 89, 2048-2053 (1985).
3. "Increased sensitivity of mammalian cells irradiated at high dose rates under oxic conditions", Int. J. Radiat. Biol. 37 331-335 (1980).
4. "A Direct Comparison of Water Calorimetry and Fricke Dosimetry", Phys. Med. Biol. 34, 23-42 (1989).

Gary H. Kramer

Bureau of Radiation and Medical Devices
775 Brookfield Road
Ottawa, Ontario
K1A 1C1
613 954 6668

PROFESSIONAL EXPERIENCE:

Currently Gary Kramer is head of Human Monitoring Laboratory (HML), Environmental Radiation Hazards Division, BRMD where he has worked since 1987. The HML is Canada's National Calibration Reference Centre. Duties include: Intercomparison Services for Canadian In-Vivo facilities (whole body, lung and thyroid). In-Vivo monitoring of possibly internally contaminated individuals, internal dosimetric calculations, design and fabrication of phantoms for calibration of Canadian facilities, systems manager for divisional mini-computer, and developing National Criteria for Bioassay and In-Vivo Monitoring.

Previously, Gary Kramer was employed by Atomic Energy of Canada Limited where he was head of Bioassay Laboratory and In-Vivo Monitoring Facility, Dosimetric Research Branch, Chalk River Nuclear Laboratories (CRNL). Duties included: Development of new bioassay (In-Vitro and In-Vivo) methods and testing, improving and documenting existing methods, implementing an in-house quality assurance program, developing improved monitoring methods, internal dosimetry, evaluation of internal contamination incidents and database administration. Research was aimed at understanding more fully the biological transport mechanisms of uranium in the human body by studying the metal ion chemistry under physiological conditions. At CRNL he was also a member of Unit 2000, a multi-disciplinary group created to pioneer work in hyperthermia, intelligent sensing and stable isotope production.

To date, he has published 22 papers and 55 reports in various areas of radiation protection (dosimetry, radiochemical procedures, in-vivo procedures, QA documentation).

PROFESSIONAL AFFILIATION AND COMMITTEE MEMBERSHIPS

Member since 1979, Canadian Radiation Protection Association, Chairman of Membership Committee (1984-1986), Director (1986-1988), Scholarship Fund Committee (1988-present), Nominating Committee (1989-present)

Member since 1980, Health Physics Society

Member, Canadian Federal/Provincial Working Group on In-Vivo and Bioassay Monitoring Criteria, Chairman (1987-present)

Member, IAEA Technical Committee Meeting on Rapid Monitoring of Large Groups of Internally Contaminated People (TC-685), 1989

Deirdre A. Morison

TELEPHONE: (613) 957-7910

FAX: (613) 954-2468

ADDRESS: Department of National Health and Welfare
Room 138, Environmental Health Centre
Tunney's Pasture, Ottawa, Ontario, K1A 0L2

CURRENT POSITION: Acting Chief, Product Safety Division (January 1, 1990)
Bureau of Chemical Hazards

PREVIOUS POSITION: Head, Non-Ionizing Radiation Section
Bureau of Radiation and Medical Devices

The function of my home-base position is to lead a group of scientists and technical inspectors specializing in the protection of Canadians from the harmful effects of non-ionizing radiations. The group is formed into 3 units: (i) Electromagnetics (powerline frequencies, radio transmissions, VDT's, microwaves, radar, etc.); (ii) Electro-optics (ultraviolet, infrared and visible radiation, lasers); and (iii) Acoustics (ultrasound, infrasound and noise).

The present research interests of the group include: ultrasound dosimetry, investigation of the specific absorption rate (SAR) in humans for a range of frequencies, the effects of 60 Hz power line frequencies on cancer promotion and carcinogenesis, the biological effects of electro-optics, electro-optics measurements.

CURRENT PROFESSIONAL APPOINTMENTS:

- Chairman of Canadian Advisory Committee (CAC) to International Standards Organization (ISO) Technical Committee on Acoustics (CAC/ISO/TC43).
- Member of American Conference of Government Industrial Hygienists (ACGIH) Physical Agent Threshold Limit Value (TLV) Committee.
- Member of Canadian Radiation Protection Association, Acoustical Society of America, Canadian Acoustical Association, Canadian Advisory Committee to IEC/TC87-Ultrasonics.

PAST JOBS, EDUCATION, PROFESSIONAL AFFILIATION

- B.Sc. Physics, Nottingham University, 1967
- Association of Professional Engineers of Ontario - member since 1980.
- Physicist, Acoustics Radiation Unit, Dept. of National Health & Welfare, 1975-1984.
- Acoustics Regional Field Manager, Ontario Ministry of the Environment, 1973-1975.
- Noise Consultant, Ontario MOE and Independent, 1971-1973.
- Acoustics Test Engineer, Vibro-Acoustics and Vibron, 1970-1971.
- Noise Engineer, Rolls-Royce Aero-Engine Division (U.K.), 1967-1969.
- Editor, Canadian Acoustics, Quarterly publication of Canadian Acoustical Association, 1980-83.

SAMPLE PUBLICATIONS

D.A. Morison (1989), "1988 Update on regulating occupational exposure to noise", Canadian Acoustics, 17(1), January, pp.3-31.

D.A. Morison (1989), "Canadian National Guidelines for Environmental Noise Control - Procedures and Concepts for the Drafting of Environmental Noise Regulations/By-laws in Canada", J. Acoust. Soc. Amer., Supplement 1, Vol.85, Spring, p.S45.

D.A. Berwell (1985), "Protective Measures for Ultrasound Exposure", Ultrasound in Medical Applications, Biological Effects and Hazard Potential, Editors M.H. Repacholi, M. Grandolf and A. Rindi, Plenum Pub. Corp., New York, 1987, pp.247-253.

Alan Mortimer

Business Address: Senior Research Officer
NRC / Division of Electrical Engineering
Ottawa, Ontario K1A 0R6

Tel. 613-993-1609
Fax. 613-952-7988

Education: Carleton University Physics 1972
B.Sc. Ottawa, Canada

M. Sc. Carleton University Medical Physics 1974

Ph.D. Guy's Hospital Medical Medicine 1989
School, Univ. of London (non-clinical)

Professional Qualifications and Affiliations:

- 1978 Membership Committee Canadian Medical and Biological Eng. Society
- 1979 Member - Bioeffects Committee of American Institute of Ultrasound in Medicine
- 1983 Chairman - Canadian National Committee of International Electrotechnical Commission 29D Electroacoustics
- 1984 Secretary - Life Sciences Subcommittee of Interdepartmental Committee on Space
- 1984 Vice-Chairman AIUM Bioeffects Committee
- 1985 Chief Mission Scientist Canadian Life Sciences Space Flight
- 1986 - 88 Chairman AIUM Bioeffects Committee

Research Interests

Biological Effects of Ultrasound
Acoustic Cavitation
Tissue Characterization
Ultrasound Diagnostic Instrumentation

Graduate Topics

Methods for detecting coronary plaque in vessels for use in laser surgery (numerical techniques)
Prediction of safe levels from ultrasound cavitation in vivo

G. Peter Raaphorst

- Address:** Ottawa Regional Cancer Centre, 190 Melrose Avenue, Ottawa, Ontario, K1Y 4K7
- Positions:** Head of Medical Physics, Ottawa Regional Cancer Centre, Civic and General Hospitals; Adjunct Professor of Physics, Carleton University; Assistant Professor Department of Radiology, University of Ottawa; Adjunct Professor Department of Biology University of Ottawa; Allied Scientific Staff, Department of Radiology, Civic Hospital.
- Education:** B.Sc., M.Sc. and Ph.D. degree from the Department of Physics University of Waterloo; Post-doctoral training, Department of Radiology and Radiobiology in Colorado State University, Colorado, U.S.A.
- Awards:** 1) Ontario Scholarship; 2) Lester B. Pearson, Prime Minister's Award for excellence; 3) Isaac Newton Award for excellence in physics, University of Waterloo; 4) National Research Council of Canada, Pre-doctoral scholarship; 5) Medical Research Council of Canada Post-doctoral scholarship; 6) New ideas and Innovations Award, Atomic Energy of Canada.
- Grants:** 1) Peer Review Funding from NCIC and NSERC.
- Professional Experience:** 1976-1978 Department of Radiology and Radiobiology, Colorado State University; 1978-1985 Research Scientist in Medical Biophysics, Atomic Energy of Canada; 1985 Head of Radiobiology Section of Medical Biophysics Branch, Atomic Energy of Canada; 1985 - Present Head of Medical Physics, Ottawa Regional Cancer Centre.
- Memberships:** 1) Radiation Research Society; 2) North America Hyperthermia Group; 3) Canadian Association for Radiation Oncology; 4) Federation of Biological Sciences
- Publications:** Over 100 publications. Some examples:
1. G.P. Raaphorst, J. Kruuv and M.M. Pintar. Nuclear magnetic resonance study of mammalian cell water. *Biophysical Journal* 15, 391-402, 1975.
 2. G.P. Raaphorst, J.A. Vadez et al. Comparison of heat and/or radiation sensitivity and membrane composition of 7 x-ray transformed malignant cell lines and normal cells. *Cancer Research*. 46, 14-19, 1986.
 3. G.P. Raaphorst et al. A study of heat and radiation response of malignant melanoma cell line developed in culture by radiation induced transformation. *Int. J. Rad. Onc.* 12, 2151-2155, 1986.
 4. G.P. Raaphorst et al. A comparison of heat and radiation sensitivity of three human glioma cell lines. *Int. J. Rad. Onc.* 17, 615-622.
- Research Interests:**
1. A study of mammalian cells and their responses to new therapeutic strategies used in the clinic, such as different combinations of radiation, hyperthermia and drugs.
 2. A study of development of hyperthermia techniques and technology to administer clinical hyperthermia for the purpose of cancer treatment.
 3. Magnetic resonance imaging and spectroscopy as applied to the evaluation of therapeutic responsiveness of human and animal tumor systems.

David W.O. Rogers

Phone: 993-2715

Fax: 952 - 9865

BITNET: IRS at NRCVM01

Mail: Laboratory for Basic Standards, Physics Division, NRC, Ottawa K1A 0R6

Current Position

I have worked since 1973 as a research officer in the Physics Division of the National Research Council of Canada (NRCC). Since 1984 I have been the head of the 14 person Ionizing Radiation Standards Section which has responsibility for Canada's primary measurement standards for ionizing radiation. My research involves radiation dosimetry and the development of Monte Carlo techniques for simulating the transport of electrons and photons in materials and the application of these and other techniques to problems in medical physics and radiation dosimetry.

I hold a grant from the NIH to fund the Omega project to develop electron treatment planning using Monte Carlo techniques and as an adjunct Professor at Carleton, I hold an NSERC grant to support graduate students working in the NRC linac lab on radiation dosimetry projects.

Related Professional Activities

1988 on: Member of the American Association of Physicists in Medicine's (AAPM) Radiation Therapy Committee which commissions and approves all AAPM therapy-related protocols and oversees the work of the Radiation Physics Center in Houston.

1987 on: Member of the ICRU (International Commission on Radiation Units and Measurements) report committee on "Absorbed Dose Standards for Photon Irradiation and Their Dissemination".

1987 on: Canadian representative on the Comité Consultatif pour les Étalons de Mesure des Rayonnements Ionisants, the committee of the Bureau International des Poids et Mesures which is responsible for maintaining the world's primary standards for exposure and absorbed dose.

1987 on: Associate Editor and member of ad hoc executive committee of Medical Physics, the official journal of the AAPM.

1987: Co-director of the International School on "Monte Carlo Transport of Electrons and Photons Below 50 MeV" held at the Ettore Majorana Centre for Scientific Culture in Erice, Italy.

1984-1986: Member of Task Group 21 of the AAPM's Radiation Therapy Committee which updated the AAPM's protocol for dosimetry in radiotherapy beams.

1981 to 1985: On executive of Division of Medical Physics of the Canadian Association of Physicists, including Chairperson, 1983/84.

I have given 17 invited talks at national and international conferences and 42 invited external seminars.

Awards

CAP's Sylvia Fedoruk Prize in Medical Physics, awarded for co-authoring the "best" Canadian paper in the field of medical physics in 1988.

Bruce Faddegon, whose PhD I am supervising, took second place in the Young Investigators Symposium at the 1989 AAPM Meeting for a paper on which I was a co-author.

Education: B.Sc(1968), MSc(1969) and PhD(1971), all U of Toronto.

Publications

49 refereed papers, 10 papers in proceedings, 9 review chapters and 30 internal reports.

Differences in Electron Depth Dose Curves Calculated with EGS and ETRAN and Improved Energy Range Relationships. *Medical Physics* 13 (1986) 687-694; D.W.O. Rogers and A.F. Bielajew.

Generation of photon energy deposition kernels using the EGS Monte Carlo code. *Phys. in Medicine & Biol.* 33 (1988)1-20.; T. R. Mackie, A.F. Bielajew, D.W.O. Rogers and J.J. Battista.

The Role of Humidity and Other Correction Factors in the AAPM TG-21 Dosimetry Protocol. *Medical Physics* 15 (1988) 40-48; D.W.O. Rogers and C.K. Ross.

Monte Carlo techniques of electron and photon transport for radiation dosimetry, in "The Dosimetry of Ionizing Radiation", Vol III, eds. K.R. Kase, B.E. Bjarngard, and F.H. Attix, published by Academic Press, 1990 D.W.O. Rogers and A.F. Bielajew.

The EGS4 Code System. Stanford Linear Accelerator Center Report SLAC-265 (Stanford Calif, Dec 1985)(400 pages) W.R. Nelson, H. Hirayama and D.W.O. Rogers.

Carl K. Ross

Address: National Research Council of Canada
Ionizing Radiation Standards, Bldg. M-35
Ottawa, Ontario K1A 0R6 Canada

Telephone: 613-993-9352
Fax: 613-952-9865

Position:

Member of the scientific staff (seven scientists, five technicians) of the NRC section responsible for ionizing radiation standards.

Responsible for the day-to-day operation of the NRC linear accelerator.

Research Interests:

- development of high energy photon and electron absorbed dose standards;
- measurement of bremsstrahlung spectra;
- water calorimetry as an absorbed dose standard;
- dose rate effects in radiation biology.

Education:

B.Sc. - Mount Allison, Sackville, N.B.
M.Sc. - McMaster University, Hamilton
Ph.D. - McMaster University, Hamilton

Membership:

CAP, COMP.

Recent Publications:

C.K. Ross, N.V. Klassen, K.R. Shortt and G.D. Smith, *A Direct Comparison of Water Calorimetry and Fricke Dosimetry*, Phys. Med. Biol. **34**, 23-42 (1989).

C.K. Ross, N.V. Klassen, editors, NRC Workshop on Water Calorimetry, NRC-29637.

D.W.O. Rogers and C.K. Ross, *The Role of Humidity and other Correction Factors in the AAPM TG-21 Dosimetry Protocol*, Med. Phys. **15**, 40-48 (1988).

Ken. R. Shortt

Address: National Research Council of Canada
Ionizing Radiation Standards, Bldg. M-35
Ottawa, Ontario K1A 0R6 Canada

Telephone: 613-993-2715
Fax: 613-952-9865
BITNET: IRS at NRCVM01

Position:

Senior Research Officer involved in ionizing radiation dosimetry for cancer therapy beams (electrons and photons of ^{60}Co and high energy) using ionization chambers, chemical dosimeters, calorimeters, solid state detectors (diodes),

Committees:

AECB sponsored working group on external dosimetry (personal radiation monitoring).
IEC Technical Committee 62 on radiation equipment and dosimeters.

Education:

B.Sc. - McMaster University, Hamilton
M.Sc. - University of Western Ontario, London
Ph.D. - University of British Columbia, Vancouver

Previous Employment:

British Columbia Cancer Institute (Medical physicist - 3 years)
Swiss Institute for Nuclear Research (pion Dosimetry - 1 year)

Typical Publications:

K.R. Shortt and R.M. Henkelman, "Ionization Chamber Measurements of a Pion Beam", Rad. Res. **85**, 419-431 (1981).
K.R. Shortt, C.K. Ross, A.F. Bielajew and D.W.O. Rogers, "Electron Beam Dose Distributions Near Standard Inhomogeneities", Phys. Med. Biol. **31**, 235-249 (1986).
C.K. Ross, N.V. Klassen, K.R. Shortt and G.D. Smith, "A Direct Comparison of Water Calorimetry and Fricke Dosimetry", Phys. Med. Biol. **34**, 23-42 (1989).

Possible Thesis Topics:

ion chamber wall materials
recombination in electronegative gases
interface dosimetry
high total doses using e.g. alanine esr
alternative methods for water calorimetry

Ian C.P. Smith

Director General, Division of Biological Sciences, National Research Council, Ottawa K1A 0R6
Telephone: 990-0884, FAX: 952-0583

B.Sc. (Hons), Manitoba, 1961; M.Sc., Manitoba, 1962; Ph.D., Cambridge, 1965
Post-doctorate year at Stanford University, 1966

Current Research Interests. Application of modern techniques of physical chemistry to problems in molecular biology and medicine, with emphasis on spectroscopy, particularly nuclear magnetic resonance. Structure-function relations in biological systems, particularly cell membrane and the cell surface.

Employment and Professional Involvements

1966-67. Biophysics Department, Bell Telephone Laboratories, Murray Hill, New Jersey
1967-to date. Division of Biological Sciences, National Research Council of Canada, Ottawa; 1973-to date. Adjunct Professor of Chemistry, Carleton University, Ottawa
1974-78. Adjunct Professor of Biophysics, Dept. of Physiology and Biophysics, University of Illinois at the Medical Center, Chicago, Illinois; Aug.-Dec., 1974. Visiting Professor, Dept. of Biophysics, University of Stockholm, Stockholm, Sweden; 1976-to date. Adjunct Professor of Chemistry, University of Ottawa, Ottawa; 1978-to date. Adjunct Professor of Biochemistry, University of Ottawa; 1985-to date. Allied Scientist, Department of Radiological Sciences, Ottawa Civic Hospital, Ottawa; 1988-to date. Consultant in Medical Physics to The Ontario Cancer Treatment and Research Foundation, Ottawa Regional Cancer Centre; 1988-to date. Allied Health Professional, Ottawa General Hospital, Department of Radiology

Professional Awards and Distinctions

1973-Fellow, Chemical Institute of Canada; 1977-Fellow, Royal Society of Canada; 1978-Merck, Sharp and Dohme Award, Chemical Institute of Canada; 1978-Ayerst Award, Canadian Biochemical Society; 1978-Medal, Japan Society for the Promotion of Cancer Research; 1978-Distinguished Visiting Lecturer in Biochemistry, Dalhousie University Medical School; 1979-Distinguished Visiting Lecturer in Biochemistry, University of Toronto; 1979-Distinguished Visiting Lecturer in Chemistry, McMaster University; 1979-Medical Research Council Visiting Professor, Department of Biochemistry, University of Alberta; 1979-Barringer Award, Canadian Spectroscopy Society; 1981-Heritage Foundation Distinguished Visiting Professor, Department of Biochemistry, University of Alberta; 1981-Among 1000 contemporary scientists most cited, 1965-78, Current Contents, #41, p. 5; 1984-Labatt Award, Chemical Institute of Canada; 1986-Herzberg Award, Spectroscopy Society of Canada; 1986-Fil. Doktor (Honoris causa), Stockholm University; 1987-Medical Research Council Visiting Professor, Department of Pharmacy, University of Alberta; 1987-Organon Teknika Lecture Award, Canadian Society of Clinical Chemists; 1990-D.Sc. (Honoris causa), University of Winnipeg.

Current Professional Activities. President, Biophysical Society of Canada; Board of Trustees and Executive Committee, Society of Magnetic Resonance in Medicine; Organizing Committee for 10th International Biophysics Congress; Editorial Board (Molecular Pharmacology, Magnetic Resonance in Chemistry, Molecular and Cellular Biochemistry).

Publications. Total - 337. Sample publications:

*Smith, I.C.P., Baenziger, J., Auger, M. and Jarrell, H.C. Deuterium NMR as a monitor of organization and dynamics at the surface of membranes: the glycolipids. Progress in Clinical and Biological Research, Vol. 292, Biological and Synthetic Membranes, ed. D.A. Butterfield, Alan R. Liss, Inc., New York, pp. 13-22, 1989.

*Deslauriers, R., Keon, W.J., Lareau, S., Moir, D., Saunders, J.K., Smith, I.C.P., Whitehead, K. and Mainwood, G.W. Preservation of high-energy phosphates in human myocardium. J. Thorac. Cardiovasc. Surg. 98: 402-412, 1989.

*Smith, I.C.P., Princz, E.J., Saunders, J.K. Magnetic resonance spectroscopy in cancer research. J. Can. Assoc. Radiol. 41: 32-38, 1990

*Auger, M., Carrier, D., Smith, I.C.P., Jarrell, H.C. Elucidation of motional modes in glycolipid bilayers. A ^2H NMR relaxation and line-shape study. J. Am. Chem. Soc. 112: 1373-1381, 1990.

