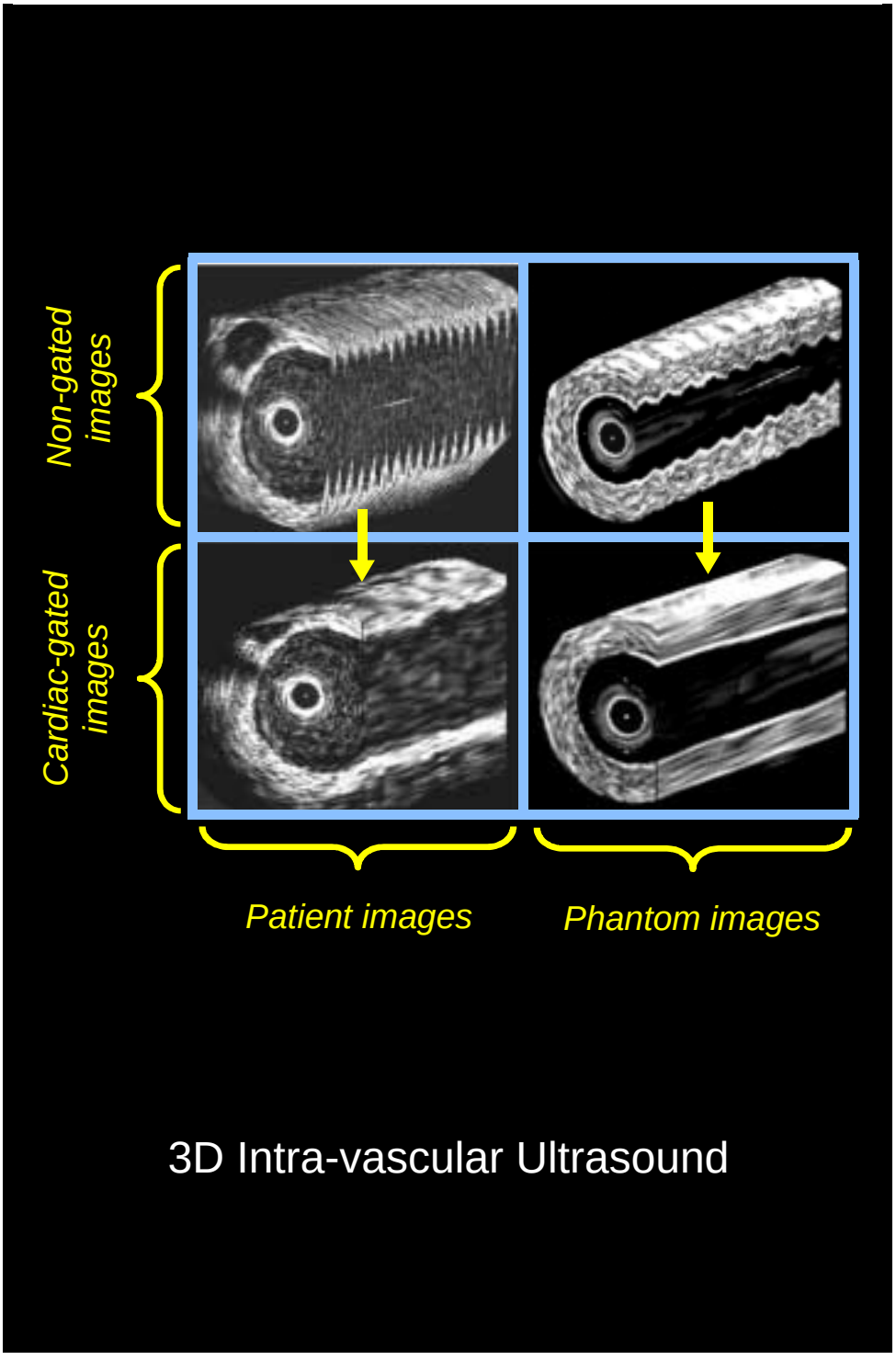
InterACTIONS

CANADIAN MEDICAL PHYSICS NEWSLETTER
Le BULLETIN CANADIEN de PHYSIQUE MÉDICALE



3D Intra-vascular Ultrasound

COMP OCPM

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CANADIAN COLLEGE OF PHYSICISTS IN MEDICINE
LE COLLÈGE CANADIEN DES PHYSICIENS EN MÉDECINE

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About our Cover

The pictures depict three-dimensional (3D) intra-vascular ultrasound (IVUS) images of human coronary arteries and coronary phantoms. The images were obtained by introducing an IVUS catheter into the arterial segment of interest to obtain tomographic views of the coronary vessel lumen and atherosclerotic plaque.

The 3D reconstruction of 2D IVUS images can enhance the diagnostic capabilities of IVUS imaging by facilitating the qualitative and quantitative analysis of the coronary wall and lumen. However, cardiac motion and vessel pulsation cause large saw-shaped artifacts as seen in the images, which can limit the measurement accuracy of 3D IVUS imaging. Cardiac-gated image acquisition can overcome these artifacts but results in lengthy acquisition times, proving harmful to patients. Seemantini Nadkarni and Dr. Aaron Fenster at the Imaging Research Labs of The John P. Robarts Research Institute have developed a retrospective cardiac gating method to recontruct 3D IVUS images of coronary arteries with negligible cardiac motion and vessel pulsation artifacts.

They tested this method on images of a custom-built coronary phantom and on in vivo images of coronary arteries. An artifact reduction of over 98% was achieved in the 3D IVUS images assembled using their image-based retrospective gating approach without increasing the image acquisition time.

Images courtesy of Seemantini Nadkarni, Imaging Research Laboratories, The John P. Robarts Research Institute, London,

The Canadian Medical Physics Newsletter, which is a publication of the Canadian Organization of Medical Physicists (COMP) and the Canadian College of Physicists in Medicine (CCPM) is published four times per year on 1 Jan., 1 April, 1 July, and 1 Oct. The deadline for submissions is one month before the publication date. Enquiries, story ideas, article submissions can be made to:

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Please submit stories in Publisher 98, Word 6.0, Word 97, or ASCII text format. Hardcopy submissions will be scanned to generate an electronic document for inclusion in the Newsletter. Images in Tiff format at 300 dpi resolution are preferred.

Advertising and corporate enquiries can be made to:

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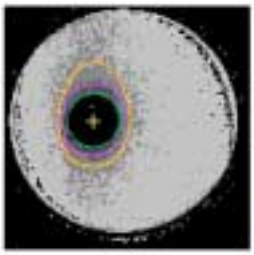

Inside this issue:

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Message from the COMP Chair:

The top priorities identified for 2002 by the Executive Committee through a survey conducted by M. Henry were: 1) Professional Development, 2) Public Awareness and, 3) Research Funding

Since my last Message from the Chair, the COMP Executive has met at its mid-year meeting in Toronto. At the meeting we discussed issues related to associated societies: possible form of membership with EFOMP, representation with CRFISM, medical physics database with the CIHI, etc. As usual our finances are doing well as we appear to be spending less than we had projected, and we had some profit from the July meeting, with 20 % of the profits going to the LAC. The Communication Committee, which has lost some important members (D. Mason, J. Mainprize and P. Munro) has been lucky enough to recruit two new members (M. Cottreau and I Yeung). The Committee also presented an impressive wish list of the services that can be offered to the membership through the COMP website. These were reviewed and others added by the Executive. A final RFP would be then finalized by January to be submitted to various website firms.

The Membership Directory for 2001 was delayed due to implementation of advertisement space to help finance the publication. This resulted in a very elegant booklet, and hopefully the publication can continue to be financed in a similar fashion. Thanks are due to M. Henry and A. Bergman for this initiative.

The fee schedule for advertisement in InterACTIONS has been updated to reflect market value. A one-page ad will cost $200 and $400 for corporate and non-corporate members, respectively, while the half-page ads will be $150 and $300, respectively. Non-profit organization would pay $300 and $225 for the one page and half-page ads. Color requests require an additional $400 flat fee.

The Executive was delighted in obtaining the report and plans for the coming year from the Executive Director, M. Henry. The top priorities identified for 2002 by the Executive Committee through a survey conducted by M. Henry were: 1) Professional Development, 2) Public Awareness and, 3) Research Funding. M. Henry's specific plans for the coming year include communication with NSERC (and later, other agencies) to make medical physics one of the categories of expertise in the respective peer-reviewed competitions, interviews with high-ranking national political figures to enhance the profile of medical physicists, and sponsorship for a Canadian Nite-out at the COMP/AAPM meeting in Montreal. The latter is further discussed below.

I should point out that, unknown to the COMP Executive, M. Henry had been absorbing the GST portions of his salary. The COMP Executive Committee extends its appreciation for the generosity of our Executive Director. This problem has

obviously been immediately remedied and COMP/CCPM will pay for the GST for the coming year. This brings up the important point: both the COMP Executive Committee and the CCPM Board enthusiastically agreed to renew the contract with our Executive Director. And, we are delighted that M. Henry has decided to renew his term with us. His insights into the political, public and corporate realms bring a refreshing sense of awareness, direction and dare I say, sanity, into our deliberations. We are very fortunate indeed, to have him on our team.

You will note in this issue of InterACTIONS that there is a call for nominations for the Chair-elect and Treasurer. I certainly hope you will respond to our call. We are also looking for a new Chair of the Awards Committee. We thank C. Arsenault for his excellent job in chairing this committee in recent years.

You are aware that we have started issuing plaques for outgoing members of the Executive. The Executive has also unanimously agreed to issue appropriate plaques for Emeritus Members. We thank J. Schreiner for taking the responsibility of having all these plaques printed in his hometown, Kingston.

(Continued on page 29)

Message from the CCPM President:

There have been two main events at the Canadian College of Physicists in Medicine since my last message to you in the fall. The first was the completion of the 2001 CCPM recertification process and the second was the midyear meeting of the CCPM Board in Toronto (which always happens at year-end). I will review these briefly for you now.

I am happy to report that the inaugural 2001 run for CCPM recertification went quite smoothly, once the application documents were developed in the late summer. About twenty members and fellows of the College successfully applied for recertification. None of the applicants reported any difficulties with the process (once it was defined). I will say more about the process in the near future when we finalize our review of recertification. Our documents and our procedure for notifying members and fellows requiring recertification are close to completion, with only some fine tuning (based on this year's experience) required. I would like to thank this years *ad hoc* Recertification Review Committee for taking on the task of reviewing the submitted applications and helping establish this new process.

Considerable work was undertaken in the midyear Board meetings. Most of the CCPM Board devoted an extra day and a half at the mid year meetings to sit down together to review some of the policy and procedure manual and the CCPM membership and fellowship standards documents that have been on the books for some time. This proved to be a very valuable exercise, and I can say that all three of these documents were advanced considerably by the work. We expect the documents to be public in the spring of 2002.

There was some discussion during the regular Board meeting regarding the length of the terms of Board members and officers. A number of us (especially me) think that the four-year terms are a disincentive for involvement on the Board, although other Board members do not feel this is an issue. I would appreciate some indication from the general membership whether you think this is a sufficient problem to require a change of bylaws. Some discussion also revolved around a request from a couple of provincial medical physics groups that Fellowship to the College be made available to medical physicists from outside Canada certified by bodies other than the CCPM (particularly, to physicists certified by Boards recognized by COMP as indicating clinical competence). A number of provincial agencies are, or are considering, requiring FCCPM certification (recognized as indicating leadership and excellence) for progression to senior ranks. It has been suggested that this may be a block to recruitment from outside of the country if senior Board certified medical physicists are required to do an MCCPM. It is clear that considerable work would be required to establish standards and guidelines for a mechanism to review candidates asking for such exemption. Before the Board begins to look at this closely, I would like to get a sense of the feelings of the general membership on this. Please drop me a line if you have views one way or the other.

Brenda Clark wrote an article in the last issue of InterACTIONS outlining that, as a result of the Board's review of the standards for CCPM Membership, it seemed reasonable and desirable to add an oral component to the Membership examination. Brenda received a modest amount of feedback from the membership after the article, with the clear majority of the replies positive. This response, together with the outcome of further extensive deliberations, led the Board to approve two weeks ago a proposed revision of the Bylaws to accommodate an oral membership examination. We will be drafting a motion of required Bylaw changes for publication this spring, and will bring this forward to the Annual General Meeting in Montreal this summer for a vote by the College membership. We will also be forming a working group to begin to establish the processes required to undertake this change.

In the last few months the material on the Canadian Medical Physics web site has been

(Continued on page 31)

I am happy to report that the inaugural 2001 run for CCPM recertification went quite smoothly

Message from the Executive Director of COMP/CCPM

Over the coming year we will be investigating a number of options for increasing the profile of the profession among decision makers

I came away from the mid year executive meeting with a host of tasks and a sense of momentum for the organization for the coming year.

COMP is moving ahead on a number of fronts including the development of a new website, planning for the Canada evening at the AAPM Montreal conference in July, and a clear objective of setting in place a series of actions aimed at increasing the profile of decision makers affecting the research and work of medical physicists in Canada.

Michael Kolios has rejuvenated the communications committee and they will soon be issuing an RFP for the development of a full service website and support for COMP/CCPM. This site will allow web-based registration, access to all COMP/ CCPM services, credit card use, and instant access to a wide range of information. Over the coming months we will be exploring corporate partnership to assist in the site development. Many thanks to the Kelowna committee for demonstrating the potential value added that enhanced web service could provide COMP members.

We look forward to meeting COMP members at the AAPM conference in Montreal. The Canada night out planning is underway with Gino Fallone and Sherry Connors and we look forward to a fun filled evening.

Over the coming year we will be investigating a number of options for increasing the profile of the profession among decision makers. We have communicated to NSERC and hope to raise the profile of medical physics in the granting process. In addition, your president will be arranging meetings with senior federal cabinet ministers to make them aware of the profession and the challenges facing it.

We will also be investigating the potential for licensure in various provinces. This will involve developing a series of approaches aimed at convincing provincial decision makers that the professional organization and college should govern the practice of medical physics. If COMP members are aware of opportunities for advancing the case at the provincial (or federal) levels, feel free to contact me with details.

We hope to continue to strengthen our relationships with our corporate members through increased communication and access to services. We also hope to increase the number of corporate members. If you or your institution has contact with corporate

representatives that could be interested in membership, forward details to me and I will follow up.

My first year with COMP/CCPM has been a steep learning curve and I am appreciative of the many executive and board members who have helped me learn about the medical physics community in Canada. I look forward to making a positive contribution in the next year and beyond.

As always, your suggestions, advice, and comments are welcome.

Michael Henry
Executive Director

2002 Sylvia Fedoruk Prize in Medical Physics

The Saskatchewan Cancer Agency is pleased to sponsor a competition for the 2002 Sylvia Fedoruk Prize in Medical Physics. This award is offered annually to honour the distinguished career of Sylvia Fedoruk, former Lieutenant-Governor of Saskatchewan and previously physicist at the Saskatoon Cancer Centre.

The prize will comprise a cash award of five hundred dollars ($500), an engraved plaque and travel expenses to enable the winner to attend the annual meeting of the Canadian Organization of Medical Physicists (COMP) and the Canadian College of Physicists in Medicine (CCPM) which will be held in Montreal, July 14-18, 2002

The 2002 Prize will be awarded for the best paper on a subject falling within the field of medical physics, relating to work carried out wholly or mainly within a Canadian institution and published during the 2001 calendar year. The selection will be made by a panel of judges appointed by COMP.

Papers published in *Physics in Medicine and Biology* and *Medical Physics* which conform to the conditions of the preceding paragraph will automatically be entered in the competition and no further action by the author(s) is required. All other papers must be submitted individually. Four (4) copies of each paper being entered must be sent to:

B.G. Fallone
Department of Medical Physics
Cross Cancer Institute
University of Alberta
11560 University Ave.
Edmonton, AB
T6R 2G6

Each paper must be clearly marked: "Entry for 2002 Sylvia Fedoruk Prize" and must reach the above address no later than **February 15, 2002.**

The award winners from the past five years are:

M. Lachaîne and B.G. Fallone, "Monte Carlo simulations of x-ray induced recombination in amorphous selenium", *J. Phys. D: Appl. Phys*., **33**, 1417-1423 (2000)

P. Busono and E.M.A. Hussein, "Algorithms for density and composition-discrimation imaging for fourth-generation CT systems", *Physics in Medicine and Biology* **44**, 1455-1477 (2000).

R.G. Kelly, K.J. Jordan, and J.J. Battista, "Optical CT reconstruction of 3D dose distributions using the ferrous-benzoic-xylenol (FBX) gel dosimeter", *Medical Physics* **25**, 1741-1750 (1999).

C.E. Zankowski and E.B. Podgorsak, "Calibration of photon and electron beams with an extrapolation chamber", *Medical Physics* **24**, 497-503 (1997).

C.J. Henri and T. M. Peters, "Three-Dimensional Reconstruction of Vascular Trees. Theory and Methodology", *Medical Physics* **23**, 197-204 (1996).

COMP OCPM

CANADIAN ORGANIZATION OF MEDICAL PHYSICISTS

ORGANISATION CANADIENNE DES PHYSICIENS MÉDICAUX

CALL FOR NOMINATIONS

Nominations for Treasurer

(Term: From 1 January 2002 through 31 December 2004)

and

Nominations for Chair-Elect

(Term: From Annual General Meeting of July 2002 until AGM in 2004; progresses to Chair in 2004, to Past-Chair in 2006; completion in 2008)

Nominations must be signed by two sponsoring members and by the nominee who by his/her signature agrees to accept the nomination.

Please send nominations to:

APPEL POUR MISES EN CANDIDATURE

Candidature comme trésorier

(Terme: Du 1er janvier 2002 au 31 décembre 2004)

et

Candidature comme vice-président(e)

(Terme: De la réunion générale annuelle de juillet 2002 jusqu'à la RGA de 2004, devient président(e) en 2004, ancien (ne) président(e) en 2006, fin en 2008)

La mise en candidature doit être signée par deux membres actifs et par le ou la candidat(e) qui indique par sa signature qu'il ou elle accepte la mise en candidature.

Envoyez vos mises en candidature à:

Dr. Michael S. Patterson
COMP Past-Chair
Hamilton Regional Cancer Centre

699 Concession Street

Hamilton, Ont. L8V 5C2
Tel: (905) 387-9711 x 67005

Fax: (905) 575-6330
E-mail: mike.patterson@hrcc.on.ca

Nominations must be received by April 1, 2002.

An election by mail ballot will be conducted in the spring. The results will be reported at the Annual General Meeting in Montreal in July 2002.

Les mises en candidature doivent être reçues avant le 1er avril 2002.

L'élection se fera par la poste au printemps. Les résultats seront rapportés à la réunion générale annuelle à Montréal en juillet 2002.

HAROLD JOHNS TRAVEL AWARD

The Board of the Canadian College of Physicists in Medicine is pleased to honour the Founding President of the College by means of the Harold Johns Travel Award for Young Investigators. This award, which is in the amount of $1500, is made to a College member under the age of 35 who became a member within the previous three years. The award is intended to assist the individual to extend his or her knowledge by traveling to another centre or institution with the intent of gaining further experience in his or her chosen field, or, alternately, to embark on a new field of endeavour in medical physics.

Further information can be obtained from:

BOURSE de VOYAGE HAROLD JOHNS

Le Conseil du Collège Canadien des Physiciens en Médecine est heureux d'honorer son président fondateur en offrant aux jeunes chercheurs la bourse Harold Johns. Cette bourse, d'une valeur de $1500, est éligible aux membres du Collège agés de moins de 35 ans at qui sont membres depuis moins de trois an. La bourse a pour but d'aider le récipiendaire à parfaire ses connaissances dans son domaine ou à démarrer dans un nouveau champ d'activités reliées à la physique médicale, en lui permettant de voyager vers un autre centre spécialisé.

Les demandes seront addressées à:

Dr. Christopher Thompson
The Registrar / Le Resistraire
CCPM
c/o Montreal Neurological Institute
McGill University
3801 University, WB3
Montreal, Quebec, H3A 2B4

The deadline for applications for the next award is **May 1, 2002**. The award will be announced at the 2002 CCPM Annual General Meeting in Montreal.

La date limite pour les demandes du prochain concours est le **1er mai 2002**. Le récipiendaire de la bourse sera annoncé à la rencontre annuelle de 2001 du CCPM à Montreal

Past recipients:

Récipiendaire anterieur:

1990 Dr. L. John Schreiner, Montreal
1991 Ms. Moira Lumley, Kingston
1992 Dr. Donald Robinson, Edmonton
1993 Dr. Yunping Zhu, Toronto
1994 Dr. Brendan McClean, Edmonton
1995 Dr. George Mawko, Halifax
1996 M. Alain Gauvin, Montreal
1997 Dr. Katherina Sixel, Toronto
1998 Mr. Horacio Patrocinio, Montreal
1999 Mr. Craig Beckett, Regina
2000 No recipient
2001 No recipient

Members of the COMP and/or CCPM can make a donation to the fund by volunteering to increase their 2002 membership dues.

Les membres du COMP et\ou OCPM peuvent faire un don à la cotisation de 2002 un montant additionel de leur choix.

First Announcement of the

AAPM-COMP 2002 Annual Meeting

Montreal, Quebec, Canada

Palais des Congrès de Montréal Convention Center

July 14 – 18, 2002

Scientific Director: Andrew D. A. Maidment, Ph.D.
Scientific Co-Director: Michael G. Herman, Ph.D.
Continuing Education Director: Eric E. Klein, M.S.
Continuing Education Co-Director: Joel E. Gray, Ph.D.
Local Arrangements Chair: Ervin B. Podgorsak, Ph.D.

Start planning for the 2002 Annual Meeting in beautiful Montreal. The meeting will be held as a joint AAPM-COMP meeting. Along with the AAPM traditional scientific sessions, there are many symposia planned along with a variety of continuing education and refresher courses that cover state-of-the-art subjects or back-to-basics. COMP and CCPM committees and examinations will be held prior to the meeting.

COMP Designated Hotel:	Delta Centre-Ville, Montreal
COMP student housing:	Royal Victoria College Residences, McGill University (corner of Sherbrooke and University Streets)
Canadian Night-Out;	Sunday, July 14, 2002, Delta Centre-Ville, Tour de Ville (Revolving) Restaurant

2002 Dates to Remember

January 14	Web site activated to receive electronic abstract submissions.
March 6 (5 PM PT):	Deadline for receipt of 250 word abstracts and supporting data.
April 26	Authors notified of presentation disposition.
May 8	Web site activated to receive electronic Works in Progress abstract submissions.
By May 15	Annual Meeting Scientific Program available on aapm.org
May 24	Deadline for receipt of 250 word Works in Progress abstracts and supporting data.
May 29	Registration Deadline to receive Discounted Registration Fees.
June 12	Works in Progress Authors notified of presentation disposition.
June 26	No refunds given for cancellations received after this time. On-line registration closes. On-site registration only after this date.
July 14 - 18	AAPM Annual Meeting, Palais de Congrès de Montréal
July 18 - 21	AAPM Summer School – McGill University, Montreal, Canada Interventional Techniques (Therapeutic and Diagnostic)

In Memory of Arthur Francis Holloway, 1922-2001

Winnipeg, 1975

With the death of Art Holloway in August 2001, medical physics has lost another of its pioneers. In a career spanning six decades, Art made major contributions to radiological physics in clinical service, in conducting and supervising research and by his leadership in professional organizations.

Art was born in Hamilton and received his university education in Queen's University (B Sc in Engineering Physics 1944, M Sc, 1950) and the University of London (PhD in Physics Applied to Medicine, 1954. Supervisor, W V Mayneord). In 1944-49 he served in the Canadian Navy as a research officer on the frigate HMCS Victoriaville. In 1948 Art joined the staff of the Kingston Clinic, OCTRF, with concurrent appointments in the Physics Department of Queen's University. In 1960 he accepted the position of Director of Physics, Manitoba Cancer Treatment and Research Foundation in Winnipeg with cross appointments in the Departments of Physics, Radiology and Medical Microbiology of the University of Manitoba.

Art was one of the original members of the Canadian Association of Medical Physicists which was formed in 1955 and which evolved shortly thereafter as the Division of Medical and Biological Physics of the Canadian Association of Physicists. He served as the Chairman of the Division 1958-1959. In 1960, the CAP-DMBP held its annual meeting in Kingston and, thanks largely to the initiatives of John MacDonald, arranged to have Professor George Gamow deliver the OCTRF Gordon Richards Lecture. In addition to his lecture on "The Nature and Origins of Life", Professor Gamow held forth on a wide range of fascinating subjects to a small group in the Holloways' living room

In the late 1970's, after considerable discussion (i.e. argument), the CAP-DMBP recommended the establishment of a body, independent of the Division, to examine the professional qualifications of Canadian medical physicists and where appropriate to issue certificates of accreditation. This body was incorporated under the name of the Canadian College of Physicists in Medicine, CCPM. A six-member steering committee, which included Art Holloway, was given the task of launching the new organization. The first meeting of the CCPM was held in 1980 with Harold Johns as President. Art Holloway, who had served as chairman of the examination committee, assumed the Presidency in 1981.

In Winnipeg, one of Art's major responsibilities as Director of Physics in the MCTRF was to oversee the monitoring of x-ray emitting devices as required under a Provincial Act. The majority of the devices were diagnostic machines and, although many of them were in Winnipeg, the locations ranged throughout Manitoba with some in remote nursing stations accessible only by float plane. Art's "mission statement" was never simply to comply with the letter-of-the-law enunciated (often arbitrarily) in government regulations but to ensure that the equipment was operated not only for maximum safety of patients and operators but also to provide the most useful diagnostic information.

Art's interests in diagnostic x rays continued after he left Winnipeg in 1980 to join the staff of the Radiological Research Laboratories of the University of Toronto. While in Toronto he played a leading role in organizing the first CCPM workshop - one on the physics of diagnostic radiology.

In 1985, the Holloways moved from Toronto to a rural setting near Cloyne, Ontario. Art's work in radiation protection also underwent a change of scene - to the "private sector". Varanidex, Inc. was founded in to perform quality control testing primarily of dental and podiatric x-ray tube heads in Ontario. Since its inception, more than 20,000 tests have been completed on installations across Canada. In the technique employed by Varanidex, a test kit along with some simple instructions is mailed to each location to be surveyed. Once the exposed packs are returned and interpreted, a report is generated indicating the patient entrance exposure, the quality (HVL) and diameter of the beam. The technique is particularly useful for routine testing in remote locations. Varanidex is currently owned and operated by Arthur L. Holloway, the son of Dr. A.F. Holloway.

Cloyne 2000

Art Holloway's help and advice will be greatly missed in the medical physics community. Our sympathy is extended to Grace, Marnie, Heather and Arthur.

Acknowledgment: The help and encouragement of Mr. A.L. Holloway and of Dr. Heather Boux is very much appreciated.

D V Cormack, November 2001

London Celebrates Fifty Years of Cobalt-60 Radiotherapy

By J. Battista and J. Van Dyk
London Regional Cancer Centre

On October 27, 2001, the London Regional Cancer Centre celebrated the 50th anniversary of the world's first treatment of a cancer patient using Cobalt-60 radiation.

This first treatment took place at the Ontario Institute of Radiotherapy then located on the Victoria Hospital campus of the London Health Sciences Centre as it is known today. Dr. Ivan Smith (right foreground) was the physician that led the medical team and Mr. Roy Errington (behind Smith) was the entrepreneurial geophysicist who championed the production of commercial Cobalt machines and is the founder of MDS Nordion. The detailed account of the "Ontario-Saskatchewan" race to implement Cobalt-60 radiotherapy has already been capably described in a series of excellent articles (*Interactions*, 1999, Munro et al). Clearly there were significant contributions from both sides of our nation: nuclear industry, national dose calibration standards, and rapid medical adoption in Ontario and innovative medical physics and strong government interest from Saskatchewan.

The Golden Anniversary week of celebration started with a "50's Saturday Night Dance" organized and dominated in dancing skills by our radiation therapists. In the week that followed, a historical lecture was presented by Dr. Cyril Danjoux, the *de facto* historian for the Canadian Association of Radiation Oncologists (CARO). The end of the week was punctuated by an international scientific symposium and the unveiling of the commemorative plaque. The scientific symposium sponsored by MDS-Nordion featured excellent presentations to a full house on the evolution of Cobalt machines, through to the current innovations in tomotherapy presented by the Madison and Kingston research groups. The symposium concluded with the prospects of exploiting molecular biology to improve the selection and effectiveness of future radiotherapy strategies. The official unveiling of the Parks Canada plaque took place on Saturday, October 27th, sponsored by Atomic Energy of Canada. Coincidentally, the first treatment of a cancer patient was also done on a Saturday, October 27, 1951. The concluding event was "first-class" with dignitaries from the federal, provincial, and municipal governments, Cancer Care Ontario and the University of Western Ontario. Keynote addresses included two of our medical physics pioneers. Dr. John C.F. MacDonald and Dr. Jack Cunningham maintained equilibrium in their anecdotal accounts of the historical events that took place in London and Saskatoon, respectively. Indeed, John not only participated in the first cobalt treatment given in London but, he represented himself as a 7 year survivor of cobalt-60 treatments using a technique that he developed back in the 1960s. The audience included the Smith and Errington family members who were invited to the podium to unveil an interior replica of the historical plaque which is now stationed at the entrance to our cancer centre. In addition, Joyce Lawson and Elaine Marshall, who assisted Dr. Ivan Smith during the first Cobalt treatments, were present and warmly applauded by an appreciative, and at times emotional, audience. The University announced the inauguration of the Smith-Errington Chair to be awarded to a scientist or physician in radiation medicine who provides leadership in cancer treatment research. This week of celebration was marked by significant coverage by the Ontario media, and the entire proceedings have been archived on video for future generations. In his closing remarks, Dr. Greg Cairncross, CEO of the London Regional Cancer Centre, proudly announced that a tomotherapy machine would be delivered to London early in the Year 2002, in synchrony with a similar delivery to the Cross Cancer Institute in Edmonton. Canada, once again, will be catapulted into developing and evaluating forefront radiation treatment technology.

Dr. John MacDonald (center) celebrates Cobalt's 50th anniversary in London (October 27, 2001), re-uniting with his former colleagues. Ms. Joyce Lawson (left) was the radiation therapist (radiographer at the time) and Ms. Elaine Marshall (right) was the registered nurse who assisted Dr. Ivan Smith with the first patient to be treated with Cobalt. Mr. Jack Brown and Dr. Roger Inch (not shown) were the other clinical physicists involved in the Cobalt commissioning in London. Dr. MacDonald replaced Mr. Brown who became acutely ill with tuberculosis before the inaugural treatment took place. Dr. MacDonald has had a long productive career in clinical physics and he is credited with leading the formation of the CCPM. He is retired and often spotted in Victoria, BC when not traveling the world. (Photo courtesy of London Regional Cancer Centre).

Report from the Communications Committee of the COMP/CCPM

Current Membership: Michelle Cottreau, Lara Dyke, Alain Gauvin, Michael Kolios (Chair), Pat Cadman (editor of Interactions), Ivan Yeung, (active non-member: Peter Munro)

The activities of the communications committee since the annual meeting have focused the attracting new members for the committee, on the newsletter, discussion of issues regarding costing of the advertisements in the newsletter (and website, potentially) and creating a request for proposal (RFP) for the revamping of the COMP/CCPM web site. The period has been relatively inactive since in July the core of the web group, Peter Munro, Darcy Mason and James Mainprize departed from the Communications Committee and they had to be replaced. They did a superb job and are commended for their hard work. Joining the committee are Michelle Cottreau, a medical physicist at Hamilton Health Sciences (HHS) and full member of COMP and Ivan Yeung, a radiation physicist at the Princess Margaret Hospital and full member of COMP. Their focus will on website related issues, and will assist in developing the full request for proposal, come up with ideas with respect to new features and functionality for the website and how to streamline this information, and also help with its regular maintenance.

Now that the new committee has been formed, within the next few months we expect the communications committee to have a full request for proposal to be submitted to various companies/organizations (potential candidates: our current ISP, Relentless Productions (CARO website), AAPM and others to be investigated) and choose a company/organization based on their submissions to our request for proposal. It is anticipated that by March of 2002 the communications committee will make a recommendation to the executive.

More changes have been made to the pricing of ads in the InterActions. A vigorous debate at the mid-year meeting was around whether newsletter advertisement revenues should be used to pay for other COMP/CCPM activities, or whether the revenues should be such that the newsletter is self-financing. The later approach was adapted for now, with the provision that the issue would be revisited in the next executive meeting. Given the potential high costs associated with using a commercial entity to administer the website (see proposal in this issue), this was one area where newsletter profit was recommended. The new pricing is indicated on page 2 under the heading *Advertising Rates*.

Report from the Communications Committee – July Report

Michael Kolios

The part year was a very busy year for the communications committee! The main highlight of course was the reorganization of the website; a great deal of work went into preparing the website so that abstracts, papers and registration (apart from the transfer on money) could be handled through the website, www.medphys.ca. Furthermore, now each member has his/her own password on the website, and is identified each time he/she logs on. I would like to thank the web programming group, James Mainprize, Peter Munro and Darcy Mason for the enormous amount of work they put into making it all work. Many hours went into converting the web-site so as to be compatible with Cold Fusion software (an application which enables communication between a database and a web server), web programming and debugging to handle information flow into and out of the website and general maintenance of the site. Of course, the post-mortem of the submission process is still underway, and there were many problems that had to be solved along the way, but most of the objectives were met. Furthermore, Pat Cadman, the editor of Interactions, has done a superb job in making sure that the Interactions maintain the high quality we are now accustomed to. As discussed below, Pat has also introduced some new features. Part of the cost of these new features is defrayed by advertisements, and Lara Dyke did a great job making sure companies would advertise. To all the members of the Communications Committee, I would like to express my gratitude for their work. Since a lot of technical work had to be done, work on website content was understandably of secondary priority, and the posting of news, various reports and other information may have been delayed in the process. This hopefully will be remedied soon, and I would like to apologize for the delay. As I propose separately to the membership, maybe the solution to this problem is to hire professional web developers do this type of work, so that the Committee can focus on content.

Amongst the many tasks performed, I would like to inform the membership of the following activities of the Communications Committee:

1. The committee designed and implemented the web submission process and created administration tools to update and maintain the website. One can now monitor the password database -check passwords, delete entries, and reset passwords-, synchronize the membership database with the password database for deleting old members and adding new members and monitor and delete entries in the abstract and paper submission table. A procedure to upload, store, organize and display abstracts and papers for the COMP/CCPM annual meeting was also created. Finally, members now have individual passwords to login to the

(Continued on page 14)

Communications Committee Report *(Continued from page 13)*

COMP/CCPM website.

2. The Interactions were published quarterly. With approval of the executive, the advertising rates were changed to the following:

Images	1/4 page	1/2 page	1 page	Addn. pages
Member	$75	$100	$125	$75
Corporate Member	$125	$125	$150	$100
Non Profit Organization	$175	$175	$200	$125
Corporate Non-Member	$275	$275	$325	$200
Color Cover An additional	$300.00			

   The color ads are a new feature organized and implemented by Pat. A new (and cheaper) delivery format was instituted. Furthermore, Darcy Mason produced a new Networthy column in the Interactions (which will be also posted on the website). Moreover, the decision was made to limit access to the online version of the Interactions to only the last four issues, making the other ones free for the public. We had numerous requests by non-members for this, and thought that it would be a good promotional tool to allow public access to older issues.

3. Reorganized the CCPM examinations on the website. They were converted to PDF files with individual passwords attached to the PDF files (which cannot be viewed without them) so that the CCPM College Registrar can control access to these.

4. Registered the following domain names: ww.ccpm.ca and www.medicalphysics.ca, which now will redirect to our website. The other obvious choice, www.comp.ca, cannot at this time be registered. As our contact explains:

   "The CIRA has reserved the www.comp.ca domain. It is not available for registration. I quote: "Under the current .ca domain name regulations all geographical place names, such as municipalities and province names, are reserved. Certain names are also reserved for future use or to avoid confusion (e.g. ca.ca, co.ca, edu.ca, internet.ca, www.ca). All single-character names are reserved for future use as well. We are not able to register the domain name you have chosen." Michael, in other words, it appears that someone else who owns a variation of www.comp.(province).ca has tried to register www.comp.ca. CIRA rules that where more than one company exists with a variation of a domain and the province code is included that CIRA reserves the right to NOT allow ANYONE to register for the main domain (in this case, www.comp.ca). Therefore, we have not been able to proceed with the registering of www.comp.ca We have run into this situation before, and have called CIRA to verify the problem. They have given us this explanation above."

   The two new domains have been registered for a two-year period at a rate of $100 + GST (Total: $107), each.

5. Increased storage allocation on our website to 300 MB. The previous rates that our web service provider charged were based on usage of 40MB of space which is too low given the number of issues of interactions stored on the website and the increased usage that resulted from the conference submission process. This resulted in an increase in maintenance cost from about $900/year (approx.) to $1530/year.

6. Contacted individuals and organizations with respect to revamping the website and having web professionals do the programming work for the web site. A proposal and an estimate and quote are provided in a separate document.

7. Discussed issues with regards to raising funds to defray costs related to the operation and expansion of the website. Potential options include Internet banners that can be added on our website, or we can have companies sponsor the website, as in the case of CARO, the Canadian Association of Radiation Oncologists (URL: http://www.caro-acro.ca). No resolution as to what the next step may be.

Potential Future Directions:

Ideas from the membership are always welcomed! Some of them are:

1. On-line form for updating membership directory.
2. Allow on-line VISA/Mastercard payments for membership and conference fees.
3. Continue developing methods of separating web site content from formatting so that web site maintenance can be simplified. With the use of ColdFusion, this process has been already initiated and some administration tools are already available.
4. Add better methods of accessing information in compact space (e.g., pull-down menu forms, DHTML menu lists).
5. On-line conference broadcasts, real time audio and video streaming capabilities, PowerPoint presentations online.
6. Update and improve website content.
7. PDA (personal digital assistant) access to various parts of the website.
8. Online storage and archiving of presentations at annual meetings?
9. Creation of "education" section on the website?
10. Advanced password protection?
11. Dynamic conversion of all html files to PDF files?
12. Online surveys?
13. Efficient website search function?

Dissolution of the Advisory Committee on Radiological Protection

By Peter O'Brien
Chair, Radiation Regulations Committee

This note is to inform both the CCPM and COMP members that the Advisory Committee on Radiological Protection (ACRP) has been dissolved by the Canadian Nuclear Safety Commission (CNSC) effective October 31, 2001. The CNSC (and its predecessor the Atomic Energy Control Board) has had three advisory committees which were charged with giving advice directly to the president and the board of the CNSC. These committees were the ACRP, the Advisory Committee on Nuclear Safety (ACNS) and the Group of Medical Advisors (GMA). The GMA was merged with the ACRP in 1999. The ACNS, which has also been dissolved, gave advice specifically on Canadian nuclear facilities used for power production. The ACRP terms of reference called for "independent advice to the Board on matters relating to any health aspect of ionizing radiation." Membership of the ACRP included nuclear medicine physicians, radiation oncologists, radiation physicists, engineers, radiation biologists and medical physicists. COMP membership on the ACRP in the past has included Dr. John Aldrich and Dr. Dave Rogers. Peter O'Brien and Dr. Harry Johnson were members of the ACRP at the time it was discontinued.

The ACRP has produced many documents of interest to the medical physics community. These are available from the CNSC and can be referenced on the CNSC website. Examples are: ACRP 20- Radiation Safety Officer's Handbook (Part A) CNSC INFO-0718; ACRP18 - Biological Effects of Low Doses of Radiation at Low Dose Rate, 1996, AECB INFO –0654; AC9-Principles of the Management of Radionuclide Therapies, 2000, CNSC INFO0714. Also, the ACRP was the group which was sponsoring the initiative to develop a national quality program for radiation therapy facilities.

The loss of the ACRP creates a large gap in the radiation safety community in Canada. Although the ACRP was not generally known to medical physicists it did serve as a watchdog for all CNSC activities which affect medical physicists and has affected CNSC policies in areas of concern to medical physicists. Federally, the CNSC will continue to seek advice from its staff and may commission individual projects to address specific issues. On a national level they will meet with Health Canada and with provincial regulators as members of the Federal-Provincial-Territorial-Radiation Protection Committee. That committee (chaired by Wayne Tiefenbach from Saskatchewan) has a number of working groups which deal with operational radiation safety matters. Because of their provincial responsibilities there are COMP members on that group - Dr. Harry Johnson and Judy Hale. The other relevant group nationally is the Canadian Radiation Protection Association (CRPA). This is not an advisory group and functions more as a scientific and professional association for radiation protection professionals. Not all professions however are well represented at the CRPA. Medical physicists in radiation therapy have not participated in large numbers in the CRPA.

Because of the disappearance of the ACRP, all professional groups in Canada whose members deal with radiation safety will have to be more diligent in reviewing radiation safety regulations and in identifying trends that may change current radiation safety practices. It is not unusual for policy and regulation to lag behind practice as evidenced by the lack of guidelines for intravascular brachytherapy radiation safety. The Radiation Regulations Committee of COMP/CCPM has traditionally only reacted to federal regulatory initiatives. It has not acted as an advisory committee and has not had a strategic planning function for radiation safety issues. Many members of the national radiation safety community feel that there is a need for a national, independent body of experts that could function much as a Canadian NCRP. Although this may not come to pass, there is a need for this sort of group to address radiation safety issues in medicine. The rationale for this is twofold: first, in the absence of expert guidelines, individuals may not adopt best practice and convergence to a Canadian standard may be very slow; second, regulators may impose unreasonable operational restrictions on medical practices if there are no accepted standards of practice.

At this time I am not advocating any particular course of action. My intent is only to notify the membership of these developments and to encourage interested medical physicists to give some thought to this issue and to attend meetings (e.g. CRPA) where these issues will be discussed.

Gel Dosimetry in Theory and Practice

By Cheryl Duzenli , Andrew Jirasek and Michelle Hilts

British Columbia Cancer Agency and University of British Columbia, Vancouver B.C

1.0 Introduction:

The desire to acquire quantitative 3D records of radiation dose has probably existed for almost as long as the biological effects of radiation have been recognized. Quantitative dose mapping in 3D has only recently been achieved by blending well established chemical dosimetry techniques and advanced imaging technology. This merging of ideas from two quite distinct areas of medical physics began in 1984 when Gore et al [1] hit upon the idea of using NMR to measure absorbed dose in the liquid Fricke dosimeter. This quickly led to the idea of creating a gel-bound Fricke dosimeter and obtaining 2 or 3 D images of the dose distributions using MRI. A few years later, Audet and Schreiner [2] and Maryanski et al [3] had picked up the thread from earlier work in 1950's and 60's on the effects of radiation on polymers [4]. Degradation and cross linking of polymers were then studied in the 1990's primarily using NMR. From these beginnings, investigators have proceeded to explore two main branches of the newly popularized field of gel dosimetry: 1) developing and understanding various types of radiation sensitive gels and 2) developing superior methods of probing gels to obtain a high quality signal related to the absorbed dose, preferably in a three dimensional sense. While several key groups of investigators have pushed ahead on these two fronts, a growing number of others have succeeded in producing numerous examples of gel dosimetry applied to the measurement of dose, covering the majority of treatment delivery techniques in clinical use today.

It is outside the scope of this article to provide detailed referencing sufficient to do justice to the abundance of literature on the subject of gel dosimetry and to the efforts of many investigators who have advanced the research in this field. The interested reader is referred to the proceedings of the recent 2nd International Conference on Radiotherapy Gel Dosimetry held in Brisbane from November 18th to 21, 2001. These proceedings are available by contacting Clive Baldock at the address listed at the end of this article (see Appendix). The 1st International Conference on Radiotherapy Gel Dosimetry was held in Lexington Kentucky in 1999. These proceedings were published by COMP and are available from the Secretariat. A brief comparison of presentations from these first two conferences is shown in Figure 1. The talks were grouped into the following broad categories: Fricke-type gel developmental work (development of gel itself or associated readout technology), polymer gel developmental work (and associated developments in technology), applications, review articles or other. By applications, we mean strictly the demonstration of existing gel formulations and readout technology applied to specific techniques in radiation therapy. It is encouraging to note that the number of papers on basic developmental work for both polymer and Fricke gel dosimeter materials and associated developments in readout technology has increased from 1999 to 2001. The need to gain a better understanding of the mechanisms underlying dose response and to develop technology tailored to measurement of gel response have become obvious to those working in the field. Gel dosimetry may be evolving in a somewhat anaologous fashion to thermoluminescent dosimetry, which we now largely take for granted. It is probably fair to say that TLD research has not yet resulted in the optimal dosimeter for all applications, but has produced dosimeters that meet some specific needs.

2.0 Gel types:

Until quite recently, most gels could be classified according to two main radiation response mechanisms: 1) Fricke (ferrous sulfate) gels based on the principle of radiation induced oxidation of ferrous ions (Fe2+) to ferric ions (Fe3+) and 2) free radical induced cross-linking polymer gel. The basic Fricke gel formulation has since been extended to include xylenol orange doping to create an optically active dose response. In addition, novel types of gelling agent such as polyvinyl alcohol (PVA) cryogel have been incorporated in order to reduce the diffusion of ferric ions which leads to a blurring of the measured dose distribution. Classes of polymer gels have now been expanded to include photo-initiated cationic crosslinking epoxy based gels and oxygen catalyzed acrylic polymerization. Particularly impressive is the array of imaginative acronyms describing these gels, from the early BANANA (Bis-Acrylamide-Nitrogen-Agarose) and BANG (Bis-Acrylamide-Nitrogen-Gelatin), and more generic PAG (Polyacrylamide Gelatin) to VIPAR, MAGIC (Methacrylate-Ascorbic acid-Gelatin Initiated by Copper) and FriXy (Fricke-xylenol orange).

3.0 Physical/Chemical considerations:

Gel dosimetry has stimulated renewed interest in radiation chemistry in general. In particular, the presence of other chemical species such as oxygen significantly affect dosimeter response. The presence of oxygen has a dramatic effect on the gel response depending on what type of radiation induced reaction is being monitored. In the Fricke system, oxygen participates in the oxidation process and enhances the rate of formation of Fe^{3+} ions. Depletion of oxygen at high doses can result in a reduction in the slope of the dose response curve. Different levels of oxygen throughout a gel can lead to gradients in dose response. With some types of gelling agent, it becomes necessary to re-oxygenate Fricke gels during production. Conversely, oxygen in a free radical induced polymerizing gel will depress the reaction of interest, as oxygen scavenges radicals and competes with the formation of polymer. Significant efforts have been applied to quantify the optimal level of oxygen required during the production of polymer gels. Usually, oxygen removal is performed by purging gels during production with a gas such as nitrogen, argon or nitrous oxide (although this fell out of favour early on due to the possible physiological side effects on the researcher!). Oxygen removal is the most difficult aspect of polymer gel manufacture and often requires the development of glove box equipment and considerable manual dexterity. (See figure 2 for an example of an in-house glove box arrangement designed for the manufacture of PAG gels and manned by it's designer, Mr. Andrew Jirasek during the course of his Ph.D. work).

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Recently, progress has been made in the search for polymerizing gels that can be prepared and irradiated under normal atmospheric conditions. Photo-initiation of cationic polymerization in epoxy gels is one approach recently demonstrated (by the Schreiner group) to have less stringent requirements for oxygen removal, although some purging is still required. Another very promising approach is the so-called normoxic gel system developed by the Gore group. Here, oxygen in conjunction with an ascorbic acid/bi-valent metal complex catalyzes the polymerization of acrylic monomer. This has been demonstrated to proceed under normal atmospheric conditions and will undoubtedly be the subject of many additional research papers in the near future.

It is interesting to draw parallels between the biological response of tissue to radiation and the effects of radiation on chemical dosimeters, in particular polymer gels. Both the oxygen effect, and high linear energy transfer (LET) effects are manifest in dosimeter gels in ways that are instructive to the researcher. At intermediate to high LET, damage to biological tissue is enhanced. At some point, depending on the effect being measured, the ionization density becomes so high as to create wasted dose and a fall-off in the biological response per unit dose. Suppression of gel dosimeter response at high LET (~100keV/u), compared with conventional photon irradiation has been demonstrated for both the Fricke based gel system and a polymer gel system. Although the relevant range of LET for suppression of response may be quite different for the gel studies compared with biological systems, it is instructive to re-visit the underlying cause of these effects for the purpose of better understanding the radiation mechanisms themselves. Dose response suppression at high LET is also common among other types of dosimeter.

Chemical stability is also a concern in gel dosimetry. Fricke gels suffer from the ill effects of auto-oxidation, resulting in an increasing background signal as a function of time. PVA cryogels may be kept frozen until use, helping to minimize the ferrous sulfate auto-oxidation problem. Polymer gels may also suffer the effects of auto-polymerization depending on the environmental conditions in which they are stored. Appropriate care must be exercised with the handling and storage to eliminate exposure to heat or UV radiation.

Temperature, pH, dose rate and solute concentration may all have an impact on measured gel dose responses. These issues have all been described in the literature in reference to one gel or another. It is also interesting to note that although the diffusion of radiation product throughout the gel over time is a well known problem for Fricke-gels, polymer gels may also suffer from diffusion effects. In high dose regions of the gel where the monomer population has been depleted, unreacted monomer can diffuse in from surrounding lower dose regions (if high dose gradients exist), resulting in distortion of the measured dose distribution.

4.0 Dose readout technology:

A wide variety of imaging or spectral analysis techniques may be used to obtain quantitative readout of the dose information stored within a gel dosimeter. It is important to match the technology to the type of gel and mechanism by which radiation dose has altered the properties of the gel. In addition, the choice of technology will depend on whether one is studying fundamental properties of the gel or whether one wishes to obtain a quantitative dose map for a radiotherapy application. A brief glossary of methods for use in gel dosimetry follows (in alphabetic order, not necessarily in order of potential utility).

MRI: Two or three dimensional magnetic resonance imaging for radiotherapy applications, or basic studies. Applicable to both Fricke and polymer systems. Normally one performs T1 or T2 weighted imaging, depending on the gel (T1 or T2 for Fricke, T2 for polymer). Magnetization transfer imaging has also been demonstrated.

NMR relaxometry*:* The measurement of either longitudinal or transverse nuclear magnetic resonance relaxation rate (R1 and R2) of mobile protons within in gels. Applicable to either Fricke based gels or polymer gels. Both parameters normally increase with increasing dose, but in general R2 is more sensitive. Good for studying the basic dose response characteristics and point doses in small sample tubes.

NMR spectroscopy*:* The spectral analysis of gels using NMR. Basic dose response studies or low resolution imaging may be possible. Has been applied to some polymer gel systems.

Optical absorption CT: (laser/diode systems, fan or cone beam/CCD systems) Imaging using visible light and computed tomography for radiotherapy applications. Applicable to xylenol doped Fricke systems.

Optical scattering CT: Computed tomographic image reconstruction by light scattering from crosslinking polymer gels.

Raman spectroscopy: Spectroscopy in the near infrared region. Produces vibrational signatures of constituent molecules. Good for basic studies on polymer gels. (See figure 3 for an example of basic Raman spectroscopy data providing us with a better understanding of polymerization reactions occurring in PAG gels).

Ultrasound imaging*:* Radiation induced changes in polymer gels are detectable using ultrasound. 2D or potentially 3D imaging may be possible. The acoustic speed of propagation, attenuation coefficient and transmitted intensity have all been measured as a function of dose.

UV spectrophotometry: Conventional for use with liquid Fricke dosimetry, but may be extended for use with Fricke-based gels (point dose measurements or basic studies).

X-ray CT: 2D Conventional multi-slice imaging for radiotherapy applications, applicable to cross-linking polymer gel systems. Characterized by a fairly weak sensitivity to dose but good for high dose gradient regions. Very practical technique allowing for registration of treatment planning images with measured dose maps.

These types of measurement systems have all been demonstrated to effectively detect radiation induced changes in various types of gel. The list will inevitably become longer as we ad-

(Continued on page 18)

vance our knowledge in these areas.

5.0 Applications:

The range of techniques in radiotherapy to which gel dosimetry has been applied includes almost every example one could think of. Below is a brief summary of some recent literature, although this is not meant to be an exhaustive list. Unless otherwise specified, the references all appear in the proceedings of DosGel 1999 or 2001 or are cited therein by Bonnet[5].

3D Conformal Radiation Therapy(3D CRT)

3D CRT results in dose distributions which often vary rapidly as a result of conforming the dose distribution to irregular 3D planning target volumes (PTV). Several authors have applied polymer gels to 3DCRT dose verification. For example, Kaurin et al, 1999, used Barex plastic pelvic phantom filled with BANG and imaged using MRI to verify a 3DCRT prostate treatment. Agreement of measured and calculated isodoses was within 3 and 1 mm for 90 and 50% isodoses respectively.

Stereotactic radiosurgery (SRS)

SRS is an attractive application for polymer gel dosimetry due to the precise, complex dose distributions with high dose gradients resulting from SRS treatments delivered using linacs or other commercial systems. Several authors have applied polymer gels to this dosimetry problem (Scheib et al, 2001, Cosgrove et al 2000, Pfaender et al 1999, Hilts et al 1999, Meeks et al 1999, Pappas et al 1999 etc.). Scheib et al, for example, recently reported agreement between measured and calculated isodose lines of < 2 mm for a BANG gel head phantom irradiated with SRS (Gamma Knife). In addition, relative doses agreed within 5% throughout the volume. Hilts et al used a novel CT polymer gel technique to measure the dose distribution from a four arc SRS treatment (BrainLAB). By registration of the planning CT and associated 3D dose calculation with the post irradiation CT image set, the measured and calculated isodose were compared and found to agree within 1.5 mm for high doses. See figure 4 illustrating these results.

Intensity modulated radiation therapy (IMRT)

An obvious potential niche for polymer gel dosimetry is in 3D verification of the complex and often relatively inhomogeneous dose distributions produced by IMRT treatment plans, achieved using dynamic delivery techniques. As a result, many authors have begun to examine this potential for both linac and tomotherapy based IMRT (Brindha et al, 2001, Vergote et al, 2001, Meyer et al, 2001, Oldham et al, 1999, Low et al 1999, De Deene et al 1998 etc.). De Deene et al produced one of the earliest reports. They used an MRI polymer gel technique to measure the dose distribution for a 8 field linac based IMRT head and neck treatment. The results were however quite poor (discrepancies of >20% compared to film) in the border region of the gel, as a result of oxygen diffusion into the gel container. More recent studies have been much more positive. Low et al (1999) irradiated four cylindrical BANG gel phantoms with IMRT arcs (NOMOS Peacock planning system) using a linac. Absolute doses, obtained using calibration gels, agreed with ion chamber measurements to within 1%. In addition, planar dose distributions agreed with film measurements to within 3 mm. Polymer gel/MRI was also used to measure the 3D dose distribution from a tomotherapy IMRT treatment (NOMOS Mimic system) by Oldham et al (1999) with promising results. They found that the measured and calculated 90 and 50% isodose lines generally agreed within 1 mm, with a maximum deviation of 3 mm. In addition, several authors at DosGel 2001 presented successful use of polymer gel to measure IMRT treatments of the prostate, thorax and head and neck regions (Brindha et al, 2001, Vergote et al, 2001, Meyer et al, 2001).

Brachytherapy

Several authors have used polymer gels to characterize brachytherapy sources and to measure brachytherapy dose distributions, including intravascular brachytherapy. The most recent, and one of the most thorough, studies of brachytherapy sources was by De Deene et al who characterized an ^{192}Ir source using polymer gel. This group studied the effects of oxygen perfusion through the catheter, MRI susceptibility artefacts as well as monomer diffusion from low dose regions to high dose regions, in areas of high dose gradient. Not only do they discuss the impact of each of these effects, but they also describe techniques for measuring and potentially working around these difficulties.

Miscellaneous*:*

The measurement of dose distributions in boron neutron capture therapy (BNCT), colloidal solutions of Yttrium-90 and I-131solutions, blood irradiators, and proton and heavy ion beams have also been investigated using gel dosimetry.

Summary:

Various aspects of gel dosimetry have been briefly touched upon in an attempt to inform the audience of the current activities in this field. Interested parties are encouraged to begin planning for DosGel 2003 which we understand will be hosted in Vienna by Dr. Ken Shortt.

Condensed list of References:

1. Gore JC, Kang YS and Schulz RJ. Measurement of radiation dose distributions by NMR imaging. Magn. Reson. Imaging Phys. Med. Biol **29**, 1189-1197, 1984.
2. Audet C and Schreiner LJ. Radiation Dosimetry by NMR Relaxation Time Measurements of Irradiated Polymer Solutions. In Proc. 10th Annual Meeting of the Soc. Of Magnetic Resonance in Medicine (SMRM, Berkeley CA), 705, 1991. (abstract).
3. Maryanski MJ, Gore JC, Kennan RP and Schulz RJ. NMR relaxation enhancement in gels polymerized and cross-linked by ionizing radiations: a new approach to 3-D dosimetry by MRI. Magn. Reson. Imaging **11**, 253-258, 1993.
4. Day MJ and Stein G. Chemical effects of ionising radiation in some gels. *Nature* **166**. 146-147 1950.
5. Bonnet, D. A review of applications of polymer gel dosimetry, Proc. DosGel 2001.

Appendix: DosGel 01

The 2nd International Conference on Radiation Gel Dosimetry (DosGel) was held this past November 18-21, 2001, at the Queensland University of Technology in Brisbane, Australia.
(Continued on page 19)

Gel Dosimetry in Theory and Practice *(Continued from page 18)*

The conference attracted approximately 50 attendees from Australasia (Australia, India, Iran, Kyrgyzstan - registered but not attended), Europe (Belgium, France - registered but not attended, Italy, Greece - registered but not attended, Sweden, Switzerland, UK) and North America (Canada, USA). The number of people registered for the conference in Brisbane was similar to the number registered to for the 1st meeting, held two years previous in Lexington, Kentucky. The international scientific committee for this conference has expanded to include 19 individuals from Canada, USA, Sweden, Australia, Italy and UK. Of note, Canada is represented on this committee by L John Schreiner, Keven Jordan, Tomas Kron, as well as two expatriates Ken Shortt (Austria/Canada) and Chantal Audet (USA). This indicates that gel dosimetry remains an active and international effort and, as usual, Canadian medical physicists are helping to lead the way.

Proceedings of DosGel 2001 may be obtained by contacting Dr. Clive Baldock at the address below:

Centre for Medical, Health and Environmental Physics
School of Physical and Chemical Sciences
Queensland University of Technology
GPO Box 2434
Brisbane Q 4001
Australia

Canadian College of Physicists in Medicine Examination Schedule 2002

Membership Examination:

Applications due: 11 January 2002
Examination date: 16 March 2002
Fee: $150.00

Decisions will be announced on February 8
Potential fellowship candidates from those aspiring candidates will be flagged here as an assessment of their eligibility can be made from their membership applications

Fellowship Examination:

Applications due: 12 April 2002
Examination date: 11, 12 or 13 July
Fee: $200.00 2002 (in Montreal)

Decisions will be announced on May 3. and later for those who do the membership exam

Note: Those writing the membership exam on March 16 should confirm their fellowship application and pay the fee within one week of receiving the membership exam results.

For further information, application kits, and membership examination study guides, contact the Registrar, Dr. Christopher Thompson, at:

Dr. Christopher Thompson
The Registrar / Le Resistraire, CCPM
c/o Montreal Neurological Institute
McGill University
3801 University, WB3
Montreal, Quebec, H3A 2B4

Figures for Gel Dosimetry in Theory and Practice

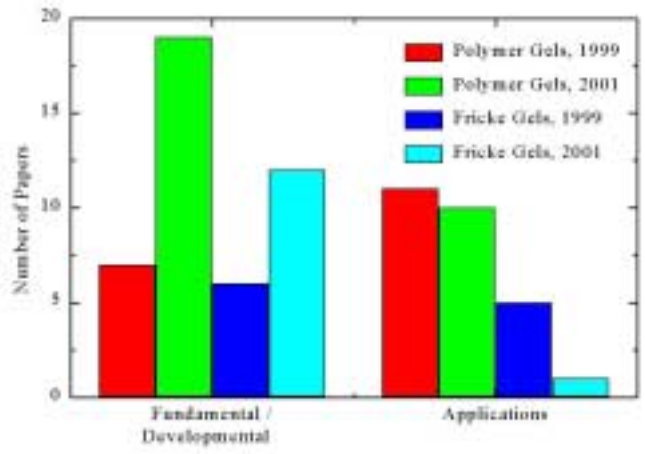

Figure 1. Graphical representation of the distribution of presentation topics at the first 2 international conferences on gel dosimetry (DosGel's '99 and '01).

Figure 2. Mr. Andrew Jirasek manning his glove box for the manufacture of polymer gels under anoxic conditions.

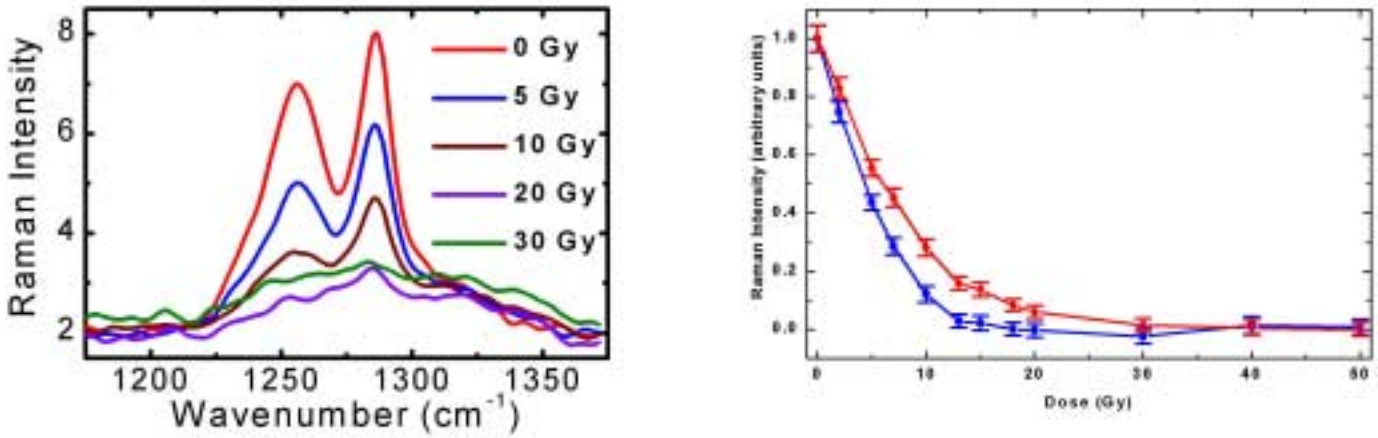

Figure 3. Raman spectroscopy data for PAG gels a) spectra showing decrease in monomer peaks as a function of dose b) monomer consumption as a function of dose measured by using a spectral correlation technique: upper curve acrylamide; lower curve bis.(Jirasek et al. Phys.Med. Biol 46 (2001).

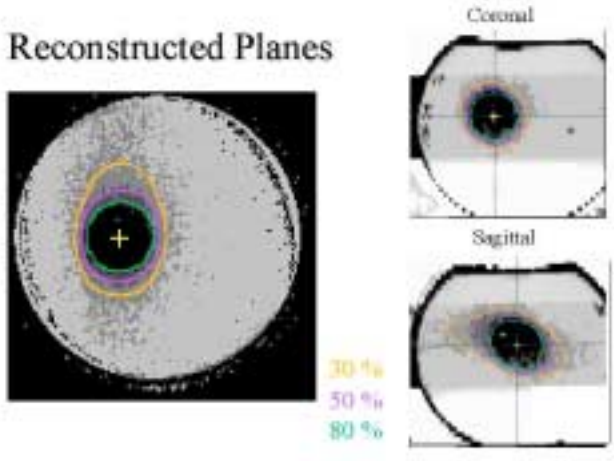

Figure 4. X-ray CT images of bis-acrylamide gels irradiated using a stereotactic radiosurgery technique. Images are reconstructed in several planes with binned CT number calibrated to represent dose. Isodose lines from the CT based treatment plan are superimposed on the measured dose images (Hilts et al., Radiation and Oncology 56 S1 (2000).

Proposal for Website Reorganization - July 2001

Prepared by Michael Kolios, Communications Committee Chair.

The current COMP/CCPM website, www.medphys.ca, is administered by the web group of the Communications Committee. The website provides information about COMP/CCPM as an organization. Furthermore, COMP/CCPM activities, reports, publications, exams and conference information are posted. Access to the electronic version of the newsletter and contact information about COMP/CCPM members are also available to members. Finally, links of interest are included.

The web group, currently consisting of three people (James Mainprize, Darcy Mason and Peter Munro, hereafter referred to as M&Ms) and the Chair of the Communications Committee, made an effort this year to implement the electronic submission of abstracts and papers for the COMP/CCPM 2001 Annual Meeting. The website was used to disseminate, collect and organize information, and to store the abstracts, papers and information about conference registration. Furthermore, the data collected had to be presented to various members of the organization (such as the Scientific Program Committee). An article by Peter Munro that will appear in this issue of Interactions will provide more detail on this procedure. The assessment of how well out effort has worked is ongoing. This required a lot of effort, not least because the web group had to modify every file on the server and ensure it complied with the new application server software that was used for the conference registration and abstract/paper submission. For the great deal of work involved in the process the M&Ms have to be commended.

The procedure however highlighted the main problem with how we currently structure and administer the website: it relies on transient volunteers to perform critical and time-consuming tasks. I realize this is true for any person that is working for the membership, but in this instance the situation is a bit different and this creates undesirable situations. Since the volunteer has a full time occupation (presumably!), either as an employee or a student, issues and deadlines associated with website administration and development are understandably of secondary nature – not a good thing when there are programs to debug (for which how much time you have to spend on is very difficult to estimate), time critical information to disseminate and specific deadlines for which everything must be up and running. Moreover, when one of the members of the web group departs, there is lack of continuity and know-how, which may bring the development efforts to a halt. The departure of a key member may be very troubling, especially if an individual of equal technical expertise does not replace him/her. While in theory this transition should be painless if everything is documented properly and the new person has the appropriate expertise, this remains to be validated in practice. Finally, as the nature of websites as communications tools becomes more sophisticated, members may demand features that would require even greater efforts from the web group. Electronic paper and abstract submission is only one example that was very taxing. Other requests include online surveys, credit card processing, newsgroups, audio and video streaming, PDA (personal digital assistant) access to website information and online PowerPoint presentations. It became clear to me that if we want the COMP/CCPM website to be a collection of static files and reports, the current administration structure would suffice; however, if we want advanced features as mentioned above, including proper conference organization on the web, we need professional administration of the website.

To this end, I looked at how a related organization, the Canadian Association of Radiation Oncologists (CARO), manages their website, which has some of the advanced features we desire (URL: http://www.caro-acro.ca). Apart from being a professionally related organization, their membership size is comparable to that of COMP, and they have members peppered all over Canada in Cancer Centers, as does the COMP/CCPM. This makes them an ideal comparator group. I contacted Dr. Cyril Danjoux, a radiation oncologist based at Sunnybrook (also the Ontario Director of the CARO) and the contact person responsible for the CARO website. In meetings with him, he explained the process of managing the website and how it works for CARO and the web hosting company (Relentless Productions, URL: www.relentlessproductions.com) that they use. I would like to publicly acknowledge his help, guidance and suggestions.

For CARO, there is one contact person that serves as the liaison between the organization and the web hosting company. He (in this case) is the person that makes sure of quality control in terms of what is allowed to go onto the web, and makes the final decision as to the inclusion and shelf life of the information. It is also preferable on the web hosting side to have one contact person instead of many. In our organization, this individual could be the Chair of the Communications Committee or the Executive Director. Thus, requests would be send to him/her, which would then communicate with the company.

In terms of the costing structure, there would be two fees if we were to implement a strategy similar to that developed by CARO: a one-time fee that would be for reorganizing the website, which would amount to approximately $10,000 – 14,000 (see attached quotation from Relentless Productions), depending on the implementation of more advanced features. It is difficult to predict what the maintenance fees would be after the reorganization, however, we can use as a guide the experience of CARO. Relentless Productions charges per hour of work, and their price guide is the following (details are in the web site proposal):

HTML, DHTML work: $50/hr (1.0 units)
Graphic Design : $75/hr (1.5units)
CGI and Programming : $100/hr (2.0 units)

The payment is done with "blocks" of units:

50 units for $2,500
100 units for $4,800
250 units for $11,500

I estimate, given my discussions with CARO and Relentless

(Continued on page 23)

Website Reorganization *(Continued from page 22)*

Productions, that 100-150 units per year would be more than enough to cover our annual operating expenses. Units purchased could be used for any year thereafter, and thus we may end paying less depending on usage, but most likely not more. As an example, I include a few lines from a schedule given to CARO, covering a period of 6 months:

27 job postings: **6 units**
17 meeting minutes pdfed and posted: **5 units**
Conference organization (on-line submission and registration and other features): **15 units**
General weekly maintenance: **22 units**

The bottom line is the following for all of the expenses related to operating the website, based on this estimate:

a. *Site hosting* (that we currently already pay for, if we go with the new company for hosting): **$1,200 per year ($1,380 with tax)**
b. *Anticipated annual expenses* for running the website: **$7,200 per year ($8,280 with tax)**. This represents, in my opinion, an upper limit unless we make very heavy use of specialized web features.
c. One-time cost for revamping the website: $9,750 or **$11,950 ($13,742)** if credit card processing and real time audio and video streaming are included.

Therefore, excluding one-time expenses, a ballpark figure of **$10,000** per annum seems reasonable. It should be noted that part of the costs for the administration of the CARO website are covered by sponsors, without cluttering the website with banners, and I cannot see a reason why we cannot get at least some of the money this way.

Given the annual income for the organization was $71,424 in 2000, this does potentially represent a sizable expense of the order of 15% of the total budget. It is up to the membership and executive to decide as to whether they think this type of expense is justified. I think it is money well spent, since it will enhance our communication a) within members of our society and b) to the outside world. The status quo is too dependent on the presence of individuals willing to input large amounts of time and learn new technologies to handle ever-increasing membership requests. Furthermore, while in theory transitions related to people leaving the communications committee could be handled by proper training and documentation, in practice trying to coordinate these activities across Canada with individuals in many time zones is no trivial task. Finally, if the committee members are freed from some of the very technical and time-consuming work that they have to do, they could then focus on the content rather than the technology and creative ways of using the website as a tool to help members and promote the well-being of the organization.

Finally, it should be noted that I did not rigorously "shop around" for pricing, and this is just to give the executive and members a "feel" as to how much this would cost so that appropriate budgeting for the communications committee is made. I did ask other individuals about what they thought of the pricing and compared to what we pay now, and I think this is a representative price for what we would pay regardless of the company we would associate with. I will investigate other companies also. It should be noted however that some of the advantages of going with the mentioned company are that: a) they have already been through the same procedure with another scientific organization of similar size, scope and needs b) it would be much easier to "link-up" our information with CARO in common databases. As part of my discussion with CARO, we thought that the creation of newsgroups and FAQs for both members would be of great help and assistance given the common interests and issues faced by the organizations. A common conference would also be much easier to organize.

In summary, I see inherent problems with the current structure of how we administer the website if we want to include advanced features including conference on-line administration (such as on-line submission, registration and payment). I investigated how another scientific society similar in size and scope handles these issues and received a quote (from the company they deal with) on what it would cost our organization to do something similar. If the executive and membership think this is reasonable expense, I will investigate other companies to receive better pricing and chose the best one. At this instance, I will submit a formal and more specific proposal.

P.S. As to whether it is all worth the expenses, it should be noted that a strong website would assist in all of the objectives of COMP, as outlined in Article II of By-law I:

A) To promote and encourage the development of scientific knowledge towards the applications of physics to medicine;

B) To further the exchange and publication of scientific and technical information relating to the science and practice of medical physics;

C) To promote educational opportunities in those disciplines which support the science and practice of medical physics;

D) To assist in the development and protection of professional standards in the discipline of medical physics;

E) To link to the activities of other societies, associations or organizations, both national and international, having objectives relevant to the foregoing and;

F) To promote across Canada the recognition of the importance of certification by the Canadian College of Physicists in Medicine (CCPM) and to encourage eligible COMP members to become certified by CCPM.

Medical Physicists Discover Cold Fusion!

By Peter Munro
Varian Medical Systems

Editor's Note: This article was written in June and it represents the situation at that time. Another article outlining future developments might be forthcoming (especially now that I have mentioned it)

Unlike that oft-cited announcement by Pons and Fleischmann [press conference on 23 March 1989, University of Utah], it is well accepted that this form of Cold Fusion actually does perform useful work. Cold Fusion is an application server – a piece of software that sits between a database and a web server and allows information to be passed between the two. Cold Fusion thus allows dynamically generated web pages to be created. [For a more detailed description on application servers and Cold Fusion see http://www.zdnet.com/pcmag/stories/reviews/0,6755,2713465,00.html and http://www.zdnet.com/pcmag/stories/reviews/0,6755,2711722,00.html from the 22 May 2001 issue of PC Magazine.]

It was this Cold Fusion technology that allowed the web programming group (Darcy Mason, James Mainprize, and Peter Munro, along with assistance from Mike Kolios) to develop the on-line abstract submission and registration capabilities of the COMP web site. After some planning it was realized that the programming project could be readily divided into three parts: administration tools, post submission distribution of abstracts, and security (James); form development and form connectivity to the database (Peter); and post submission data handling (Darcy). The goal was to develop a submission process that was easy to understand, required relatively little effort by the user, and which could be interrupted and resumed with little extra effort. We also decided to use file upload from the browser rather than document e-mailing as the method to transmit abstracts and proceedings documents, since we thought that this method simplified the submission process. [At the time of the decision, file uploading had not been used before for file submission, although the AAPM eventually used file uploading for this year's AAPM annual meeting, as well.] We also decided to use the e-mail address of each registrant as their user name. For COMP members, their e-mail address is a unique identifier and this identifier allowed us to link the information in the COMP membership directory with the registration database.

Despite the planning, our programming activities were not without their difficulties. Although the individual programming tasks were supposed to be independent there were times when one programmer's actions of would influence the functionality of other programmers' developments. This was most notable when security features were added to the web site. Regular conference calls were necessary to co-ordinate our activities, keep others abreast of our accomplishments, and to discuss the difficulties and problems that had been encountered. These weekly conference calls also encouraged all participants to get something accomplished for each conference call.

From the user's perspective it is not clear how well the submission process functioned. The web forms were designed so that the registrant could make a new submission or edit an already existing submission. However, the final database contained numerous duplicate (and incomplete) submissions. It is not clear if this was a glitch in how the forms interacted with the database or whether many individuals restarted the submission process rather than edit an existing submission. As a result, we had to manually "massage" the registration database to remove the duplicate submissions. In addition, we encountered a number of situations that had not been anticipated. One registrant wanted to submit an abstract that included seven institutions. This number of institutions had not been anticipated in our planning and we had to handle this abstract manually. Because of limited resources (our spare time) we also decided that we could only support one word processor. While we know that there are COMP members who are much happier using WordPerfect or Latex we had to limit our support to MS Word documents. So despite our plans to simplify the registration process, there were some situations/limitations that created challenges for both the registrants and the web programming group.

Because we had developed what we thought was a fairly intuitive submission process and because we ran out of time, we did not put a great deal of effort into documentation. This proved to be a mistake. After the submission deadline had passed we realized that we had not done a good job at educating the users how to enter information into the forms. For instance, we had not given firm instructions on how capital letters were to be used in the abstract title. Therefore, registrants used a variety of formats including sentence case, all capitals, or capitalizing the first letter of each word when entering their titles. We had to generated scripts to automatically reformat the text, but this reformatting process in turn created problems when some acronyms (e.g., MRI, DQE, …) were part of the title. Once again more manual effort was required of the web programming group to solve these problems. [One benefit of the manual editing of the abstract titles was that a number of spelling mistakes were found. These were corrected free of charge.] We also felt it necessary to keep registrants informed of our efforts. In turn, our progress reports generated numerous requests to resubmit new versions of the abstracts. There is no need to let you know the thoughts of the web programming group towards these requests (!##!!!% @#& …) but we decided, because of the extra effort that would be involved, not to allow any resubmissions.

One of the biggest challenges was to handle the data and documents once they had been collected. We had to allow the Awards Committee to view the YIS submissions and rate them, we had to allow the Scientific Program Committee to view all of the submissions, rate them and then generate the scientific program, we had to generate feedback for each registrant about the disposition of their abstracts, and we had to use all of the submitted information to generate the COMP proceedings in an electronic form. These were tremendous amounts of work and both Darcy and James are to be commended for their efforts.

What do we foresee for the future? We would like to make the current process easier for both the registrant and for the web

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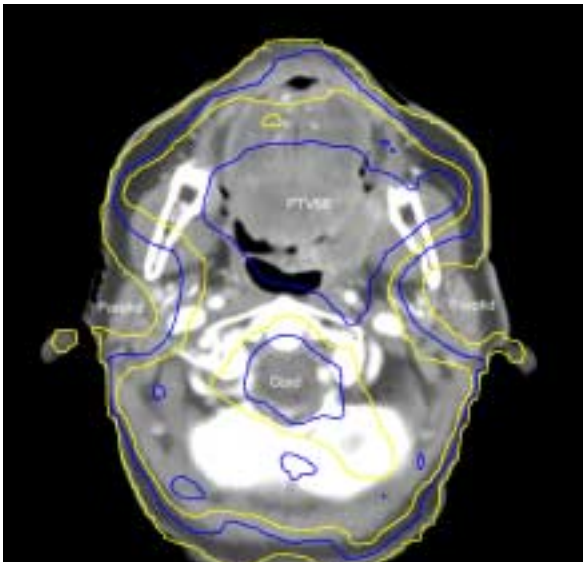
Credentialing for an RTOG IMRT Protocol

By Patrick Cadman
Saskatoon Cancer Centre

The Radiation therapy Oncology Group (RTOG) is a cooperative research organization, operating under the auspices of the American College of Radiology. The RTOG has had nearly 30 years of experience in running multi-institutional clinical trials, with participation from over 250 institutions in both the USA and Canada. In February of 2001, the RTOG activated the first multi-institutional clinical trail involving IMRT techniques. The H-0022 protocol is a phase I/II study of conformal and intensity modulated irradiation for oropharyngeal cancer (tonsil, base of tongue or palate). The main study objectives are: (i) to assess whether adequate radiological definitions of the targets and adequate target irradiation and major salivary gland sparing can be achieved in a multi-institutional study and (ii) to evaluate xerostomia in patients treated with IMRT techniques. Current accrual will be limited to 64 patients. At the Saskatoon Cancer Centre, participation in the H-0022 protocol was seen as an excellent way to both develop and validate our IMRT program, with a worthy clinical objective of salivary gland sparing. I would like to provide a general overview of the H-0022 protocol itself and our credentialing experiences at the Saskatoon Cancer Center.

Plan scoring criteria:

Currently, only one patient group is open with doses of 66.0 Gy to 95% of primary target, PTV66, (includes primary tumor and involved lymph nodes) and 54.0 Gy to 95% of secondary target, PTV54, (includes lymph node groups at risk of subclinical metastasis). Minimum and maximum dose/volume constraints are also specified for the PTVs with some minor variations allowed. For the parotids, the intent is to achieve: (i) a mean dose to either parotid less than 26.0 Gy; (ii) 50% of either parotid receiving less than, or equal to 30.0 Gy or (iii) 20 cc of the combined parotid glands receiving less than 20.0 Gy. Current constraints on organs at risk are as follows:



Dry Run test isodoses: 66, 54, 45, and 30 Gy

Mandible	70 Gy
Brain Stem	54 Gy
Spinal Cord + 5 cm	45 Gy
Glottic Larynx	2/3 below 50 Gy

The original protocol scoring criteria has been modified and is pending approval; follow the plan scoring link for the protocol at http://rtog3dqa.wustl.edu. Note that, originally, violation of any of the constraints on the mandible, brainstem, spinal cord or unspecified tissue outside the target, would be considered a major variation and a credentialing failure. With the revised scoring criteria, while exceeding these tolerance dose values listed above is not prohibited, it is strongly recommended that they not be exceeded. This change, as well as allowing a greater inhomogeneity of dose in the PTV volumes before a minor variation, should allow credentialing to be more easily achieved.

Credentialing Procedure

Credentialing must obtained through the Image Guided Therapy QA Center at Washington University (http://rtog3dqa.wustl.edu) before participation in the protocol. Each facility must: (i) submit a completed Facility Questionnaire for the protocol, (ii) submit and successfully complete a protocol specific Dry Run test and (iii) perform a phantom experiment. If an institution has a 3D Facility Questionnaire which has been approved for use in other RTOG 3D CRT studies, it is only necessary to submit an addendum to document the differences (personnel, immobilization, treatment units, etc.). The Dry Run test may be performed on any suitable head and neck patient CT data set. The facility must demonstrate the digital exchange of planning data (CT images, DVHs, ROIs, dose, etc) according to the RTOG format and specifications. The phantom experiment consists of CT scanning, planning and irradiating a head phantom which includes a dosimetry insert. For the Dry Run test and phantom experiment, digital data with a set of hard copy isodoses must be sent to the IGT QA Center.

To date, 3 institutions have successfully completed all requirements to receive credentialing for participation in this study: M.D. Anderson Cancer Center, Houston, TX (Nomos Corvus), Thomas Jefferson University, Philadelphia, PA (CMS Focus) and the Saskatoon Cancer Centre (ADAC Pinnacle P3).

The Saskatoon Experience

In Saskatoon, IMRT planning is performed using an ADAC Pinnacle P3 treatment planning system (with IMRT/Inverse Planning module). IMRT treatments are delivered using a step-and-shoot technique on a Clinac 21EX with 120 leaf dynamic MLC; head and neck patients will be treated using 6 MV photons.

We received our clinical version of the Pinnacle IMRT software in the spring of 2001 but had gained experience with prototype versions throughout the previous year. Since then, we have planned and treated a single patient using step-and-shoot IMRT beginning in August of 2001. An extensive dose validation procedure has been developed in conjunction with Pinnacle features which allows calculation of dose to a plane for a homogeneous phantom, and 3D dose calculations to a CT scanned phantom. Measurements are made both on a per-field basis using a calibrated stereotactic diode and radiographic film, and with all treatment fields delivered using film placed at axial planes on a

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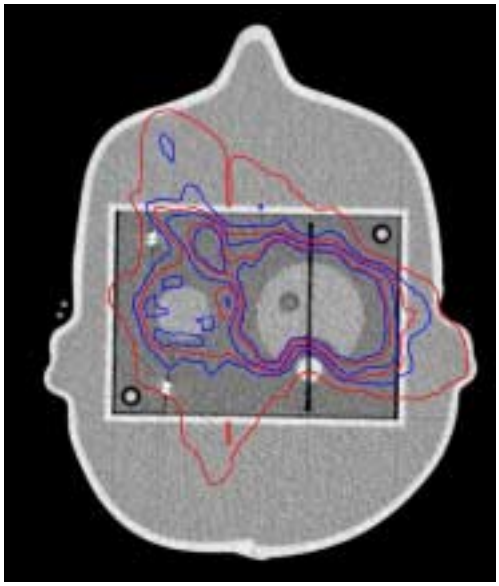
cylindrical polystyrene phantom. RadCalc software is used to check monitor units calculated, using the effective depth supplied by Pinnacle to perform an inhomogeneous point dose calculation with a modified Clarkson algorithm. This validation procedure is quite extensive and may change as we gain more experience and incorporate other techniques, such as on-line portal imaging, into the process.

Besides contouring the critical structures, skin surface, and the gross tumor volume, the oncologists spent, a great deal of time contouring the secondary CTVs (lymph node groups at risk of metastasis). The protocol provides references which describe outlining of the lymph node groups on CT, but these descriptions were not complete for the entire volume and the oncologists were continually checking the references to establishing the anatomical limits of the nodal regions on CT. The volumes are reviewed by the IGT QA Center for compliance for the Dry Run and the first five patients treated.

Inverse planning began by specifying uniformity objectives (uniform dose coverage) for the PTV54 and PTV66 volumes and maximum dose constraints for the critical structures. For the parotids, we specified maximum dose/volume objectives based on 50% volume receiving less than ~30 Gy. A nine-field arrangement was chosen on our Clinac 21EX with 6MV photons. Due to a maximum MLC leaf travel during interdigitization of 15 cm, two of the fields were set asymmetric to achieve better coverage of the PTV54 from their orientation.



Isodoses for the RPC head and neck phantom

During optimization, Pinnacle attempts to calculate an "ideal" opening density matrix or 2D fluence map for each beam without regard for the modulation technique (MLC or compensator). Through each optimization iteration, the weight of each beamlet in each beam is adjusted until the specified objectives have been met or a specified maximum number of iterations have been reached. The time required for optimization is a function of the beam, region-of-interest and dose grid parameters. A challenge with the protocol is that a minimum of 5 mm is required around all secondary nodal CTVs to create the PTV54 and this can cause the PTV54 to lie very near or even outside the skin surface. During optimization, the algorithm will attempt to boost the fluence in the periphery of the beam in an attempt to boost the skin dose for those beamlets that run tangential to the skin surface. This can produce a fluence profile that has high peaks in the periphery and is difficult to produce using static MLC segments. A method that we found to avoid these regions of high fluence was to perform optimization with a small amount of bolus, then remove the bolus before the final dose calculation.

The conversion process transforms the ideal fluence map produced by optimization into deliverable MLC segments. In Pinnacle, an error or tolerance is specified between the ideal and the fluence map calculated considering the physical characteristics of the MLC shaped beam (maximum leaf travel, leaf interdigitization, leaf and jaw transmission, head scatter, etc). The conversion process produced 285 segments for our nine-field plan, however, the post-conversion dose distribution was not acceptable in terms of the original objectives. This might be expected, since the original objectives were just barely met before conversion (the original objectives are tough to achieve due to the homogeneity constraints on the PTV54, and the proximity of the PTV64 to the mandible and the PTV54 to the parotids), and the conversion process cannot be expected to achieve the ideal fluence map without using an unreasonable number of MLC segments. Pinnacle has the ability to perform segment weight optimization, where the segments weights themselves may be adjusted during optimization, according to the set objectives. This allowed us to achieve an acceptable plan but required a full 3D dose calculation for each segment (loads of memory) and we needed to run the optimization overnight. ADAC has recently suggested methods to reduce the overall optimization time and techniques that may render beam weight optimization unnecessary. The Dry Run plan was exported from Pinnacle in RTOG format and sent to the IGT QA Centre using the FTP protocol. Hardcopy isodoses and documentation were forwarded the good, old-fashioned way.

On Halloween, a strange silver case arrived from Texas. It contained a severed head: the RPC Head and Neck Phantom to be precise, the planning and irradiation of which is required for credentialing. The phantom is to be filled with water, CT scanned, IMRT planned and irradiated according to instructions from the RPC. The plastic head phantom accommodates a dosimetry insert which is comprised of a concave primary PTV structure to be treated to 6.6 Gy (95% volume), a secondary cylindrical target treated to 5.4 Gy (95% volume) and a critical structure (spinal cord analog) a few mm below the concavity in the primary PTV to be limited to 4.5 Gy. Normal tissue outside the PTVs and critical structure is to receive less than 7.26 Gy. Sagittal and axial radiochromatic films are centered on the primary PTV volume. As well, four TLD capsules are situated inside the PTVs and critical structure; these are contoured and the mean, min and maximum doses reported.

An equally-spaced, 7-field arrangement was chosen. A uniformity objective was specified for each of the PTVs and a maximum dose objective for the critical structure. Conversion to leaf sequences resulted in a total of 55 segments. Planning of the phantom experiment was fairly straight-forward and the objectives were relatively easy to achieve. An isodose plot is shown just off the central axis.

Summary

A couple of weeks after our first Dry Run submission in October, we received a Dry Run QA Review from the IGT QA Center by email. The analysis compared the differences between the submitted plan and the IGT results in terms of dose and volume and provided dosimetric scoring in terms of variation from the protocol objectives and a plot of IGT calculated dose vol-

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NetWorthy by Darcy Mason

Medical Physics Links (http://go-pips.com/html/links.htm)
(submitted by Shlomo Shalev, Masthead Imaging Corporation)

This a large set of links to sites of interest to Medical Physicists, organized into various categories. Shlomo reports that the site is scanned regularly and links updated or removed as necessary.

The literature

It has taken a while for the journals to take good advantage of the internet, but the offerings are now maturing very nicely. Below are a selection of links to journals or for finding journal information online. The access without subscription varies. Generally, the table of contents and the text of the abstracts are available to all. Some publishers offer a regular email of the table of contents.

British Journal of Radiology (http://bjr.birjournals.org): I only mention this one individually because I discovered there is a free trial period on now. Until Feb 1, 2002, all internet users have full access to the entire journal online (including previous issues).

Elsevier Science: (http://www.elsevier.nl/) Elsevier publishes many journals in oncology and imaging; there is a search engine at this site to allow you to list them according to subject area and publication type. Several of the journals relevant to medical physics are listed in the other lists of links referred to below.

Institute of Physics electronic journals (http://www.iop.org/EJ/welcome): Largely subscription-based, but abstracts can be viewed for free. Covers all kinds of areas within physics. *Physics in Medicine and Biology* is one of their journals.

Journal of Applied Clinical Medical Physics (http://ojps.aip.org/acm): An on-line journal with full medical physics articles, all for free. Click on one of the 'Browse …' links on the left to go to the articles.

Medical Physics (http://www.medphys.org/). Many of us are AAPM members and have full-text access to the online journal, but there is much more information at this site. For example: instructions to authors (including template files to download), viewing the status of an accepted abstract, and "sneak previews" of articles which have been accepted for future publication.

Pubmed (http://www.pubmed.gov or www.ncbi.nlm.nih.gov/entrez/query.fcgi): A free query engine for searching the medline database. A related link, PubMed Central (http://www.pubmedcentral.nih.gov/), has full-text online journals. These appear to be mainly medical (as opposed to medical physics) but may be worth a look if you like to keep a feel for general science activity.

Other lists of links:

Medical Physics Books and Journals Online (http://www.medphysics.wisc.edu/~cameron/journals.html)

AAPM publications links (http://www.aapm.org/medphys/#publications)

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Project to promote the use of the Internet for Interactive Software Packages Demo and Consultation

By Milton Woo
milton.woo@tsrcc.on.ca

We would like to solicit support and involvement on a project designed to promote the use of the Internet for real-time interactive communication among the Medical Physics community for the purpose of software packages demo and consultation.

A typical scenario of the demo/consultation process involves a physicist at his/her workstation connecting to another physicist's workstation at another cancer centre via the Internet. The computer screen of the second physicist's workstation will appear on the first physicist's workstation so that the first physicist can view as well as control the second physicist's computer. The second physicist can then demonstrate the software while the first can have hands-on practice of the software package. Conversely, the first physicist can be the consultant to diagnose any problem that the second physicist may encounter on the system.

At Toronto-Sunnybrook Regional Cancer Centre, we have set up a workstation with many software packages that we use regularly at our centre. These include Theraplan Plus, RIT Film Dosimetry system, PipsPro image analysis system, Microcalc Origin, Lantis, PrimeView, ImageRT, MMS prostate Implant system, Plato, Radionics, and a few others. We would be happy to offer demos as well as our expertise on these systems.

In return, we would like to ask other physicists to contribute their resources and their time and expertise to this project, so that we can establish a database for the many software packages that the Medical Physics community use constantly.

There are many other applications for this process of real-time communication, as well as many complicated issues such as security and licensing rights to be addressed. The first project proposed here hopefully will be a model to move this process forward.

The project is still in its infancy, and we ask anyone interested to send email to Milton Woo (milton.woo@tsrcc.on.ca) to either participate in a demo session or arrange to be set up as a support site. A website to coordinate this process is under development.

Anita Berndt wins Young Investigator Competition

CancerCare Manitoba is please to announce that Anita Berndt won the John R. Cameron Second Place Award in the Young Investigator Competition at the AAPM 43rd Annual Meeting held in Salt Lake City, Utah July 22-26, 2001. There were over 45 abstract submissions to the Young Investigator's Competition. The abstracts were evaluated along with all other abstracts submitted to the meeting and only the 10 highest scoring abstracts were accepted into the Competition. This abstract was rated by the reviewers as among the best submitted. It was the only Canadian finalist (for a list of the finalists see www.aapm.org/meetings/01AM/yi.asp). The original abstract follows:

An ^{192}Ir CT Scanner for High-Dose-Rate Brachytherapy

A Berndt*1, S Rathee2, D W Rickey1, J Bews1

(1) CancerCare Manitoba, Winnipeg, Manitoba, Canada
(2) Cross Cancer Institute, Edmonton, Alberta, Canada

For brachytherapy (BT) treatments computed tomography (CT) scans provide much more assurance than planar radiographs that the tumour volume is being adequately treated and nearby critical structures are being spared. We are developing a fourth generation CT scanner consisting of a ring of 96 8-channel photodiode scintillator ($CdWO_4$) detectors. The Ir^{192} BT source from a commercial high-dose-rate treatment unit provides the photons required to form an image.

The detectors used in the prototype scanner are linear over 2.6 orders of magnitude and are quantum noise limited for incident gamma-rayintensities associated with 43 cm of attenuating Plexiglas. A single pair of lead collimators collimate both the source and the detector to give a scanner inner bore diameter of 50 cm and a radiation profile of width 2.7 cm in the axial direction. Image quality was assessed by computer modelling the scanner, assuming a 7.5 Ci Ir^{192} source, 768 detectors of width 0.275 cm and 864 source positions (source length = 0.36 cm). This allowed us to examine the effect of varying detector spacing, source size and number of source positions. The width of the point spread function is 0.22 cm. The standard deviation in CT number at the centre of a 25 cm diameter Plexiglas phantom is 23 HU. The CTDI for a 100 second scan (2.4 cm slice spacing) is 0.9 cGy. The high contrast resolution and noise characteristics are adequate for visualising metal objects and contrast filled organs. Preliminary images clearly show streak free visualisation of BT needles and bone.

Book Review:

IWDM 2000: Proceedings of the 5th International Workshop on Digital Mammography

Editor: Martin J. Yaffe
Publisher: Medical Physics Publishing, Madison
ISBN 1-930524-00-5

Reviewed by: Rasika Rajapakshe
Cancer Centre for the Southern Interior
BC Cancer Agency, Kelowna

This 840-page book is the conference proceedings of the 5th International Workshop on Digital Mammography held in Toronto from June 11-14, 2000. Edited by Dr. Martin Yaffe, undoubtedly one of the most qualified expert on the field of digital mammography, the proceedings are divided into six sections: Image Acquisition, Computer-Aided Detection (CAD), Clinical Aspects, Image Processing, Quality Control, and Quantitative Image Analysis, with contributions from around the world.

The introduction article is written by Dr. Marilyn Schneider, the executive director of the Canadian Breast Cancer Research Initiative, who herself is a breast cancer survivor. She has given a good summary on the status of breast cancer in Canada, with some of her own personal experiences. The Image Acquisition section has 17 contributions with a wide variety of topics including evaluation of digital mammography systems against film/screen mammography, stereoscopic depth measurements, and improvements in mammography using Synchrotron Radiation.

The Computer Aided Detection (CAD) section, the largest section of the proceedings, contains 47 articles (40% of the total). The magnitude of this section indicates how important the computer aided detection schemes are becoming in mammography. Most of the articles in this section address the automatic detection of micro-calcifications and masses in digital mammograms. Furthermore, there are articles on the developments of digital mammogram databases for evaluating efficacy of CAD systems. Some contributors are also reporting results of their refinements of old CAD algorithms to reduce False Positive predictions.

The Clinical Aspects section contains 14 articles, beginning with an article summarizing the results of the Ontario Breast Screening Program for the period of 1990-1998. The Image Processing section contains 12 articles, covering enhancement of low contrast structures, identification of skin-air boundary and image compression, to name a few. The Quality Control section contains articles on developing QC methods for digital mammography as well as automatic analysis of quality control images.

The Quantitative Image Analysis section consists of 18 articles mainly devoted to registration/fusion of mammograms with breast MRI for surgical planning and postoperative assessments as well as registration of temporal or bilateral mammograms. Modeling of breast tissue deformation, which is a common problem for these algorithms, is also addressed in this section.

As a mammography physicist I found the proceeding to be very interesting and useful. I consider this book to be a valuable addition to the library of anyone involved in mammography, especially those who are interested in moving onto a full field digital arena in the future.

COMP Chair Report *(Continued from page 4)*

The 2002 COMP meeting will be held in conjunction with the AAPM at the Palais de Congres de Montreal from Jul 12-14. It is important to remember that a Canadian Nite-Out will be held on the Sunday night, July 14, 2002. Since the AAPM has decided to cancel their customary Sunday night Icebreaker for the 2002 meeting, we felt it would be convenient to have our Nite-Out that evening so as to avoid interference with other AAPM activities. The Canadian activities are being organized through the Edmonton office, and it is hoped that most of the responsibilities for this will be "dumped" from the shoulders of S. Connors to those of our Executive Director. The Executive Director will also pursue corporate sponsorship for the Nite-Out. It is expected that a nominal ticket fee (about $10-15 CAN) will be asked from COMP members to attend the Nite-Out. This amount results from the knowledge that the AAPM has recently decided a registration fee of $395 US for the 2002 meeting, an amount that is substantially less than what was discussed previously. The membership should also be informed that registration and submissions would be through the AAPM offices. The deadlines for registration and submission are listed in this issue of InterACTIONS. The COMP AGM will most probably be held on Monday, July 13 (5:30 – 7:00PM). There will not be any COMP Proceedings this year.

The 2003 COMP meeting will be held in Edmonton from June 5-8 after consideration of various options. This meeting will be held at the University of Alberta Hospital, and accommodations within the Residences of the University of Alberta, which is only a block away. The 2004 COMP will be in conjunction with the CAP in Winnipeg from July 13-16. at the Delta Hotel / Convention Centre.

Finally, I want to personally take this opportunity to wish our membership good cheer for the holiday season, good health and prosperity for the near year.

B.G. Fallone, Chair of COMP
September 16, 2001

(Medical) *Physics in Canada*

The journal of the Canadian Association of Physicists, *Physics in Canada*, is devoting its March/April 2002 special issue to Medical Physics. Contributing authors for the 13 articles come from 11 different institutions in 5 provinces. Indeed, the large majority of authors are themselves members of COMP. The anticipated contents are:

Gary Bavaria et al., CHUM, La physique medicale au Centre Hospitalier Universitaire de Montreal (CHUM) - in French
Luc Beaulieu *et al.*, Laval/CHUQ, brachytherapy - in French
Rob deKemp, Ottawa, cardiac PET - in English
Roger Lecomte, Sherbrooke, oncological PET - in French
Dave Rogers, NRC, Monte Carlo in radiation therapy - in English
Stephen Pistorius, Manitoba, Exit dosimetry - in English
Alex MacKay, UBC, MRI/MRS (de)myelination - in English
Ross Mitchell *et al.*, Calgary, Medical Physics at the Seaman Family MR Research Center - in English
Jake Van Dyk, London, Tomotherapy - in English
Joanne O'Meara, McMaster, Medical Physics Education - in English
Ellen Grein et al., BC Cancer, Proton Therapy - in English
Brian Wilson, Toronto, Biophotonics - in English
Aaron Fenster, Western, (3D) Ultrasound, image guided therapy - in English
editors: Jean-Pierre Bissonnette (CHUM), David Chettle (McMaster)

Copies of this special issue may be ordered, at a 30% prepublication discount, from:

Physics in Canada,
Suite 112, McDonald Bldg.
150 Louis Pasteur Ave.
Ottawa, Ontario K1N 6N5
Fax: (613) 562-5615 e-mail: CAP@physics.uottawa.ca

The cost in advance of publication is $7 plus shipping/handling per copy, all plus GST (7%). Shipping/handling is $3 for a single copy, with savings for increased numbers of copies.

Cold Fusion *(Continued from page 24)*

programming group. Ideally we would like to automate the process of generating feedback to the registrant about any formatting problems with the abstract. This goal is complicated by the fact that we use a web hosting service – a company the puts our web pages on their computers. To keep costs reasonable we use a shared server where other applications, such as MS Word or Adobe Acrobat are not allowed (to improve security). While we have to set up a second computer that monitors the COMP web site and automatically downloads and processes any new submissions, the process is not completely seamless. We would like to make the process more automatic and less dependent on manual intervention. Although we have accomplished a lot, clearly much remains to be done. We are also debating about adding the ability for registrants to pay their registration fees on-line. Such a step requires a great deal of consideration because of the security issues and because of the extra charges (5%) associated with the use of credit cards. One alternative that we are investigating is an on-line payment scheme called PayPal (see http://www.paypal.com) that is used by people who frequent auction sites. This reduces the costs and some of the security issues but may prove to be inconvenient to COMP members. Finally, we have to admit that although we have put a tremendous effort in the abstract submission and registration capabilities, these features make almost no visual impact on the COMP web site. So Mike Kolios has been busy interacting with representatives of the Canadian Association of Radiation Oncologists who have organized a well thought out web site (see http://www.caro-acro.ca) to find out the CARO web site was developed. Mike is currently generating a proposal where the entire abstract submission and registration process as well as other features of the web site would be developed by professional web developers. While this would cost a lot of money, the end result could be a process that dramatically improves our web site and simplifies the organization of our annual meeting. In the long run this could be money well spent.

Peter Munro

In Brief

Correction

In the feature article of the October 2001 issue of Interactions "High Resolution Subsurface Imaging with Optical Coherence Tomography: Basic Principles and Biomedical Applications," by Alex Vitkin, the acknowledgements were inadvertently cut-off. They are reproduced here in their entirely; my sincerest apologies for the oversight.

Acknowledgements

I would like to acknowledge the hard work and creativity of the "OCT student team" at the Ontario Cancer Institute/ Princess Margaret Hospital (Victor Yang, Maggie Gordon, Alvin Mok), and financial support from NSERC and CIHR.

Pat Cadman, Interactions Editor

CCPM President *(Continued from page 5)*

updated and more information regarding the College is on the web site. It has been recognized that some links that go directly to the documents from the main medphys web page are missing. The joint COMP/CCPM communications committee is helping us to correct this, and hopefully College information will soon be more easily accessible. I will also use this opportunity to remind new young members of the College that applications for the Harold E. John Travel Award are being solicited for 2002.

Finally, after a shocking and sobering fall, I hope that this upcoming holiday season will strengthen your spirits. I wish you and your families peace and joy in the New Year.

L. John Schreiner
December 2001

Medical Physicists Conduct Experiment for Posteriority

COMP Meeting, Kelowna, 2001

Two of COMP's top notch scientists, Tony Falco (in the white T-shirt) and Jean-Francois Corbett conducted clandestine experimentation at a secret laboratory known only as the O. K. Corall in Kelowna, B.C. duriong the recent COMP Annual Meeting Both scientists experienced pain in the lower body area over the next couple of days, though they still managed to give their respective talks. The severity of late effects has yet to be reported on.

RTOG Credentialing *(Continued from page 26)*

ume histograms. With this report, it was possible to easily and quickly identify any protocol variations – this was good since the report contained the words "***You failed to achieve a score of No or Minor Variation with the treatment plan you submitted based upon PTV coverage.***" Darn! It turned out that we misinterpreted the simple protocol requirement that the entire PTV be covered by the 95% isodose (just like a good old-fashioned prescription). An increase of the total monitor units brought the PTV coverage into line, the parotid objectives were met and the mandible was slightly overdosed (remember, this is not considered a major variation with the new scoring). Three weeks later we receive our credentialing approval. Ah! We hope to accrue patients for the protocol early in the new year. I would recommend this exercise for all centres planning to embark on an IMRT program; it will help provide a focus for your IMRT team, the clinical objectives are worthy and the external validation by the IGT QA Center will lend credence to your program.

Funding of Medical Physics Research Projects in Ontario

An "R&D" fund was established originally by Theratronics International as a result of a purchasing agreement reached with Cancer Care Ontario (CCO). Theratronics was awarded a contract to supply a large number of computer workstations for 3D radiation treatment planning in Ontario. The first commercial installation took place in the Fall of 1996 at the London Regional Cancer Centre. New computer systems have since been installed in Toronto, Windsor, Thunder Bay, Kingston, and Ottawa.

In a research partnership with the Cancer Care Ontario medical physics community, MDS-Nordion agreed to provide medical physics research funding of $250,000 over a 5-year period. The goal is to seed new projects of excellent scientific merit in the area of clinical radiation therapy. Projects are peer-reviewed by a panel of physicists with a MDS representative. Judgement of projects is based on criteria such as innovation, scientific merit, impact on the field, ease of technology transfer across cancer centres, and the potential to attract external funding.

The following Table lists the projects approved recently by the Grants Panel in the third-round of competitions.

MDS-Nordion Cancer Care Ontario GrantsTheratronics-Cancer Care Ontario Grants (2001-2002)

Applicants	Cancer Care Ontario Location	PROJECT TITLE	Amount Approved
G. Lam	Ottawa	Investigation on the Tolerance Doses of Normal Tissues	$12,000
D. Wilkins L. Gerig	Ottawa	A Model for the Process of Radiotherapy	$24,000

Congratulations to these awardees !

The next competition will been scheduled early in the new year.

Jerry J. Battista, Chairman
MDS Nordion Cancer Care Ontario Grants Panel

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POSITION: **RADIATION ONCOLOGY PHYSICIST**

LOCATION: **London Regional Cancer Centre**
London, Ontario, Canada

The London Regional Cancer Centre is committed to providing leadership in cancer treatment, research, and education. Comprehensive resources serve a regional population of 1.8 million in Southwestern Ontario. The radiation therapy facilities include 8 megavoltage therapy machines, several with MLC and portal imaging, 2 simulators, a CT-simulator, HDR, 2 LDRs, and specialty programs in intensity–modulated 3-D radiation therapy, prostate brachytherapy, stereotactic radiosurgery, and photodynamic therapy. A prototype helical tomotherapy system will be installed in early 2002. Related research is underway in intensity modulated arc therapy, 3-D gel dosimetry using optical CT and MRI, on-line verification imaging including CT, 3-D dose optimization, radiobiological modeling, and treatment uncertainty propagation. The successful candidate will join one of Canada's top Medical Physics teams with a full range of dosimetry, computing, and engineering support. The candidate will participate in clinical service, research, and teaching, including graduate student supervision. The successful candidate must be eligible for an appointment at the University of Western Ontario.

Minimum qualifications include a Ph.D. with several years of related clinical experience, and Canadian certification (CCPM) or equivalent. The salary range is CDN $79,403 - CDN$118,000 depending on years of experience and proven academic productivity.

London, Ontario is a pleasant and affordable university and health care city of 350,000 people nestled in south-western Ontario within a short drive to Toronto, Windsor (Detroit), and Niagara Falls (Buffalo). Proximity to Canada's Great Lakes region offers a wide range of recreational activities during all seasons.

In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. Cancer Care Ontario is an equal opportunity employer. We thank all those who apply; however, only candidates chosen for interview will be contacted.

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CANCER CARE ONTARIO

Northeastern Ontario Regional Cancer Centre

Cancer Care Ontario operates nine regional cancer centres in Ontario, with several new centres scheduled to open between 2003 and 2005. Our work includes programs in cancer prevention, screening, treatment (medical, surgical and radiation), supportive care, research, education and the development of treatment guidelines.

Cancer Care Ontario is the province's leader in the integration and coordination of cancer control services, and the Ministry of Health and Long-term Care's principal advisor on cancer issues.

Located on the shores of beautiful Lake Ramsey in Sudbury, Ontario, the Northeastern Ontario Regional Cancer Centre (NEORCC) is a progressive organization with a strong commitment to patient care. NEORCC, which is affiliated with Laurentian University and the University of Ottawa, is currently seeking a…

Chief Physicist

Reporting to the Centre's Head of Radiation Oncology, you will coordinate and evaluate clinical support and academic activities of the Radiation Physics and Technical Support Team in the Radiation Treatment Program, fostering a cooperative working environment that is based on team participation, open dialogue and shared goals and experiences. You will act as Radiation Safety Officer, lead and participate in research and educational activities in Radiation Physics and related areas, and be involved in teaching and supervising graduate students in Medical Physics.

The Radiation Treatment Program currently has three linear accelerators, one Cobalt machine and one orthovoltage unit. We are equipped with a Nucletron high-dose rate brachytherapy unit and real-time portal imaging. Three dimensional treatment planning is available. NEORCC also has a strong research group in physics and tumour biology, and is planning a major expansion for completion in 2002, which will see the addition of 30,000 square feet and 5 new and replacement linear accelerators. When complete, the expanded department will have full conformal therapy capabilities including virtual simulation. A satellite radiation therapy facility, affiliated with NEORCC, is planned for Sault Ste. Marie.

The successful candidate will have a Ph.D. in a directly related field coupled with at least 10 years of related experience. Eligibility for or membership in the Canadian College of Physicists in Medicine is preferred. An academic appointment with Laurentian University, Sudbury and/or the University of Ottawa is offered for appropriately qualified individuals. Demonstrated leadership abilities, including proven coordinating and facilitating talents and excellent communication, interpersonal and organizational skills, are preferred. Knowledge of relevant software is required. French language skills would be an asset.

Sudbury offers many recreational and educational facilities including a university, colleges and private schools, a symphony orchestra, museums, competitive sports, and a full spectrum of outdoor activities. The successful candidate will also enjoy a highly competitive remuneration package including comprehensive benefits and educational opportunities. Overseas candidates may be considered, and relocation assistance is available. For consideration, please forward a curriculum vitae and three letters of reference, quoting filename: **CPH09/01**, before **February 8, 2002**, to: **Dr. J. Bowen, Head of Radiation Oncology, Northeastern Ontario Regional Cancer Centre, 41 Ramsey Lake Road, Sudbury, Ontario, Canada P3E 5J1. Telephone: 705-522-6237, ext. 2453. Fax: 705-523-7329. E-mail: jbowen@neorcc.on.ca**

In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada. We are an equal opportunity employer.

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www.cancercare.on.ca

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CENTRE RÉGIONAL DE CANCÉROLOGIE DU NEO

SCHOOL OF HEALTH SCIENCES

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announces a search for a

TENURE-TRACK FACULTY POSITION: RADIOLOGICAL SCIENCE

The position is a full-time, tenure track, academic year, faculty appointment at the assistant professor level in the School of Health Sciences, Purdue University, a State University. Outstanding applicants will be considered for a higher faculty rank. Applicants in all areas of radiological science will be considered but preference will be given to those having expertise in medical physics (therapy or imaging) and/or and health physics, radiobiology, microdosimetry, or radioanalytical instrumentation. The successful applicant must be able to participate in courses dealing with the fundamentals of radioactivity, radiation interactions, radioisotope methodologies, radiobiology, and radiation protection. The applicant must have a Ph.D. or equivalent, and will be expected to maintain an externally funded research program and to supervise graduate students. Purdue is one of the top 10 universities in engineering and science and interdisciplinary research is highly valued and encouraged.

Applications should be sent to:

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Head and Chair, Search Committee
Purdue University
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West Lafayette, Indiana 47907-1338
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e-mail: sandison@purdue.edu

Interested applicants should submit a letter of introduction which includes a statement of research interests and goals, a curriculum vita including a list of publications, past and current research funding, and the names, addresses, and telephone numbers of three references. Applications will be received and reviewed immediately and continue until the position is filled.

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Employment Opportunity

Capital Health

Note: This competition is open to employees of Capital Health and to the general public.

Closing Date:	16 November 2001 **Opening Date**: 15 October 2001
Position:	**MEDICAL PHYSICIST** - Regular Full-time
Salary Range:	As per salary band
Department:	UAH Nuclear Medicine
Hours of Work:	Monday to Friday - 7.75 hours per day
Duties:	The successful candidate reporting to the Regional Administrative Director, will have responsibilities in the Nuclear Medicine and Diagnostic Radiology quality assurance program. The position will also have responsibilities in the physics teaching program for Radiology and Nuclear Medicine residents and the quality assurance Technologists. The successful candidate will also provide leadership in research endeavors and be an active member of the Radiation Safety Committee
Qualifications:	Minimum requirements are a Ph.D or equivalent in Medical Physics. Minimum of two years direct related experience. Knowledge of and experience in the imaging and physics aspects of X-ray, Nuclear Medicine and MRI imaging. Experience in large computer networks is required. Eligible for certification with the Canadian College of Physicists in Medicine.
Competition Number:	**DM-02698-RA**
When Applying:	Applications should be submitted, quoting the competition number, to: Human Resources, Royal Alexandra Hospital Site, 10240 Kingsway, Edmonton, AB, T5H 3V9 or Fax: (780) 477-4960.

Please note that only those involved in the interview process will be contacted. Applicants may be required to pass a skills assessment test. All employees new to Capital Health must provide a criminal records check.