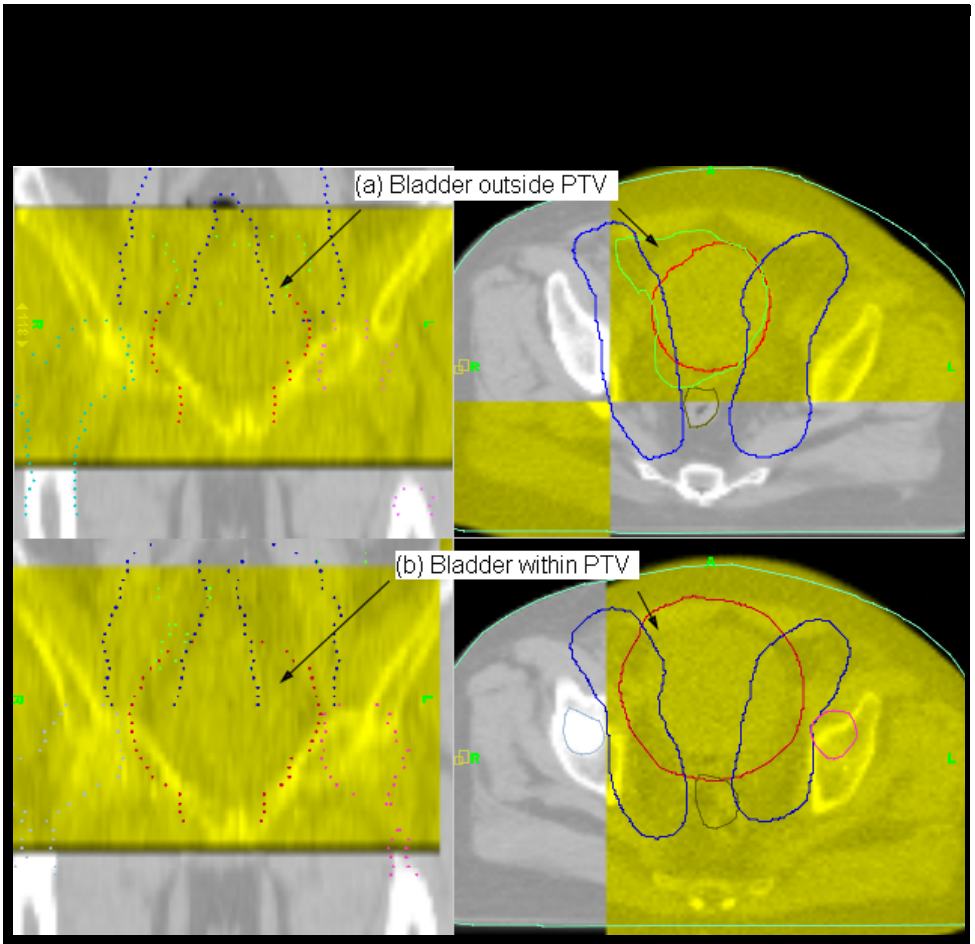
InterACTIONS

CANADIAN MEDICAL PHYSICS NEWSLETTER
Le BULLETIN CANADIEN de PHYSIQUE MÉDICALE



Adaptive Radiotherapy of the Bladder using Helical Tomotherapy

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

52 (3) juillet/July 2006

About our Cover

At The Ottawa Hospital Regional Cancer Centre (TOHRCC) we are investigating the combination of radiation therapy and intra-arterial cisplatin for organ preservation in bladder cancer. As part of this study, we have developed a technique to adapt the radiation delivery to daily changes in bladder volume, using the image-guided capabilities of a TomoTherapy HiART machine.

Each patient receives three treatment planning CT scans: with full bladder, with half-full bladder, and with empty bladder. Treatment plans are generated on each CT scan to encompass the PTV (bladder + 2 cm margin) whilst minimizing dose to rectum and small bowel. Patients are instructed to void before each treatment fraction, the empty-bladder plan is downloaded, and an MVCT is acquired to localize the target and assess bladder volume. If the bladder is deemed too close to the PTV, then the next-largest-volume plan is downloaded and the process repeated until adequate coverage is assured.

Figure (a) shows coronal and transverse views of a pre-treatment MVCT of a patient (yellow-green) registered to the empty bladder TPCT (grayscale). The treatment planning contours are super-imposed. In the top pair of images, the bladder clearly extends beyond the PTV (shown here in red), even though the latter includes a 20 mm margin for occult spread and geometric uncertainty. Figure (b) shows a second MVCT of the same patient on the same day, with the full bladder contours superimposed. In this case, the bladder was deemed adequately covered by the PTV, and the treatment proceeded. To date, four patients have been treated using this technique.

Images provided by Miller MacPherson, Shawn Malone, Rob MacRae, Libni Eapen, Lee Gerig, Greg Fox, Kathy Carty, Lynn Montgomery, and Brenda Clark
The Ottawa Hospital Regional Cancer Centre, Ottawa, ON.

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, images, and article submissions can be made to:

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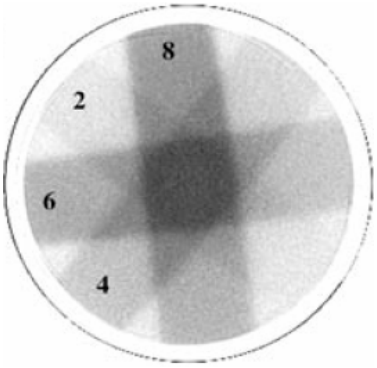
Michelle Cottreau: mjcottreau@ihis.org

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

InterACTIONS 52 (3) juillet/July 2006



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Message from the COMP Chair:

COMP as an organization is now poised to enter a new stage in its development.

The COMP 2006 meeting was one to remember thanks to **Pat Cadman** and the Saskatoon LAC and to **Stephen Pistorius**, chair of the conference committee. The first presentation at the meeting, at the public lecture session, was an introductory talk by a cancer patient, **Lisa Rendall**. Bringing a patient and her story to the forefront of the meeting is an excellent way to remind us of the ultimate goal of our work. All who attended were affected by this talk. At the inaugural gold medal session **Jerry Battista** lead us on an entertaining tour of early Canadian medical physics. The session recognized **Jack Cunningham, Doug Cormack and Sylvia Fedoruk**, all former students of **Harold E. Johns** at the University of Saskatchewan in Saskatoon. Interestingly, all of the gold medal recipients and the public lecturer, **Rock Mackie** have some personal connection to the Bessborough hotel, the venue for the COMP 2006 meeting. The CCPM symposium this year highlighted some of the potential imaging and therapy applications for the new Canadian Light Source and at the end of the conference many of us took the opportunity to tour the facility on the campus at the university. Fascinating stuff – but there is a large gap that has to be bridged between their work and ours and many opportunities for COMP members to contribute in closing that gap.

Congratulations to all of the scientific award winners, particularly **Guy-Ann Turgeon** and the **Terry Peters** group for winning the **Sylvia Fedoruk** award for 2006 with their paper describing 2D-3D image registration of coronary angiograms. The award was presented this year by the honourable **Sylvia Fedoruk** on behalf of the Saskatchewan Cancer Agency. The poster award went to **M. Rogers** and the **John Schreiner** group for their work in developing cobalt Tomotherapy. The YIS winner was **A. Sarfehnia** from McGill for his presentation on imaging using orthogonal bremsstrahlung; 2nd place went to **S. Freidman** from the Robarts Research Institute in London and 3rd to **J. Draper** from the Foothills Medical centre in Calgary. The oral presentation award winner was **J. Zheng** and the **David Jaffray** group at Princess Margaret hospital for work on the development of liposome based multimodal contrast agents. Thanks to BEST industries who now sponsor all of the conference awards and to all of the vendors who exhibit and sponsor events at our annual meeting.

The next COMP scientific meeting will be a joint conference with the Canadian Association of Radiation Oncology (CARO), and will be held at the Sheraton hotel in Toronto from October 10-14.

COMP as an organization is now poised to enter a new stage in its development. The membership has approved a strategic planning exercise for the COMP executive, so that we may analyze our current situation, set goals and priorities and objectives for the next

Peter O'Brien, COMP Chair

5 years. Canadian medical physicists are a relatively small but strong group and there are many opportunities for the future. We must examine these carefully and choose from them wisely so that we can maintain the advantages of a close-knit community while playing a meaningful role both nationally and internationally.

This is my last submission as the chair of COMP and I would like to exit with a heartfelt thanks to all of the COMP volunteers. It has been a privilege to work with them to serve the medical physics community in Canada. I hope to continue to work with the new executive under the leadership of **Stephen Pistorius**, as we maintain and improve our organization.

Message from the CCPM President:

There have been several changes on the CCPM board with two members being replaced by new members. I would like to thank Brenda Clark for her 8 years of service on the CCPM board, 4 of them as President. Also, I would like to thank John Andrew for serving on the CCPM board for 2 years on very short notice; John had already served on the board from 1989 to 1996. I would like to welcome two new board members, Rob Corns who is the new deputy chief examiner and Dave Wilkins, who is the new Vice President (President elect). Michael Evans has become the Chief Examiner relieving Katharina Sixel who served in this position for 4 years. Thank you Katharina.

Dick Drost, CCPM President

This is also Katharina's last year on the board, so we are looking for a new board member who would be starting their term in October 2007 at the joint COMP/CARO scientific meeting in Toronto. If you are interested please contact Brenda Clark who has taken over from John Schreiner as chair of the nominations committee. Although John lured me onto the CCPM board, I would still like to thank him for his work on the nomination committee.

The board elected and welcomed 18 new members and 3 new fellows to the board at the CCPM AGM held at the COMP scientific meeting in Saskatoon, June 1, 2006; my congratulations to the new members and fellows.

The CCPM board was asked to report the activities of CAMPEP (Committee on Accreditation of Medical Physics Educational Programs), a committee that is sponsored by the AAPM, ABR, ACMP, and the CCPM. The two CCPM members on the CAMPEP committee are Brenda Clark and Peter Dunscombe. Currently 13 medical physics graduate programs are accredited, 4 of them in Canada (McGill, U of Calgary – Tom Baker Cancer Centre, UBC, and U of Alberta – Cross Cancer Institute), and 13 residency training programs are accredited, 3 of them in Canada (McGill, U of Calgary – TBCC, and the U of Alberta – CCI). The residency program at the U. of Alberta is accredited in both therapy and imaging.

Finally, I would like to thank two people that have helped the CCPM in public relations: Darcy Mason, who has been the web master for the COMP and CCPM web sites, and Boyd McCurdy, who has been the Interactions editor. Both of them have finished their terms.

Currently 13 medical physics graduate programs are accredited, 4 of them in Canada... , and 13 residency training programs are accredited, 3 of them in Canada...

Message from the Executive Director of COMP/CCPM:

I have been struck by the culture of the medical physics community in Canada, which is characterized by the collegiality among the the members and the commitment of the many volunteers.

It is difficult to believe we are on the other side of the 2006 Annual Scientific Meeting and CCPM Symposium. It seems like just yesterday that the Conference Committee had its first teleconference to begin planning the event.

Congratulations to Pat Cadman and Narinder Sidhu and their team for a job well done. It was wonderful to be in Saskatoon and to have an opportunity to continue putting faces to the names of members I have communicated with via email or telephone or whose names I have seen on the membership list.

Many of the meeting delegates have shared that a highlight was the Gold Medal Ceremony in which three "pioneers" were honoured for their outstanding contribution to Canadian medical physics: Jack Cunningham, Doug Cormack and Sylvia Fedoruk. Jerry Battista kicked off the ceremony with a presentation on the history of medical physics in Canada that was both informative and entertaining and was particularly appreciated by those who are new to the field. Sheila (Reesor) Cunningham and Ishbel Cormack were also present to participate in the ceremony.

A brief online survey was circulated so that all delegates would have an opportunity to give feedback that will be most helpful as we plan future meetings. The results of this survey will be published in the October issue of InterACTIONS.

I would like to take this opportunity to thank some important volunteers who officially completed their terms at the 2006 Annual General Meeting in Saskatoon. Darcy Mason, Councillor for Communications, was very helpful to me as I became familiar with the membership database, the website, online dues processing and online conference registration. I am most appreciative of Darcy's technical expertise (both as a webmaster and photographer!), his willingness to answer my questions and his patience. Clément Arsenault, who served in many capacities and most recently as Past-Chair, was a source of wisdom and often the voice of reason as issues were discussed. Clément also provided valuable insight into how we might better meet the needs of our francophone members.

Boyd McCurdy has served as Editor of InterACTIONS for the last three years and ends his term with the production of this July 2006 issue. Putting this newsletter together is no small task and Boyd has done so with professionalism, style and humour.

Serving as Executive Director of the CCPM as well, I have had the pleasure of working with Brenda Clark and John Andrews whose terms on the Board have also come to an end. Brenda has provided the CCPM with excellent leadership as CCPM President and has been a strong advocate for the importance

Nancy Barrett,
COMP/CCPM Executive Director

of certification in the medical physics profession. John Andrew, who had served on the Board during a previous period, stepped in for a two-year period during a time of high turnover on the CCPM Board and provided much needed experience and continuity.

I look forward to getting to know the members who have generously agreed to fill the various positions: Michelle Cottreau and Jason Schella will serve on the COMP Executive, Parminder Basran will serve as the Editor of InterACTIONS starting with the October issue while David Wilkins and Robert Corns will fill the vacancies on the CCPM Board.

A little over a year has passed since our contract with COMP and the CCPM started. I have been struck by the culture of the medical physics community in Canada, which is

(Continued on page 96)

Harold E. Johns Travel Award 2006

The winner of this year's H.E. Johns Travel Award is François DeBlois of the McGill University Health Centre. Congratulations François!

The award of up to $2000 will be used by François to help with expenses associated in travelling to the first European workshop on Monte Carlo Treatment Planning in Ghent, and visit Clinique Universitaires St-Luc in Brussells.

Members of the CCPM (less than three years since gaining membership and under 35 years of age) are encouraged to apply for this award.

Farewell from the editor

I never realized that three years could pass so quickly. Maybe it just confirms my pet theories of time contraction being proportional to increased age! This is my final issue as editor of *InterACTIONS*. I would like to thank all of the COMP members who have submitted articles, images, and stories, as well as those members who subtly twisted the arms of colleagues to also submit material! I only have so much nagging to spread around!

This newsletter is a communication vessel of the membership, reflecting current interests and issues. So if you feel the newsletter has been worthwhile and useful, then give yourself a pat on the back (but be careful you don't break anything)! Many of you have submitted material on various topics, providing the COMP members with a very wide and interesting variety of content in their newsletter. I feel that this variety is one of the strengths of the newsletter, and speaks highly as to the quality of our members. The scientific content (typically the 'Feature Article') is especially challenging for our busy members to write, but is an extremely valuable element. Other material has ranged from the controversial to the mundane (but nevertheless important and necessary). If the saying goes 'variety is the spice of life', then I would urge members to keep contributing material, and let's crank this newletter up to a cayenne pepper!

It has been very rewarding to be an integral part of *InterACTIONS*. I would like to thank my immediate predecessors, Pat Cadman and Peter Munro, for setting up the framework of the newsletter in such a way that it could be used quickly and easily by a novice like myself. Parminder Basran of Toronto will begin his tenure as newsletter editor with the October 2006 issue. Knowing Parminder, I'm sure he will do an excellent job. Please assist him by continuing to contribute a wide assortment of material. Not only is it fun and gratifying to see your material in print, it is a benefit to all members of COMP.

Thank you again!

Sincerely,
Boyd McCurdy

'On assignment' in the Hunter Valley wine region of Australia (March 2006), with daughter Tess.

Citation Award 2005

Submitted by Michael S. Patterson
Juravinski Cancer Centre and McMaster University
Hamilton, Ontario

It is once again time for my annual recognition of the medical physics paper published ten years ago (1995) that has been cited most often in the following ten years. Readers interested in the origins of this quixotic pursuit are referred to my article in *InterACTIONS* (Vol. 50, pp. 29-32) and the announcement for 2004 (Vol. 51, p. 103). I am still hopeful that COMP will initiate a formal award based on similar criteria, but in the meantime, this will have to do. The rules (invented by the author) are simple: the work must have been performed mainly at a Canadian institution, only papers in peer-reviewed journals are considered, review or "popular" articles are not eligible, and the paper must be "medical physics" – for example, articles dealing with clinical application of a mature imaging technology are not included, even if medical physicists are co-authors. The winner is determined by data in the Science Citation Index. I believe that my search strategies are thorough, but no claim of infallibility is made by the author.

This year we have a runaway winner. From its appearance in 1995 until the end of 2005, it was cited 310 times and it is one of the most cited Canadian medical physics papers ever published:

BEAM: A Monte Carlo code to simulate radiotherapy treatment units

D. W. O. Rogers, B. A. Faddegon, G. X. Ding, C.-M. Ma, and J. We

Ionizing Radiation Standards, Institute for National Measurement Standards, National Research Council Canada, Ottawa K1A 0R6, Canada

T. R. Mackie

University of Wisconsin, Department of Medical Physics, Madison, Wisconsin

This paper describes BEAM, a general purpose Monte Carlo code to simulate the radiation beams from radiotherapy units including high-energy electron and photon beams, ^{60}Co beams and ortho-voltage units. The code handles a variety of elementary geometric entities which the user puts together as needed (jaws, applicators, stacked cones, mirrors, etc.), thus allowing simulation of a wide variety of accelerators. The code is not restricted to cylindrical symmetry. It incorporates a variety of powerful variance reduction techniques such as range rejection, bremsstrahlung splitting and forcing photon interactions. The code allows direct calculation of charge in the monitor ion chamber. It has the capability of keeping track of each particle's history and using this information to score separate dose components (e.g., to determine the dose from electrons scattering off the applicator). The paper presents a variety of calculated results to demonstrate the code's capabilities. The calculated dose distributions in a water phantom irradiated by electron beams from the NRC 35 MeV research accelerator, a Varian Clinac 2100C, a Philips SL75-20, an AECL Therac 20 and a Scanditronix MM50 are all shown to be in good agreement with measurements at the 2 to 3% level. Eighteen electron spectra from four different commercial accelerators are presented and various aspects of the electron beams from a Clinac 2100C are discussed. Timing requirements and selection of parameters for the Monte Carlo calculations are discussed.
Dedication: This paper is dedicated to the memory of our friend and colleague, Jiansu Wei, who made a significant contribution to this project before he passed away on March 15, 1993.

Report on WesCan 2006

Submitted by Keith Nakonechny
CancerCare Manitoba
Winnipeg, MB

The 2006 edition of the annual WESCAN conference was held in the "Queen City" of Regina, Saskatchewan on the first official weekend of Spring (March 22-25), hosted by the Allan Blair Cancer Centre. Known for its relaxed and cordial environment, this year's conference did not disappoint in providing a forum where centres could exchange ideas, both of a practical nature as well as more "scientific" content. WESCAN is one of the few technical conferences that sees such a diverse background of attendees from all aspects of the radiation therapy process, and not just us "millimetre-itis" physicists (as one radiation therapist once said). Unfortunately some of the roughly 75 attendees from across predominantly Western Canada may have been attracted to Casino Regina which was across the street from the conference headquarters, but one can only assume they were attending presentations on Monte Carlo treatment planning … okay, no more bad puns.

This year's theme was "Immobilization and Image Guided Radiotherapy". The first day began with a very informative and well-attended immobilization workshop which highlighted the pros and cons primarily between the different types of thermoplastic shells in current use at different clinics. Mould room staff from several centres showed off their talents, including a real-time fitting of one of the members of the Allan Blair group. Lunch was hosted in the display room where the (generous!) sponsoring vendors showed their wares. Scientific sessions, ranging from an online applications training demo (Cross Cancer Institute) to brachytherapy QA (BC Cancer Agency and the Tom Baker Cancer Centre), and vendor symposia followed to fill out the remainder of a successful first day. Of course there was the ongoing poster session (n=1); kudos to Siobhan Ozard (Windsor Regional Cancer Centre)!

Day two continued with more scientific sessions beginning with an enlightening talk about cancer incidence and trends in Saskatchewan by Regina epidemiologist Dr. Jon Tonita of the Saskatchewan Cancer Agency. Next was a very informative presentation from this year's esteemed invited speaker, Dr. David Jaffray from Princess Margaret Hospital in Toronto. Dr. Jaffray's talk entitled "Volumetric and Radiographic Guidance in the Treatment Room: Initial Experience" summarized the state of the art in the implementation of kilovoltage cone-beam CT (CBCT) for patient position verification, as well as exploration of using CBCT for the whole treatment process (imaging, planning, QA, verification, treatment) all in the same treatment session. After his talk, Dr. Jaffray was presented with an original work by renowned Regina painter Henry Ripplinger. The rest of the day consisted of vendor symposia and scientific talks, including an unabashed parade of slides featuring photographs of lush beautiful British Columbia mountainsides that many conference attendees call home. Perhaps us Flatlanders are too sensitive (jealous?); if only the beauty of a "sea" of blue flax juxtaposed against a field of yellow canola flowers, reaching from sky to sky, came across as well on film (err, I mean CCD)! Of the remaining presentations, perhaps those inciting the most discussion were by representatives of the CNSC. Their playful yet informative overview of the audit process and the upcoming changes to Class II nuclear facilities regulations sparked a barrage of questions from the audience, especially after utterance of the "L-word": licenses. Apparently the physicists in the crowd did not like the prospect of more paperwork!

The award winner for best paper by a therapist, technician, or student was Leo Moriarty (Tom Baker Cancer Centre) for his work on a denture plate based restraint system.

The night out on Friday was held at the Applause Feast and Folly dinner theatre featuring a performance of "Gunslinger Gals", a pleasant mixture of: dinner, song and dance, male actors dressed up as women, and female actors wandering into the audience to put the male conference members in somewhat "compromising" positions.

Those die-hards who stayed long enough on the Saturday and were not feeling any "residuals" from Friday night at the pub were treated to a morning tour of the Allan Blair Cancer Centre, followed by lunch.

Many thanks go out to the entire organizational group of the Allan Blair Cancer Centre for all their hard work on hosting a very enjoyable and successful WESCAN, most notably Craig Beckett, Matthew Schmid, Colin Ladyka, Wanda MacDonald, Janet Smart, and Janelle Frey. See you all at next year's conference in Edmonton!

Enjoying the dinner theatre.

WESCAN invited speaker, Dr. David Jaffray.

Ervin Podgorsak – 2006 AAPM Coolidge Award winner

Submitted by Michael Evans, Jan Seuntjans, and Marina Olivares
McGill University Health Centre
Montréal, QC

The 2006 William D. Coolidge Award from the American Association of Physicists in Medicine has been awarded to Dr. Ervin B. Podgorsak of McGill University in Montreal. This highest honour, presented once a year by the AAPM, requires the candidate to have demonstrated through an eminent and longstanding career in medical physics both leadership and excellence in three major categories, most notably having had a:

- Significant impact on the scientific practice of medical physics; and
- Significant influence on the professional development of the careers of other medical physicists; and
- Demonstrated leadership in national and/or international organizations, with specific emphasis on AAPM activities.

Prof. Podgorsak, Ph.D., FCCPM, FAAPM, DABMP, Director of the McGill University Medical Physics Unit and Director of the Medical Physics Department of the McGill University Health Centre was born in Vienna, Austria 1943 and graduated with a major in Physics from the University of Ljubljana, Slovenia in 1968. In 1969 he began graduate studies at the University of Wisconsin where he completed his M.Sc. degree in Physics under Dr. John R. Cameron (1980 Coolidge Award recipient) in 1970 and his Ph.D. degree in Physics under Prof. Paul R. Moran with a minor in Radiological Sciences in 1973. Following an invitation by Dr. Harold E. Johns (1976 Coolidge Award recipient), Dr. Podgorsak moved to Toronto where he was first employed as a Post-doctoral Fellow at the University of Toronto Department of Medical Biophysics and then as a clinical physicist at the Ontario Cancer Institute under Dr. John Cunningham (1988 Coolidge Award recipient).

Traveling against the political tide, he headed east to McGill University in Montreal in January 1975 where he took up a double load as tenure track Professor and Clinical Physicist in Radiation Oncology. In 1979 he assumed directorship of the hospital-based departments of radiation oncology physics at the three McGill University teaching hospitals (Montreal General, Royal Victoria and Jewish General hospitals) as well as director of diagnostic radiology physics at the Montreal General Hospital. Fully tenured in 1985 as Professor of Medical Physics in the Faculty of Medicine, Dr. Podgorsak also became director of the academic-based McGill University Medical Physics Unit in 1991, and continues to serve both the hospitals and the university in all of these positions.

While space and time do not permit a full examination of all achievements and successes that have brought the AAPM to consider Dr. Podgorsak as this year's Coolidge Award recipient, a brief examination of his 81 page (and growing) CV is of interest. In terms of "*significant impact on the scientific practice of medical physics*", it is clear that Dr. Podgorsak's practical approach to clinical radiation oncology physics is an example of translational research which has had a true impact on the life and well being of many patients. The author of 140 peer reviewed publications, 18 invited book chapters, 66 conference proceedings, 185 published abstracts, and some 340 invited and proffered presentations, Dr. Podgorsak has been involved in basic medical physics research, such as solid-state dosimetry and linac target design, as well as the development of numerous innovative cancer therapy techniques, such as photon and electron total-body irradiation, mono-isocentric breast irradiation, high dose-rate brachytherapy, electron arc therapy, and dynamic stereotactic radiosurgery. Showing no signs of slowing down, two recent publications both in 2005 are textbooks that are likely to be reference material for medical physicists for years to come. These are the 657 page "Radiation Oncology Physics: A Handbook for Teachers and Students" published by the IAEA and edited by Dr. Podgorsak, as well as a 450 page textbook based on thirty years of lectures given to graduate students at McGill entitled " Radiation Physics for Medical Physicists" authored by Dr. Podgorsak and published by Springer from Heidelberg.

The AAPM's second criterion demands a "*significant influence on the professional development of the careers of other medical physicists*". As a professor in the McGill Medical Physics Unit since its establishment by Dr. Montague Cohen and its director since 1991, Dr. Podgorsak has been a graduate course teacher and mentor to the 140 M.Sc. and 19 Ph.D. graduates. In 1991 he was instrumental in changing the M.Sc. degree to the combination didactic and thesis based program resulting in McGill's M.Sc. and Ph.D. medical physics programs being the first in Canada to attain the CAMPEP accreditation in 1993. Of these graduates he was a direct supervisor of 30 M.Sc. and 7 Ph. D. students, and has helped many others with the arduous task of thesis writing. His continuing interests in advancing the careers of young medical physicists prompted him to develop a Medical Physics Residency program in radiation oncology physics, and his ability to once again join the academic and clinical worlds ensured the CAMPEP accreditation for the McGill Residency program in 2000, another Canadian first. National and international research and educational grants secured in part or in whole by Dr. Podgorsak since 1980 have also been important funding tools in the early careers of many medical physicists who themselves have already gone on to distinction in our profession. Dr. Podgorsak also teaches radiological technologists as well as medical residents, and participates in IAEA development and assessment of medical physics teaching programs around the world.

Having known Ervin since 1982, I would say that his teaching legacy is the one he is most proud of, however, the third requirement of the AAPM to be hurdled is the *"demonstration of leadership in national and/or international organizations, with specific emphasis on AAPM activities"*. Again space does not do this summary justice, however, Dr. Podgorsak has served the AAPM as an Associate Editor of Medical Physics, Board Member, on various Task Groups and councils, and as Local Arrangements Chair for the 2002 AAPM summer meeting held

(Continued on page 95)

2006 AAPM Coolidge Award Winner... (Continued from page 94)
in Montreal. In a similar manner, he has served the Canadian College of Physicists in Medicine (President: 1985 – 1987), the Canadian Organization of Medical Physicists, the American College of Medical Physics and the International Stereotactic Radiological Society. National and international granting agencies often call upon his expertise for grant reviews and his additional knowledge and ability to function in 5 languages has also made him a sought after member of several committees of the International Atomic Energy Agency in Vienna.

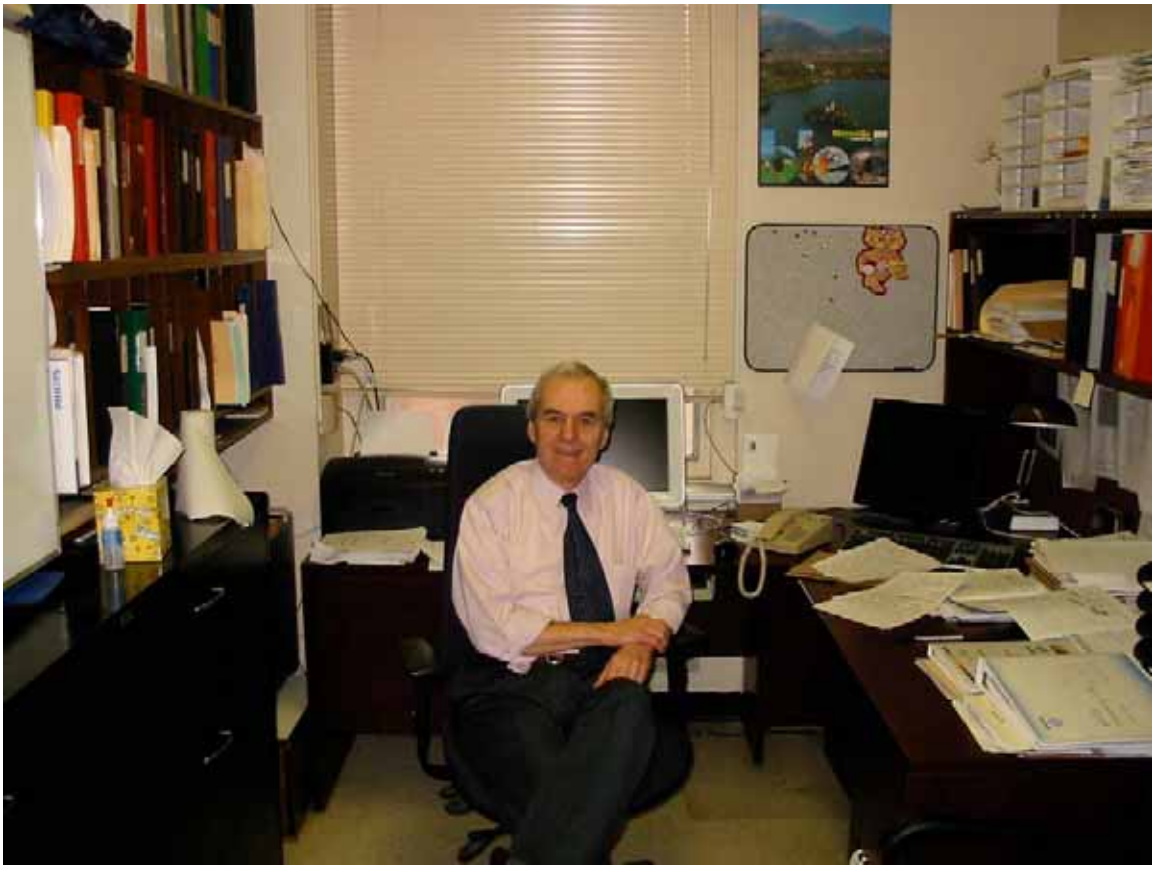
These accomplishments on their own are enough to explain the merit of the Coolidge award, however, what is even more remarkable is that these many achievements have been obtained in the environment of a bureaucratically overmanaged and sparingly funded health care system. Somehow, Dr. Podgorsak has managed to obtain the tools and means for himself and his colleagues to succeed to some degree. His motto as he goes to pound on yet another desk hidden somewhere out of sight in the health care or university complex is 'you have to bleed to get what you need". He continues to contribute to the needs of the university and hospital with his expertise when requested, although as often happens, his vast experience and knowledge is more and more in demand nationally and internationally, while often remaining unrecognized or even refused at the local level. The expression that "an expert is someone that comes from more than 100 km away" was sadly never more true than now as he is awarded the Coolidge Award for leadership and excellence in medical physics.

Nonetheless, I believe it is the opinion of his family, friends and colleagues that is most important to him, and he has had successes on all three levels. His wife Mariana has been a constant support, and has probably spent enough time in medical physics departments to qualify as an honorary physicist. In true biblical fashion he has 'given " his first son Dr. Matthew Podgorsak to the medical physics profession, and I am sure that they, along with their other son Gregor and Ervin's mother, would agree that his life in many ways has been dedicated to serving the medical physics community.

The picture says it all. The door is always open and Dr. Podgorsak is always willing to help when he can. From first year students and staff to colleagues from around the world, Dr. Podgorsak understands that the problems people encounter are important to them, and his attention to people and their immediate situations are what has made him respected both as an administrator and as a scientist.

The Canadian medical physics community, representing both friends and colleagues, would like to extend congratulations and best wishes to Dr. Podgorsak as the third Canadian recipient of the AAPM's most prestigious prize; the Coolidge Award. His link to the other two Canadian recipients, his post-doctoral supervisor Dr. Harold Johns (1976 winner) and his clinical physics "boss" Dr. Jack Cunningham (1988 winner) is no coincidence and speaks to the continuing tradition of excellence in medical physics he has always strived to achieve, both for the profession and the well being of patients with whom he always feels a great empathy. To quote one of the many reference letters solicited in support of this award " Ervin is the dean of our profession in Canada but his influence extends to the United States and the rest of the world. He is a symbol of integrity, truth and excellence both inside and outside our field. Bestowing the Coolidge Award upon Dr. Ervin Podgorsak honors all of us".

Congratulations Ervin!



New COMP Executive Members

**Submitted by Clément Arsenault,
Régie régionale de la santé Beauséjour,
Moncton, NB**

Chair-Elect:
Jason W. Schella, M. Sc., FCCPM
Nova Scotia Cancer Centre

Jason did his undergraduate and M.Sc. at St. Mary's University in Halifax, then completed a residency at the Nova Scotia Cancer Centre. He has continued as a physicist at NSCC and has been the lead physicist for many major projects at the Centre. Since 2004, he has been Interim Head of the Medical Physics Department at the NSCC. He has been a COMP member since 1993 and is looking forward to working with the Canadian medical physics community.

Councillor for Communications:
Michelle Cottreau, M.Sc.
Queen Elizabeth Hospital

Michelle did her undergraduate studies at the University of Prince Edward Island and her M.Sc. at McMaster University in Hamilton. She worked as a diagnostic physicist at Hamilton Health Sciences from 1991 to 2003. Since 2003, she has been employed by the Queen Elizabeth Hospital in Charlottetown. She has been an active member of the COMP Communications Committee since 2001 and has accepted to chair this committee as Councillor for Communications.

Trésorière (Janvier 2006):
Maryse Mondat, M.Sc., FCCPM
Hôpital Maisonneuve-Rosemont

Maryse a fait ses études sous-graduées à l'Université de Sherbrooke, Sherbrooke et sa maîtrise à l'Université McGill, Montréal. Elle a travaillé en tant que physicienne médicale dans le département de radio-oncologie à l'Hôpital de Chicoutimi, Chicoutimi de 1989 à 1991. Ensuite elle a travaillé au Centre universitaire de l'Université de Montréal, Montréal de 1991 à 2000. Depuis 2000, elle est employée au service de radiophysique du département de radio-oncologie de l'Hôpital Maisonneuve-Rosemont, Montréal. Elle est membre de l'OCPM depuis 1990. Elle a été membre du comité des affaires professionnelles de l'OCPM de 1993 à 1995. Depuis janvier 2006, elle est trésorière de l'OCPM.

Executive Director's Message…. (Continued from page 90)
characterized by the collegiality among the members and the commitment of the many volunteers. I look forward to working with the COMP Executive and the CCPM Board within the spirit of this culture as the organization moves forward.

Wishing you a safe and happy summer!

Canadian Organization of Medical Physicists
Organisation Canadienne des Physiciens Médicaux

Annual General Meeting
MINUTES

Location:	Bessborough Hotel, Saskatoon, SK.	Date:	2 June 2006
Chair:	P. O'Brien,	Secretary:	W. Ansbacher
Present:	52 members (quorum is 42)		

Meeting called to order by P.O'Brien at 4:30pm

1. **Adoption of the Agenda** **Adopted**

2. **Minutes of previous AGM,** Hamilton, 2005
   Motion to adopt: C.Arsenault **Carried**

3. **Report of the Chair** (P.O'Brien)
   a) The Management (Executive Director, N.Barrett) has accomplished a great deal this year. A professional relationship with corporate members (which have increased from 17-26) has been established and the COMP Archives project has been started. She has provided a great deal of help organizing annual meetings, instituting the Gold medal and public lecture, and provided support for a number of committees and the Treasurer. Volunteer management has improved, and the Policies and Procedures Manual is being overhauled.

      Unfortunately, the financial status of COMP is not good. Reserves will be depleted for the first time in 2006. GST will have to be charged on dues and other COMP costs, and there are new Budget pressures in 2007, including the "Beanstream" account for online payments, administrative costs for Management services such as the Salary survey, increased Newsletter, Insurance and Auditing costs. As a result, there is a proposal to increase membership fees by 50% in 2007, and re-evaluate six months after that.

   b) S. Pistorius outlined the proposal for a Strategic Planning Exercise to identify where COMP should be in 5 years as the changes that are taking place are not driven by a clear strategy. Time is needed to review objectives, identify roles, analyze strengths and weaknesses and review organizational structure and operations. This is to be achieved through an extra day session at the mid-year meeting (winter 2006/07) involving a facilitator, the Executive and possibly Student, Academic and Corporate members. A draft report would be placed on the website for members' feedback, with a final report at the Oct 2007 AGM for ratification. The estimated cost of $11k ($5k for facilitation, $6k for teleconferences, additional mid-year meeting costs) has been included in the proposed Budget as a one-time charge against the Reserves

   Moved: (S.Pistorius, 2nd J.Schella) **That the membership support the Strategic Planning Exercise**.
   Discussion: As to whether the execrcise would be a waste of time; this was addressed by N. Barrett, who indicated an RFP (request for proposal) would be developed. **Carried**

   c) A proposal for a Trainee Travel Award was outlined by S.Pistorius. This would support trainees in developing countries coming to Canada for the COMP meeting and visits to 2 other centres, and in alternate years, senior residents from Canada going to developing countries for local experience. An award of $5k ($3k from COMP and $2k Corporate support) would cover, flights, health insurance, meals and accommodation. A mechanism for applying for the award was described. The program would be advertised through IAEA and would be trialled for 2 years. S.Pistorius called for members willing to assist, act as hosts and/or serve on the award committee to contact him.

      J.Schreiner expressed support for the concept and suggested contributions could be solicited at membership renewal time.

4. **CCPM President's Report** (R. Drost)

   a) 3 new Fellows and 18 new Members were welcomed into the College

   b) Improvements have been made to the web site, separating COMP and CCPM material. W.Beckham has been involved in a Planning Education initiative with CAMRT.

   c) New members on the board are: Dave Wilkins – Vice President, and Robert Corns – Deputy Examiner.

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2006 AGM Minutes… (Continued from page 97)

d) The H.E.Johns Award this year goes to F. DeBlois of McGill, who will travel to the first European workshop on Monte Carlo Treatment Planning in Ghent, and visit Clinique Universitaires St-Luc in Brussells. Another plea was also made for contributions to the Fund for this award. It was pointed out that as little as $10 from every member would be more than enough to continue funding the award.

e) B Clark and P. Dunscombe provide CCPM representation on the CMA and CAMPEP. Growth in the number of Canadian CAMPEP-accredited Graduate (1) and Residency (3) programs was noted for this year, for a total of 4 in each category.

5. Secretary's Report (W. Ansbacher)

a) At the time of the AGM the membership was as follows:

Category	June 2006	June 2005	Change
Full	**413 ± 16**	376	37
Associate	**9 ± 2**	5	4
Student	**99 ± 1**	81	18
Retired	**6**	5	1
Emeritus	**8**	9	-1
Corporate	**26**	19	7
Totals	**561**	495	66+

The confusion over some figures arises from the existence of two incompatible databases, which the Executive Director is sorting out.

a) PAC requested a Bylaw change to Article III (previously published in InterActions), to replace "unprofessional activities" with: "activities that contradict the intent of the Code of Ethics as published by COMP".

Moved (W.Ansbacher, 2nd C.Arsenault) **That the above change be adopted**
Amendment (M.Paterson, 2nd D.Drost)
To remove the words "**the intent of"** from the above change. **Carried** (8 against)

The first paragraph of Article III: DISCIPLINE will now read: "The assembly at the General Meeting, on recommendation of the Executive, may expel, suspend, or reprimand a member engaged in activities that contradict the Code of Ethics as published by COMP." **Carried** (2 against)

6. Communications Committee Report (D. Mason)

a) Membership changes: Two new members are needed, with technical skills. D. Mason's term as Chair has ended, and Boyd McCurdy's term as editor will finish after the July issue of InterACTIONS. However, both will remain on the committee. Parminder Basran will assume the Editor role.

b) CCPM and COMP content have been separated on the website, and CCPM can now be accessed at **ccpm.ca.** CCPM has provided French translations for parts of their website; the committee has just started to post these. Dues payment and conference registration were updated. It was noted that much of the website material is out of date. The committee relies on the Membership to keep it informed of necessary changes.

c) D. Mason thanked Ivan Yeung and Julian Badragan for their sterling work on the Committee. Boyd McCurdy was thanked for his excellent service in his role as InterACTIONS Editor.

7. Professional Affairs Committee Report (P. McGee)

a) Terms of Reference are changing to include Provincial representatives (A.Baillie-BC and L.Beaudoin-QC).

b) Documents are being developed for Evidence of Competency to allow comparison between COMP and foreign organizations. These will be private and non-circulating. A question about whether CCPM was the body that should deal with this was answered to the effect that CCPM had asked PAC to.

c) The Scopes of Practice for R.T. have been completed; Diagnostic Imaging & Nuclear Medicine are under development and will be available for review next year.

d) The Professional Survey is now in electronic form and will go out in 2-3 weeks. The issue of privacy was raised but it was pointed out the information is already publicly-accessible on Government websites.

e) The disciplinary Bylaw Change (see 5b) had been requested to ensure consistency between CCPM and COMP in relation to the code of Ethics.

f) PAC responded to the request to become involved in certifying Physics Assistants by inviting them to first join COMP as Associate Members, then refine and clarify what they wanted to achieve. It was emphasized that COMP is *not* becoming

(Continued on page 99)

involved in certification.

8. Report from Radiation Safety & Technical Standards Advisory Committee (P.Dunscombe)

a) RSTSAC has been joined by Frank Tourneur, and Jacqueline Gallett has resigned from the Committee

b) In terms of radiation safety training, the group is in the process of reviewing available presentations for possible adoption by COMP on a national basis.

c) Six CAPCA standards have been approved by COMP. The review process for the five draft standards will commence shortly. Draft standards exist for Data Management Systems and Treatment Planning Systems, which will appear on the COMP website within a month. A plea was made for feedback as it is clear the CNSC will hold us to the final documents.

d) P.Dunscombe wants to stand down as Chair of RSTSAC but will continue to lead the CAPCA initiative.

9. Treasurer's Report (M. Mondat)

a) The 2005 accounts were audited by Randal Miller and again found to be in good order. However he is unable to audit this year's accounts; a Certified Auditor will be required in future. This was accepted by Exec.

b) The statements for 2005 were presented, together with an amended 2006 projection (based on actual revenues and expenditures to date). The proposed 2007 Budget was presented and highlighted additional expenses relating to Beanstream, the Exec Directorship, Insurance, the Salary survey and the future Auditor. The figures presented *include* the proposed 50% fee increase

Moved: (P.O'Brien, 2nd D.Mason) **That the 2007 Budget be accepted**
Discussion: J. Battista asked for clarification that the 50% increase would still put the budget in deficit. (true). Comment was made that that dues have not changed in 18 years. The Salary survey was questioned, but the membership had indicated they wanted one. **Carried**

c) It was noted that GST will be applied next year on dues and advertisements, and that the revenue and expenses should be recognized in the year they are earned or incurred. This will be applied in the 2006 statements.

10. Nominations Committee (C.Arsenault)

Two positions are vacant. A Call for Nominations went out in the Oct. and Jan. issues of InterACTIONS and was posed on the website in September.

a) Councillor for Communications. One nomination: Michelle Cottreau, M.Sc (McMaster, 1994) from Charlottetown. An active Member of Communications Committee since 2001. Nominations were called from the floor, and none were received.
Michelle Cottreau declared elected

b) Chair-Elect: Jason Schella, M.Sc., FCCPM M.Sc. (Dalhousie, 1992), interim head of Medical Physics in Halifax, was the only nomination. Nominations were called from the floor, and none were received
Jason Schella declared elected

11. Future Conferences: (P.O'Brien**)**

2007: Toronto (9-14 October at the Sheraton Centre Hotel) will be a joint meeting with CARO. Joint sessions will include the YIS, Poster sessions, French Connection, the CCPM symposium and Social events
2008: Quebec City, organized by L.Beaulieu, at a university site to be determined
2009: No formal submission for hosting the conference has been received
2010: Ottawa
2011: the AAPM is shortly to make a final decision on a joint meeting in Vancouver.

12. Other business:

a) P.O'Brien thanked the Exec members, and director N.Barrett in particular, for their work throughout the year.

b) S.Pistorius was introduced as the new Chair of COMP. As his first duty, he awarded plaques to outgoing Executive members B.McCurdy (Editor of Interactions), D.Mason (Councillor for Communications) and C.Arsenault (Past Chair)

Motion to adjourn: (D.Rogers) **Carried**
Meeting adjourned at 5:55 pm.

2005 HE Johns Travel Award Report: 9th International Electronic Portal Imaging Workshop (EPI2k6)

subtitle: How to spend an HE Johns Travel Award in a single airfare

April 8-12, Melbourne, Australia

G'day mates! The 9th International Electronic Portal Imaging Workshop (www.epi2k6.org.au) was held from April 8 - 12, 2006, in beautiful Melbourne, Australia. As you may have deduced from the conference name, this meeting focuses exclusively on portal imaging research, development, and clinical applications (more on content later). It is held once every two years, and combines a mixture of Medical Physicists, with some Radiation Therapists and a few Radiation Oncologists thrown in for good measure. The meeting is reasonably small enough (typically 120-150) that participants may be involved in many informal discussions. Due to the remote (yes, even to someone living in Winnipeg) location, the number of physicists attending this meeting was slightly lower-than-average (77), but that was made up for by a healthy turnout of Australian Radiation Therapists, placing the total number of attendees at about 260. Canada was well represented with 11 Canadian's there, several of whom were giving either invited talks and/or refresher courses (including David Jaffray, Kurt Luchka, Peter Munro, Jean Pouliot, and Elizabeth White).

The conference organizers did an excellent job of setting up 'hands on' workshops for the participants. These workshops were run on the Saturday and Sunday preceding the scientific sessions. In fact, there were six separate workshops covering various clinical aspects of EPI useage (please refer to the website for all the workshop titles). Space was very limited, and the spots filled up quickly. I was lucky enough to get into two workshops (maximum of two per attendee) including "In-room CT verification and image guided radiation therapy" and "The role of on-board imaging in monitoring patient motion during adaptive radiotherapy". These 3-hour workshops consisted of informal presentations of techniques, implementation tips, and discussion of the benefits and/or realistic problems of the topics at hand. Commenting on only the workshops I attended, there was a wealth of experience available to be tapped, and they proved very valuable and interesting.

Coinciding with the scientific session days (Monday through Wednesday), refresher courses were offered during the early hours of the morning. Despite the relatively small conference size, the courses were offered in pairs (in parallel sessions!). These provided good reviews of several pertinent topics. Unfortunately, one could only attend half of them!

Monday April 10th included invited presentations by Marcel Van Herk ("Image Guided Radiotherapy") and Elizabeth White ("The impact of image guidance on radiation therapy practice"). April 11th saw invited presentations by Paul Keall ("The combination of respiratory gating and electronic portal imaging for thoracic radiotherapy") and Jean Pouliot ("Dose guided radiation therapy strategies"). On the final day, the invited talks included Emile van Lin ("Portal Imaging: Not only a toy for physicists.... Clinical implementation and relevance") and David Jaffray ("Image-guided radiation therapy - initial experience and plans for broad clinical deployment"). These invited talks were of excellent quality, and forecast a very interesting and exciting future for portal imaging. One definitely got the feeling that 2D portal imaging was in danger of being surpassed (perhaps 'supplemented' would be better word here, but definitely not 'replaced'!) by 3D volumetric imaging of the patient on the treatment couch prior to treatment. 'Adaptive radiotherapy' and 'image-guided radiotherapy' were the unofficial buzz words of the conference.

Some interesting quotes from a few of the speakers included:

> "...interpretation of volumetric imaging is much faster and accurate, making planar imaging obselete." - *Marcel Van Herk.* [of course, Marcel recanted within seconds, mentioning that portal imaging will always be a useful record of the actual delivered treatment!]
>
> "...blind gating is potentially dangerous." [referring to radiotherapy delivery combined with lung gating based on external references, without supplementary imaging of internal anatomy] - *Ross Berbeco*
>
> "Application of CTV-PTV margin recipes, based on portal imaging data of actual target position variations appears to be necessary for IMRT and dose-escalation applications." - *Emile van Lin*
>
> "A blurring of previously well-defined roles is occurring and the individual disciplines need to be flexible to the upcoming transition." - *Elizabeth White*

In addition to the high quality of scientific program, there were a few interesting social events. The "ice-breaker" was set at the Melbourne Aquarium. A glass tunnel under the main aquarium waters lead to a central viewing area, where the main conference organizer, Kay Hatherly, arrived via a scuba diving suit in the water (yes, she was microphoned too). This was especially impressive since there were a large number of sharks and manta rays in the tank too! Later in the week, the conference banquet was held in the beautiful atrium of the Victorian National Art Gallery (oddly named!), where a live band and some fine Australian wines entertained the attendees. At the banquet, I was thrilled when my Ph.D. graduate student, Krista Chytyk, was presented with a student travel award generously provided by the EPI conference organizers!

My employer, CancerCare Manitoba, very kindly funded additional one-day clinical visits to the Newcastle-Mater Hospital (Newcastle, New South Wales) and the Peter MacCallum Cancer Centre (Melbourne, Victoria). I spent a full day at each clinic with a Medical Physicist to show me around

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2005 HE Johns Travel Award Report… (Continued from page 100)

and trade questions with (Peter Greer in Newcastle and David Taylor in Melbourne -- both having spent time previously in clinics on Canada's west coast). These visits offered a fascinating glimpse inside the Medical Physics field in Australia. Issues that we perhaps feel are unique here in Canada (e.g. government under-funding for clinical equipment as well as research, waiting lists, adoption of newer technologies in the clinic, training issues, professional accreditation, salaries, etc.), seem to be paralleled to some degree in Australia. Without boring you with the details, my opinion at this time is that our Canadian Medical Physics community on the whole is doing quite well. The grass is not necessarily greener on the other side of the fence (Pacific Ocean fence that is). Mind you, the weather *was* very nice and you're never very far from a beach.....

I would like to sincerely thank the Canadian College of Physicists in Medicine for the HE Johns Travel Award ($2000 CDN). Without this award, my travel to such a distant location would have been nearly impossible, and the unique professional experiences that this opportunity provided would have been lost. I would strongly encourage all recent members of the CCPM to apply for this award. I would also encourage all members of CCPM and COMP to be as supportive as possible (in the financial sense). The HE Johns Travel Award fund has not received $2000 of annual donations for several years running now, and the fund is slowly slipping away. You can help save this worthwhile Award by contributing a small amount on your annual membership dues renewal. Our entire community benefits from this award, and it is up to all of us to ensure it is here for our future.

Rebecca Amner (hidden at far left) giving the “In room CT verification and IGRT” workshop.

Tomas Kron (left) and Peter Munro (centre) giving “The role of on-board imaging in monitoring patient motion during adaptive radiotherapy” workshop.

Delegates enjoying the conference banquet in the main atrium at the Victorian National Art Gallery.

A few Canadians ‘down under’, including (left to right): Rasika Rajapakshe, Richard Lee, Boyd McCurdy, and Kurt Luchka.

X-ray computed tomography imaging of polymer gel dosimeters

By M Hilts[1], A Jirasek[2], C Duzenli[3]
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1.0 INTRODUCTION

During the past 10 years there has been considerable and continually increasing interest in the use of polymer gel materials for 3D dose verification in radiation therapy particularly given the ever-increasing complexity of modern radiation therapy treatment techniques (1-3). The basic fundamental principle of polymer gel dosimeters is the radiation-induced polymerization of monomer (and often co-monomer) species suspended in a gelatin matrix. Radiation induced polymerization creates long-chained polymers that are spatially retained in the gelatin matrix, allowing for the extraction of 3D dose information from the polymer gel dosimeters. The first widely known polymer gel dosimetry system used MRI to read-out BANG® gel, now trademarked by MGS Research Inc. BANG® gel, subsequently PAG gel, consists of a gelatin matrix infused with co-monomers acrylamide and bis-acrylamide that polymerize to form cross-linked polyacrylamide.

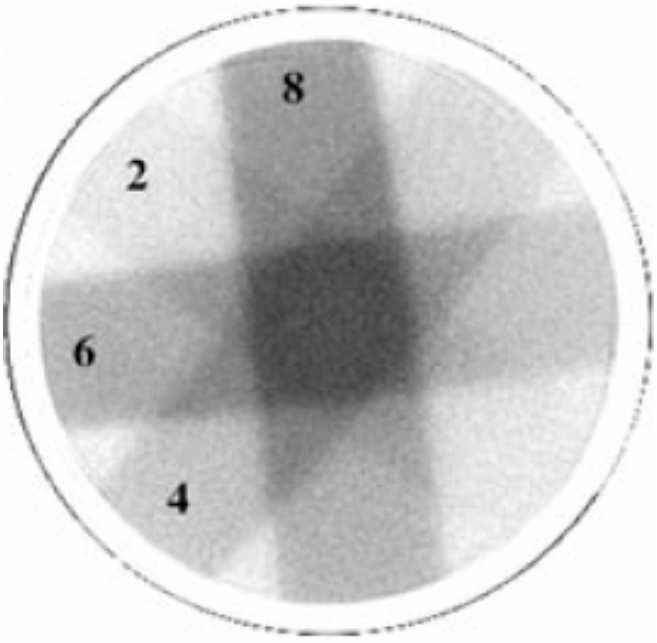

Figure 1: A CT image of a polymer gel irradiated with four intersecting photon beams. The dose dependent contrast showing varied beam weights (maximum Gy as shown) is evident (8).

In recent years our understanding of PAG gel systems has increased substantially. Furthermore, many other gel compositions (~14) are being investigated as potential materials for 3D gel dosimetry. These include a new class of polymer gel dosimeters termed "normoxic" polymer gels, which contain oxygen scavengers and can be manufactured on a bench-top in the presence of oxygen. Furthermore, several imaging modalities are being investigated for use in read-out of these gel dosimeters. These include MRI, x-ray CT, optical CT (OCT), ultrasound and Raman imaging (4-9). This wealth of research is rapidly expanding and it is an exciting time in this research field. This article aims to illuminate one branch of polymer gel dosimetry research, x-ray CT polymer gel dosimetry, by summarizing the current state of knowledge in this area.

The use of x-ray CT for the imaging of irradiated polymer gels was introduced at the 1st international conference on radiotherapy gel dosimetry, DOSGEL99, and in a subsequent paper (8,10). These works showed dose dependent contrast in CT images of irradiated PAG gel and established the potential of CT as an alternative to MRI for gel read-out. Figure 1 is an example of CT contrast in a PAG gel irradiated with four 6 MV photon beams (8).

CT read-out is an exciting option for gel dosimetry due to the accessibility of CT in clinical radiation therapy in the form of CT simulators used for treatment planning. This practical attraction combined with the dosimetric promise shown by the initial feasibility studies has led to increased research into x-ray CT gel dosimetry over the last few years. The following summarizes recent work in the field, including: fundamental gel properties that allow for CT read-out, characteristics of gel CT dose response, considerations for CT imaging polymer gel, image filtering solutions for post-processing image noise reduction and applications.

2.0 FUNDAMENTALS: X-RAY ATTENUATION AND DENSITY CHANGE IN IRRADIATED POLYMER GEL

As is exemplified by the CT image contrast in figure 1, the CT number (N_{CT}) of polymer gel changes with radiation dose. Several theoretical and experimental studies have investigated the fundamental gel properties that result in this change in CT number (ΔN_{CT}) with dose (11-13). N_{CT} is a measure of the linear attenuation coefficient of the sample (μ) relative to that of water. The only parameter affecting μ (and therefore N_{CT}) that will change with radiation dose is polymer gel density. Independent measurements of the change in PAG gel density (figure 2) and attenuation coefficient with dose have confirmed this theory: i.e. the contrast observed in CT images of irradiated PAG gel results from a density change occurring in the gel (13). This has been corroborated for a second gel formulation, a

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methacrylic acid based normoxic gel termed MAGIC gel (12). Recent work has examined the effects of gel composition on the density change occurring in PAG gel (11). Both the total fraction of monomer in the gel (%T) and the relative fraction of the cross-linking and linear co-monomers (%C) have been shown to affect the resulting density change. A model has been developed which suggests that it is the effect of gel composition on the structure of the formed polymer which in turn affects the density change that is observed. In short, gel composition is a critical factor in determining response of gel density to dose.

Since no mass is added to polymer gels through irradiation, the observed change in gel density with irradiation must be due to either a change in the distribution of mass within the system or to a change in gel volume. In the second case, a volumetric decrease would be required to account for the increase in gel density with dose. This raises concerns about potential loss of spatial integrity in polymer gels due to radiation induced shrinkage. This was addressed in a work presented at DOSGEL2001 (14) which showed that four times the currently observed PAG gel density change is allowable before spatial distortions in a typical gel may exceed 2 mm.

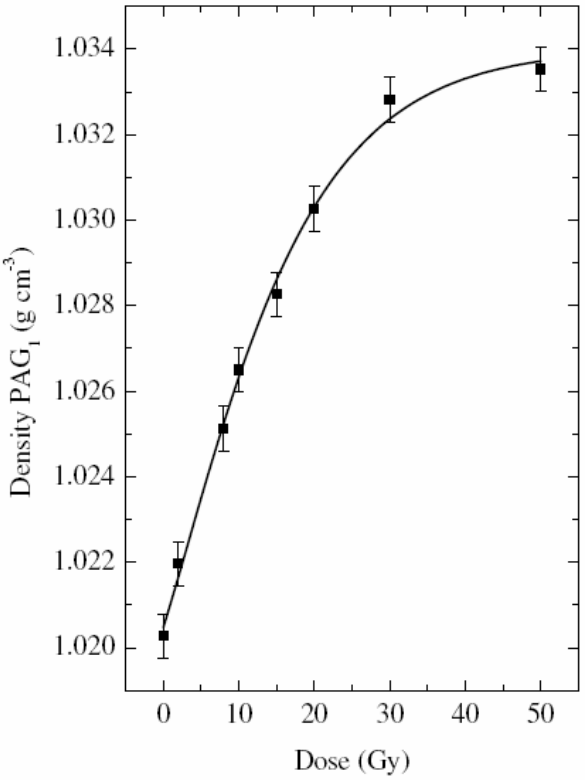

Figure 2: The density of PAG gel as a function of absorbed radiation dose. This density change is why contrast is observed in CT images of irradiated polymer gel dosimeters (13).

3.0 GEL CT DOSE RESPONSE CHARACTERISTICS

The first polymer gel CT dose response was presented at DOSGEL99 for a standard PAG gel formulation (10). Since this time, the CT dose response characteristics of PAG gel have been extensively studied (8,11,15). Information is now available on critical dose response characteristics such as sensitivity and dose range, reproducibility and temperature dependence. Recent investigations have also begun exploring the CT dose response of normoxic gels (16-18). At this time knowledge of normoxic gel CT dose response is limited largely to dose response sensitivity and dose range and further work is required to investigate other important characteristics of these systems.

3.1 *Sensitivity and dose range*

The CT dose response for a standard PAG gel (composition: 6% T, 50%C) is mono-exponential with a saturation dose of ~ 25Gy. The sensitivity of the "quasi-linear" low dose region is ~ 0.8 HGy^{-1} (8,11,15). Sensitivity varies greatly with PAG gel composition, as shown in figure 3. Notably, a gel composed solely of crosslinker (bis-acrylamide) shows a linear dose response for doses from 0 $\rightarrow$ 100 Gy! Normoxic gel studies thus far all exhibit mono-exponential CT dose responses, however, in general, the responses are less sensitive than for PAG gel (16-18). Furthermore, the concentration of the oxygen scavenger has been found to have a profound affect on the sensitivity of CT read-out for a normoxic version of PAG gel (termed nPAG or PAGAT) (18).

3.2 Dose resolution

Dose resolution, or minimum detectable difference in dose, is one of the most important features of a dosimeter. In CT gel dosimetry, the most significant factors affecting dose resolution are CT dose response sensitivity (as described above) and the level of noise in the CT images (19). Since image noise varies greatly with CT imaging technique, phantom size etc. (see below) (20), it is difficult to compare quoted CT dose resolutions between different gel dosimeters. Based on data

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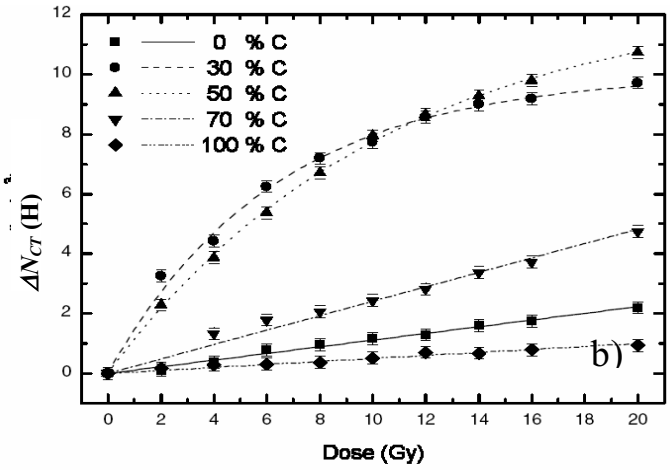

Figure 3: The CT dose response of PAG gel varies dramatically with gel composition. Shown here is the variation with relative fraction of the two co-monomers (%C) (11).

X-Ray CT Imaging of Polymer Gels... (Continued from page 103)
available in the literature, one can ascertain that current CT gel dosimeters (both PAG and normoxic systems) have dose resolutions (95% confidence) of ~ 1 Gy (17). However, for gels with linear dose responses (or regions of dose response), it makes sense to speak of *relative dose resolution* since these gels can be used for relative dosimetry without requiring a calibrated dose response. Table 1 shows a typical range of relative dose resolutions achievable with PAG CT gel dosimetry (21). Relative dose resolution depends on maximum linear dose range in addition to sensitivity and image noise. Values quoted in table 1 are for one standard deviation (67%) and 95 % confidence levels. Note the compromise between voxel size and dose resolution, due to increased noise with both decreased slice thickness and pixel dimensions. These values compare favourably to MRI and OCT gel dosimetry (21), as shown in table 2.

3.3 Reproducibility

By all accounts the reproducibility of PAG gel CT dose response is excellent. Figure 4 shows dose responses measured for 4 independent batches of PAG gel over a period of several weeks (21). This excellent reproducibility is not arduous to achieve and represents an advantage of CT read-out over other methods such as MRI. The CT dose response reproducibility of a normoxic version of PAG gel has also recently been tested and was shown to be comparable to traditional PAG (18). The reproducibility of the CT dose response for other normoxic gels has not yet been studied.

3.4 Temperature dependence

The sensitivity of the CT dose response of PAG gel varies by 0.5% per °C at time of imaging (8). This slight temperature dependence will not affect relative dose measurements, since dose response linearity is preserved. However, for actual dose measurements large variations in temperature (e.g. refrigerated vs. room temperature) could cause errors in dose measurements. The effect of gel temperature on the CT dose response of other types of polymer gel has not yet been investigated.

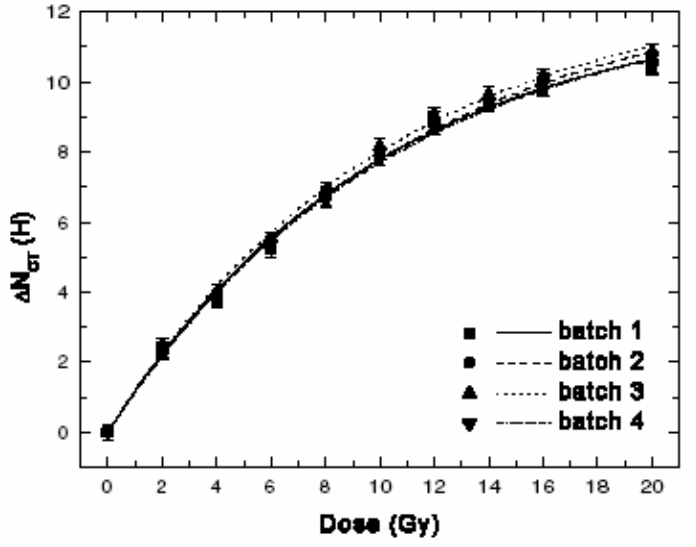

Figure 4: CT dose responses measured for four independent batches of PAG gel. Reproducibility is excellent: all dose responses agree well within error (21).

3.5 Temporal stability

The CT dose response of PAG gel is very stable over a time frame of several days (8). Recent work has shown one normoxic gel (normoxic PAG gel) to also exhibit a highly stable CT dose response (18). The stability of the CT dose responses for other gel formulations has not yet been investigated.

4.0 CT IMAGING CONSIDERATIONS

Early work highlighted the effect of CT imaging technique on CT gel dosimetry (8). Since this time, much work has been done to determine specific considerations and optimization strategies for CT imaging gel dosimeters (14,17,20,21).

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Voxel dimensions			
x, y (mm)	z (mm)	$D_{\Delta,\%}$ (%)	$D^{95\%}_{\Delta,\%}$ (%)
0.5	1.0	11.5	31.7
1.0	1.0	9.2	25.4
0.5	3.0	6.8	18.8
1.0	3.0	5.4	15.0
1.5	3.0	4.2	11.5
2.0	3.0	3.0	8.2
2.5	3.0	2.2	6.2
2.5	5.0	1.8	5.1
5.0	5.0	1.0	2.8
5.0	10.0	0.7	1.9

Table 1: Relative dose resolution for CT PAG gel dosimetry for a range of voxel sizes (21).

Modality	Voxel size (mm)	Approx Dose resol. (%)[a]	Time (min/slice)	Reference
MRI	1 × 1 × 2	4.5%	–	Oldham *et al* (2001)
	1 × 1 × 5	4%[e,f]	25	Gustavsson *et al* (2004)
	–	3.6%[e,g]	34	De Deene and Baldock (2002)
OCT	1 × 1 × 1[b]	1.1%	20	Oldham *et al* (2001)
	2 × 2 × 2[c]	4%	5–6	Xu *et al* (2003)
	1.4 × 1.4 × 1[d]	3%	12	Islam *et al* (2003)
X-ray CT	1 × 1 × 3	5%	<1	Hilts *etal* (2005)

[a] Based on relative dosimetry. Sixty-seven per cent confidence interval quoted unless otherwise noted.
[b] Thickness based on laser spot size (~0.75 mm).
[c] Variable down to 0.3 mm.
[d] 0.8 mm possible (laser spot size).
[e] 95% confidence.
[f] Varies with dose, minimum quoted.
[g] Theoretical result.

Table 2: Comparison of relative dose resolutions for MRI, OCT and x-ray CT gel dosimetry techniques (21).

4.1 Effect of imaging technique on dose response

The technique used for CT imaging does not affect polymer gel CT dose response. The only imaging factor with this potential, tube voltage (since attenuation, μ, depends on beam energy), has been shown to have no effect for both PAG gel and the normoxic MAGIC gel (17,22).

4.2 Effect of imaging technique on image noise

CT imaging technique can have a dramatic effect on image noise and therefore the achievable dose resolution of CT polymer gel systems. Several works have discussed the relationships between the imaging parameters used to CT image polymer gel and the resulting image noise (14,17,20,21). Reconstruction algorithm has the largest single effect on image noise. An algorithm designed to enhance edges or detail can produce images ~5 times noisier than standard algorithms (21). Table 3 lists the quantitative effects on image noise of selectable CT imaging parameters (kV, mA, slice scan time, and slice thickness), number of image averages (NAX) and pixel dimension as achieved via binning pixels post-imaging (21). In summary, increasing kV, mAs, slice thickness, NAX and pixel dimension (post-processing) all serve to reduce image noise. Of these parameters, kV has the largest effect on image noise. Field of view (FOV) is also selectable on many CT scanners and increasing FOV is found to increase image noise (17). On a practical note, since CT imaging parameters affect image noise independently of one another, the noise level resulting from any imaging protocol can be deduced from a single noise measurement (given known imaging parameters) through application of the relationships in table 3. This provides a method to tune imaging protocols to achieve specific dose resolutions required for given applications.

4.3 Protocols for gel imaging

In selecting a protocol for the CT imaging of polymer gel there is a compromise between achieving low noise (high CT scanning technique, large slice thickness and pixel size) and achieving both high spatial resolution (thin slices and small pixel size) and short imaging times (fewer slices imaged, low scan technique and therefore reduced load on the x-ray tube). As a result, the "optimum" imaging protocol will depend on the requirements of a particular application. A typical gel imaging protocol would be: 140 kV, 200 mAs, 3 mm slice thickness, 16 NAX. To remove image artefacts a background subtraction procedure, which involves subtracting a background image of water or an unirradiated gel from the images of the gel of interest, is recommended. This procedure was introduced with the feasibility of CT for gel read-out (8) and has been used with continued success by all groups performing CT gel dosimetry. Figure 5 demonstrates the excellent image uniformity achieved utilizing background subtraction (21).

Factor affecting image noise (symbol)	Relationship to image noise ($\sigma_{N_{CT}}$)
Phantom diameter (d)	$\sigma_{N_{CT}} \propto e^{d}$
Tube voltage (kV)	$\sigma_{N_{CT}} \propto (\mathrm{kV})^{-1.4}$
Tube current (mA)	$\sigma_{N_{CT}} \propto (\mathrm{mA})^{-0.5}$
Slice scan time (s)	$\sigma_{N_{CT}} \propto \mathrm{s}^{-0.5}$
Number of averages (NAX)	$\sigma_{N_{CT}} \propto (\mathrm{NAX})^{-0.5}$
Pixel dimension (w)	$\sigma_{N_{CT}} \propto e^{w}$ ($or\ w^{-0.65}$)
Slice thickness (h)	$\sigma_{N_{CT}} \propto h^{-0.5}$

Table 3: Factors affecting CT image noise (21).

4.4 Phantom design

Phantom size is an important consideration when CT imaging gel dosimeters since it affects image noise (see table 2). Phantoms should be designed as small as possible for a given application (21). In addition, high density containers (e.g. glass) should be avoided as they can produce extreme artefacts that are difficult to remove by background subtraction. The same is true for high density rubber stoppers which should be removed during imaging (21).

5.0 IMAGE FILTERING FOR NOISE REDUCTION RESULTS

As described above, careful consideration of CT imaging technique can go a long way towards reducing image noise. However to achieve dose resolutions required for clinical applications, further noise reduction may prove necessary. Digital image filtering is being explored for this purpose. The use of spatial, "kernel" based image filters were investigated in a recent work (23) through the application of a variety of filters to a stereotactic radiosurgery (SRS) dose distribution. Based on the ability to 1) reduce image noise and 2) preserve the spatial distribution of dose, two filters, the adaptive mean and SUSAN filters, performed strongly, providing ~ 50% reduction in image noise while producing very minimal distortions in spatial dose information. Ongoing work indicates that the adaptive mean filter outperforms the Susan filter for a range of dose distributions and this is the recommended "kernel" type filtering technique.

Recently a novel filtering technique based on a 2D two-point maximum entropy regularization method (TPMEM) has been developed that shows great promise for noise reduction in CT

(Continued on page 106)

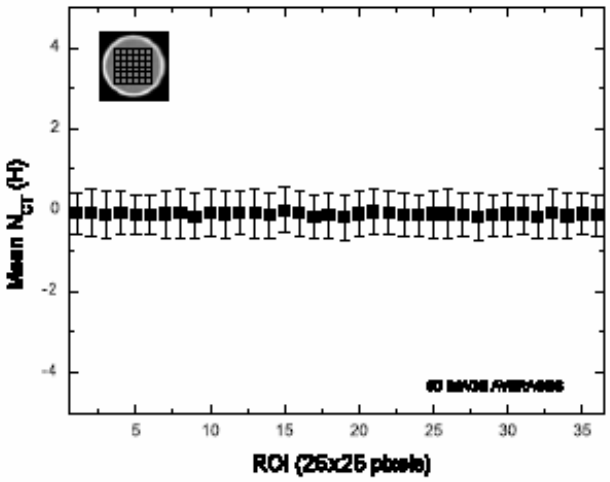

Figure 5: Evidence that background subtraction produces highly uniform CT images. After performing a background subtraction, mean pixel values were measured in 36 distinct regions of a water filled phantom (21).

X-Ray CT Imaging of Polymer Gels... (Continued from page 105)

gel dosimetry (24). This method offers advantages over kernel based filtering approaches due to an enhanced flexibility to tune the filter to balance the complementary requirements of noise reduction and maintenance of image fidelity. Results for both synthetic dose distribution patterns and an actual irradiated polymer gel (SRS dose distribution) are excellent. SNR enhancement factors > 15 are possible with minimal distortion of original image detail (24). Figure 6 shows TPMEM filtering of the SRS dose distribution. Examples are shown for TPMEM optimized for both moderate and high noise reduction.

6.0 APPLICATIONS

Research in CT polymer gel dosimetry has thus far focused largely on the fundamental development of the technique, and, as such, studies illustrating applications are rather scarce. To illustrate the clinical potential of CT gel dosimetry, the initial feasibility work was followed up with an application to 3D dose measurement of a stereotactic radiosurgery (SRS) treatment (25). This work showed that the technique could correctly localize the high dose region delivered by SRS, but lacked sufficient sensitivity to accurately define low doses. In another application, the high spatial resolution capabilities of the technique were highlighted by measuring the PDD from a clinical proton beam (26).

7.0 SUMMARY: ADVANTAGES AND LIMITATIONS

There are several advantages of using x-ray CT to read-out polymer gel dosimeters. Many of these are practical advantages which will benefit clinical implementation. Perhaps the most significant is the widespread accessibility of CT scanners to

(Continued on page 110)

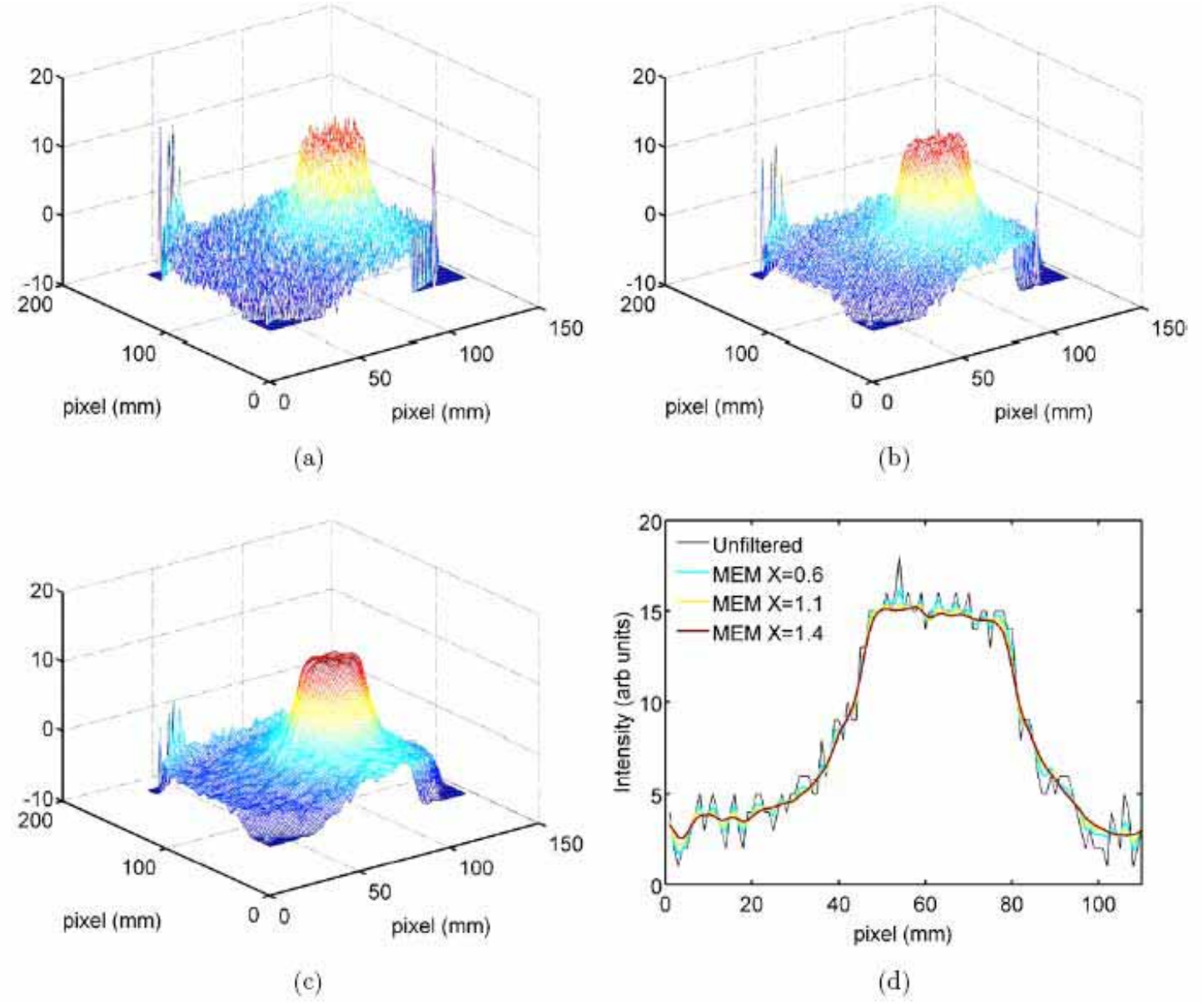

Figure 6: Application of TPMEM filtering to an SRS irradiated gel imaged with x-ray CT. (a) Unfiltered CT image, (b) TPMEM filtered image with low filtering power, (c) TPMEM filtered image with high filtering power, (d) profiles through the high dose region for a range of filtering powers (low, X = 0.6 to high, X=1.4) (24).

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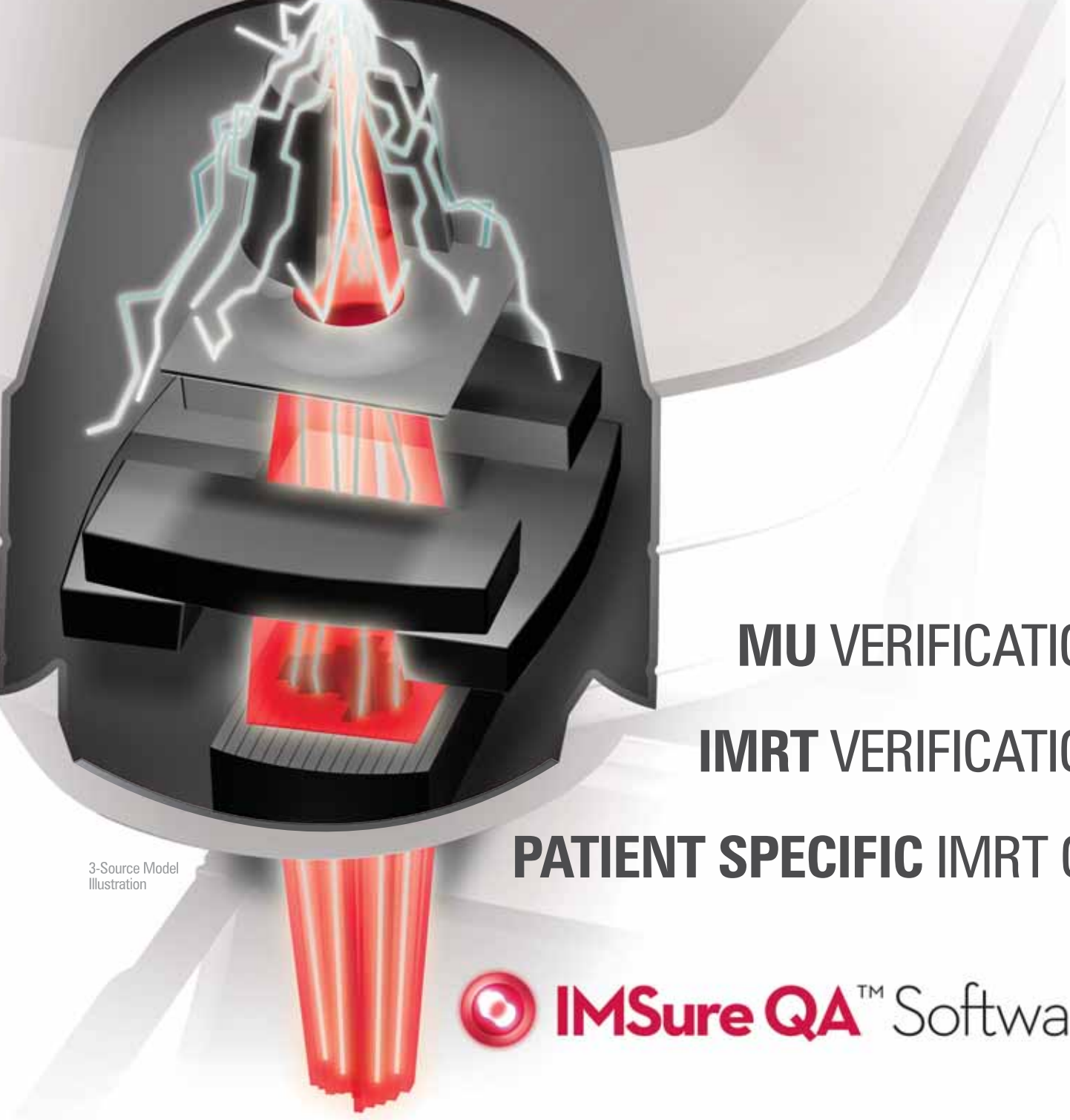

3-Source Model
Illustration

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IMSure QA™ Software

IMSure QA is the *only* software that utilizes the patented Stanford University 3-Source Model algorithm to accurately calculate dose by including the two main sources of scattered radiation, the flattening filter and the main collimators. Single source algorithms, like the modified Clarkson algorithm, do not take into account this scattered radiation that can contribute up to 12% of dose at isocenter.[1] In *less than a minute*, IMSure QA delivers an accurate secondary check of your patient treatment plan.

1. T. C. Zhu, B. E. Bjarngard, Y. Xiao, and C. J. Yang, "Modeling the output ratio in air for megavoltage photon beams," Med. Phys. 28, 1352–1358 ~2001.


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X-Ray CT Imaging of Polymer Gels... (Continued from page 106)
radiation therapy departments in the form of CT simulators for treatment planning. In addition, CT scanners are fast and easy to operate and both physicists and radiation therapists in cancer hospitals will frequently already be experienced operators thereby reducing the learning curve associated with implementation. In terms of dosimeter quality, CT read-out can offer images with small voxel size, a robust and stable dose response with low dependence on imaging temperature and a low level of image artefacts which can typically be removed by background subtraction. Combined with the new easy to manufacture normoxic gel formulations, CT gel dosimetry promises to be a practical solution for routine clinical implementation of 3D gel dosimetry.

There is however one significant disadvantage of current CT gel dosimetry systems: low dose response sensitivity. Recent work is showing this to be particularly true for some normoxic gel formulations. However, when used for relative dosimetry a large linear dose range observed in some of these gels may compensate for the low dose response sensitivity (17). An additional potential disadvantage of CT gel dosimetry is the delivery of radiation to gels during the read-out process. However, recent work, to be presented at the upcoming international meeting of radiation therapy gel dosimetry (DOSGEL2006), indicates that gels will be unaffected by typical gel CT imaging protocols.

In conclusion, x-ray CT gel dosimetry is poised to be an exciting option for clinical implementation of 3D gel dosimetry. Future work is required to improve the sensitivity of gel formulations to CT read-out and to develop applications. Finally, those interested in learning more about gel dosimetry are encouraged to attend the upcoming conference, DOSGEL2006, which is being held in Canada this year: hosted in Sherbrooke Que., August 7 – 11, 2006. See www.dosgel.org for more information.

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(Continued on page 111)

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COMP Treasurer's Report
June 2006 AGM, Saskatoon, SK

Submitted by Maryse Mondat
Hôpital Maisonneuve-Rosemont
Montréal, QC
The 2005 highlights and statements were done by Horacio Patrocinio, McGill University Health Centre, Montréal, QC

The following is a summary of on the 2005 financial year statements:

1. As of December 31, 2005 the net worth of the organisation stood at $198,093. $37,048 was in our current account and the value of our GIC investments (reserve) stood at $127,379. There were $3,962 in outstanding liabilities. In addition, $22,118 remained in the 2005 ASM LAC account and $15,510 stood in our new online payment account (BeanStream). This latter amount includes a rolling reserve and transfer amounts pending.
2. The higher net worth (compared to 150,447$ at the start of the year) is largely the result of (1) a delayed 2005 dues campaign which brought money in mostly during this year, (2) the transfer of profits from the 2004 scientific meeting, which did not occur until 2005.
3. Dues for the 2005 campaign brought in $52,623 in total (Corporate $10,296; Full $40,107, Student $1,780, Other $460) of which $51,774 were received during 2005. At year's end, $13,650 of 2006 dues had already been received.
4. Expenses for web site and newsletter are on the rise. Committee expenses were not claimed during the year.
5. Office expenses include 2,967.72$ in expenses associated with the CCPM exam process but paid erroneously by COMP.
6. Subscriptions for the 2005 campaign incurred a small profit (revenues $12,295 and expenses of $11,817) due fluctuations in the Cad-US exchange rate. The 2,592$ surplus at year's end was the result of the earlier start in the 2006 dues campaign.
7. The expenses for the executive director in 2005 consist not only of costs associated with the new executive director but also interview costs for another candidate as well as a $14,083 expense for the services of Mr. M. Henry, former executive director of COMP until April 2004 for the period covering September 2003 to April 2004. The new executive director's team has also assumed the secretariat duties.
8. The COMP portion of the profit from the 2004 scientific meeting (jointly with CAP) totaled $27,362 including the 20% LAC return. The net profit after the LAC return was 21,890.
9. The 2005 scientific meeting was a great success, yielding total profits of $52,394 largely exceeding the $10,319 budgeted amount. These profits were the result of larger than expected vendor contributions. The net profit (total profit – 20% LAC return) of $41,914 has been deferred to 2006 to aid in balancing the budget for that year.
10. As the total assets of COMP exceeded $200,000 at year's end, the organization will be obliged to report revenues to the Canadian Customs and Revenue Agency starting in 2006, and for all subsequent years.

The following are some of the highlights of the 2007 budget:

1. The 2007 budget includes an increase in advertising revenues due to an increase in fees. It also includes an increase of 50% of the membership dues.
2. The 2007 budget includes new expenses: certified auditor services ($1500), the salary survey ($1600), $3000 for the new resident exchange program . Also the fees for the management services are expected to rise since the workload will increase.
3. The 2007 budget does not include $11,000 that will be taken from the reserve in 2006 or 2007 for a strategic planning session. This is a one time expense.
4. The fee for the salary survey is spread over two years since it will be done every two years.

(Continued on next page)

COMP Treasurer's Report... (Continued from previous page)

Balance Sheet (December 31, 2005):

Account	Description	January 1, 2005	December 31, 2005	Notes
ASSETS				
Bank Account	Main account at TD-Canada Trust	$41 972.50	$37 048.13	
GIC Accounts	3 GIC investments	$124 052.70	$127 378.79	
BeanStream Account	Beanstrean Holding Account	N/A	$15 509.93	
2005 ASM LAC Account	Hamilton 2005 LAC Account	N/A	$22 117.75	
TOTAL ASSETS		*$166 025.20*	*$202 054.60*	
LIABILITIES				
Credit card balance	COMP treasurer	($773.56)	$0.00	
Credit card balance	Secretariat	$25.71	($0.05)	1
Cheques not cleared	Main Account / 2005 LAC Account	$16 326.29	$3 962.04	2
TOTAL LIABILITIES		*$15 578.44*	*$3 961.99*	
Assets less Liabilities		**$150 446.76**	**$198 092.61**	

Notes 1. Leap year credit on cancelled secretariat credit card
2. 3812.04$ not cleared on main account and 150.00$ not cleared on LAC 2005 account

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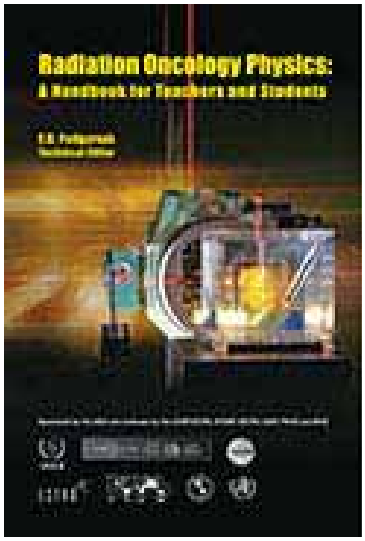
Book Review:

Radiation Oncology Physics: A Handbook for Teachers and Students



E.B. Podgorsak, Technical Editor. Published by the International Atomic Energy Agency (IAEA), Vienna, Austria, 2005 (www-naweb.iaea.org/NA/)
657 pages, 137 figures
Price: $65.00 Euros
ISBN 92-0-107304-6

Submitted by Peter Dunscombe
Tom Baker Cancer Centre
Calgary, AB

This superb book is exactly what it claims to be – a Handbook for Teachers and Students of Radiation Oncology Physics. It packs into its 657 pages pretty much all the physics, dosimetry, radiation biology and radiation safety that a practising radiation oncology physicist needs to know. Published in 2005 it is very up to date even including a section on Image Guided Radiotherapy. Whether or not a graduate program in Radiation Oncology Physics could be based solely on this book, which for cost reasons would suit students, is a question for this reviewer. Many of the concepts particularly in dosimetry are complex and can be confusing. The slower pace and lower information density of traditional texts such as Johns and Cunningham might be easier for the majority of students. I suspect the answer to the question depends on the ability of the teacher to fully elucidate these complex concepts. Certainly if a student was so impoverished that he or she could only afford one text book, which may be the case in some parts of the world, this would be the one I would recommend.

The Technical Editor has been involved with the CCPM in many capacities over many years. This may or may not be the reason for this book being ideal for physicists preparing for the written part of the membership exam. If you knew everything in this handbook you would have to try very hard to fail the exam.

I need say no more. The book is available from the IAEA for 65 Euro; however, you can check it out yourself on the IAEA (http://www.naweb.iaea.org/nahu/dmrp/publication.asp) and McGill (http://www.medphys.mcgill.ca/academic/IAEAsyllabus.pdf) websites and even download it from these sites.

I certainly plan to make copies of this excellent text available to our graduate students.

Income Statement (2005):

January 1, 2005 through December 31, 2005

Description	Amount (CAD$)
OPERATIONS ACCOUNT	
Bank Account Balance at Jan 1, 2005	$41 972.50
Credit card balances at Jan 01, 2005	$747.85
Operating balance at Jan 1, 2005	**$42 720.35**
REVENUES	
Advertising	$19 343.95
Deferred revenue (2004 AGM)	$27 362.38
Donations	$1 101.95
Dues	$65 448.77
Interest	$27.45
Other	$30.69
Scientific meeting	$121 754.55
Subscriptions	$14 409.74
GROSS REVENUE	$249 479.48
Revenue deferred to 2006	$41 914.94
NET REVENUE	**$207 564.54**
EXPENSES	
Awards/Support	$1 000.00
Bank Charges	$408.13
Committee Expenses	$0.00
COMP/CCPM Representation	$688.06
Corporate Fees	$30.00
Discretionary Fund	$1 727.19
Directory	$2 044.11
Donations	$526.95
Executive Director	$57 958.77
Insurance	$950.00
Mid Year Meeting	$13 476.87
Other	$5 531.83
Newsletter	$18 238.01
Office	$6 007.42
Plaques	$103.50
Scientific meeting	$74 241.24
Secretariat	$6 000.00
Society Memberships	$2 122.84
Subscriptions	$11 817.23
Web Site	$15 451.82
NET EXPENSES	**$218 323.97**
REVENUE less EXPENSES	**($10 759.43)**
Transfer from Reserve	$800.00
Operating balance at December 31, 2005	**$32 760.92**
Credit card balances at December 31, 2005	($0.05)
BeanStream Account at Dec 31, 2005	($15 509.93)
LAC 2005 Account at Dec 31, 2005	($22 117.75)
Revenue deferred to 2006	$41 914.94
Bank Account Balance at Dec 31, 2005	**$37 048.13**
RESERVE ACCOUNT (GICs)	
RESERVE (Start of Year)	**$124 052.70**
Investment Growth	$4 126.09
Transfer to/from Operations	($800.00)
RESERVE BALANCE (End of Year)	**$127 378.79**

Budget :

Description	2006 Budget	2006 Projected	2007 Budget
GENERAL INCOME			
Advertising	$25 000	$25 000	
Advertising-Directory			$5 000
Advertising-Newsletter			$20 000
Advertising-Web site			$5 000
Deferred revenue (AGM)	$30 000	$41 915	$20 000
Dues	$48 000	$52 000	$72 000
Short-Term Interest	$100	$100	$100
TOTAL	**$103 100**	**$119 015**	**$122 100**
OPERATING EXPENSES			
Awards/Support	($3 000)	($2 000)	($4 000)
Bank Charges	($100)	($100)	($100)
Communications			
Oper. exp.	($1 500)	$0	($1 000)
Directory	($5 000)	($5 000)	($5 000)
Newsletter	($14 000)	($20 000)	($20 000)
Web site + Beanstream	($12 000)	($16 000)	($16 000)
COMP/CCPM Representation	($8 000)	($5 000)	($5 000)
Corporate Fees	($30)	($30)	($30)
Discretionary Fund	($1 000)	($1 000)	($1 000)
Executive/Board meetings	($12 000)	($14 000)	($12 000)
Management services	($45 000)	($45 000)	($70 000)
Insurance	($1 000)	($5 000)	($5 000)
Office	($2 500)	($3 000)	($3 000)
PAC	($2 000)	($500)	($1 600)
Plaques	($200)	($200)	($200)
Public relations	($1 500)	($1 000)	($1 500)
RSTSAC	($3 000)	$0	($1 000)
Society Memberships	($2 000)	($2 000)	($2 000)
Salary survey		($1 600)	($1 600)
Certified auditor			($1 500)
Others			
TOTAL EXPENSES	**($113 830)**	**($121 430)**	**($151 530)**
NET (INCOME - EXPENSES)	***($10 730)***	***($2 415)***	***($29 430)***

Estimated asset at the end of the year :

Description	2006 Projected	2007 Budget
GENERAL INCOME		
Advertising	$25 000	$30 000
AGM :	$15 000*	$20 000
Dues	$52 000	$72 000
Short-Term Interest	$100	$100
TOTAL	**$92 100**	**$122 100**
TOTAL EXPENSES	**($121 430)**	**($151 530)**
NET (INCOME - EXPENSES)	***($29 330)***	***($29 430)***
Transfer to/from reserve	**$29 330**	**$29 430**
ASSET (first of the year)	**$202 055**	**$175 725**
Investment Interest	$3 000	$3 000
Strategic planning $11 000	?	?
Transfer to/from Operations	($29 330)	($29 430)
ASSET (end of the year)	**$175 725**	**$149 295**
GIC	$127 379	$130 000
Operating revenue	$48 346	$19 295

*$27 000 of the AGM revenue was received in 2005 and is already included in the $202 055 asset (first of the year).

Across Canada

BC Cancer Agency
CARE & RESEARCH
An agency of the Provincial Health Services Authority

Cancer Centre for the Southern Interior
Kelowna, BC
Submitted by Alistair Baillie

The Cancer Centre in Kelowna provides cancer care services to patients in a catchment area in the interior of BC, stretching from Hope to the Alberta border, and from the US border to Quesnel. Currently we provide about 1900 courses of radiation therapy per year. The physics team has been remarkably stable since the centre was opened in 1998, and currently includes 5 physicists – myself, Cynthia Araujo, Darcy Mason, Rasika Rajapakshe and Larry Watts. However that stability will be shaken soon with the departure of Darcy Mason, and the arrival of a replacement, together with an additional physicist later in the year.

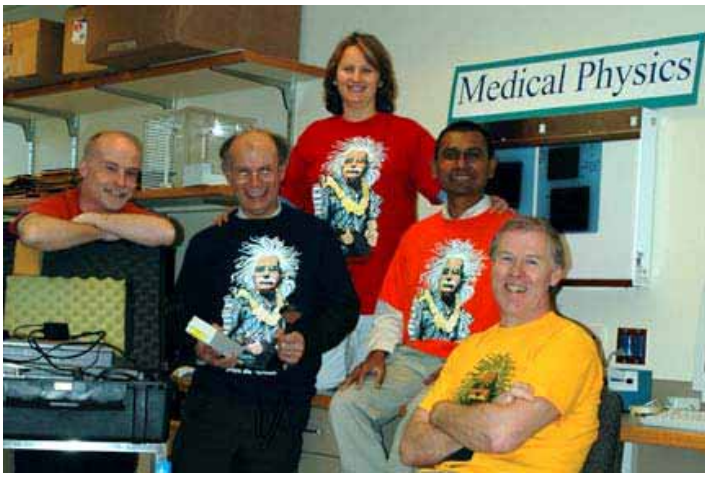
Our treatment equipment consists of 4 Elekta linacs, Pantak orthovoltage unit, and a Selectron LDR. Treatment planning is based on a Philips PQ-5000 scanner and a Philips SLS-38 simulator, and is carried out on Varian Eclipse workstations. The Eclipse stations are integrated with SomaVision and Varis systems across the entire BCCA system, in an installation with over 30 Eclipse, 160 SomaVision, and 24 Varis-connected linacs.

As most of our equipment is now 8 to 9 years old (where did these years go!?), we expect to experience a comprehensive replacement program over the next few years. The first element of that program should occur next year with an expansion including an additional accelerator, and the creation of a brachytherapy suite with an HDR unit. At that time we expect to start permanent seed prostate implants, building on present activity in that area, where we currently perform planning and post-implant assessment, with the OR procedure carried out in Vancouver.

Our main project work currently is focused on the implementation of IMRT which we expect to start this summer. For a long time we have been unable to progress in this area because of limitations of our equipment, principally the problem of not having a treatment planning system capable of preparing plans for delivery on the Elekta linacs. However Eclipse Helios now has that capability, and we have also been able to acquire the Elekta PrecisePlan system, so we are suddenly in the position of having to decide between two methodologies for planning IMRT. We have also been able to upgrade our Elekta SL20s so that IMRT treatments are not only possible, but are now practical. Once we have a clinical IMRT program in place, we hope to continue research on the relative merits of the two treatment planning systems, which are based on quite different philosophies of plan preparation.

We are involved in provincial activities with our BCCA colleagues, such as teaching at UBC and UVic for medical physics students. We usually are able to hire coop and summer students who help with research and development projects. Over recent years these students have worked on IMRT related topics, development of image management tools, and Monte-Carlo modeling of our linacs.

Kelowna is a great place to live and we try to have fun at work – here we are enjoying our Einstein-day celebration.



BCCA-SI physicists (left to right): Darcy Mason, Larry Watts, Cynthia Araujo, Rasika Rajapakshe, Alistair Baillie

Northwestern Ontario Regional Cancer Care

Thunder Bay Regional Health Science Centre—Regional Cancer Centre
Thunder Bay, ON
Submitted by Peter McGhee

As many who read InterACTIONS are likely aware, the last few years have been tumultuous times for cancer care in Ontario and this has certainly been particularly true in Thunder Bay. At the same time that Cancer Care Ontario (CCO), the provincial cancer agency, was undergoing significant restructuring, the Thunder Bay Regional Hospital, the host hospital for the Northwestern Ontario Regional Cancer Centre (NWORCC), was engaging a substantial transition of its own. In fact, the Thunder Bay Regional Hospital no longer exists, and has been replaced by the Thunder Bay Regional Health Sciences Centre (TBRHSC). This transition coincided with the migration from two separate hospital campuses to a brand new facility on a

(Continued on page 115)

ACROSS CANADA… (Continued from page 114)
single campus located adjacent to Lakehead University. To add another dimension to the excitement, the first new medical school to be established in Canada in over thirty years, the Northern Ontario School of Medicine (NOSM), was founded. The school, which accepted its first students in September of last year, operates both at Lakehead University in Thunder Bay and at Laurentian University in Sudbury. The presence of the new medical school has clearly had influence over the new academic and research focus of the TBRHSC. It was during this storm of activity that the NWORCC ceased to exist as it was integrated into the operations of the Health Sciences Centre to become TBRHSC – Regional Cancer Care (RCC).

The transition to the new site was a particularly busy time for Medical Physics in Thunder Bay. Despite support with the design and construction of the new radiation treatment facility offered by Cancer Care Ontario, and Dr. Donald Dawson in particular, the local group was in essence responsible for bringing a new cancer treatment centre on line while fulfilling the routine clinical functions required to maintain operations at the existing facility. (In retrospect I think that all involved would agree that such a once in a lifetime experience is probably once too often.) In a massive exercise executed over the course of only a few days, the hospital vacated its two old campuses and moved all of its operations to the new 650,000-sq. ft., 375-bed facility. For our part, the ultimate measure of success was when we completed radiation treatment operations at the old site on a Friday and resumed operations at the new site the following Monday. The treatment schedule for all patients was fully restored by the Tuesday. While it was many more months before things settled back down to what could be considered a routine, the smooth transition for the patients under treatment was truly a highlight.

So, what were some of the benefits that can be realized by taking on such a challenge? Well, for one, we did end up with a very nice new working environment (stated, of course, with complete lack of bias). Another positive outcome was a lot of new equipment. The workhorses for the centre are two Siemens Oncor Impression Plus linear accelerators (6, 15MV; 6, 9, 12, 15, 18, 21MeV) installed prior to the opening of the new facility. A Theratron 1000 cobalt teletherapy unit was installed in a third room. (A tip of the hat to the Windsor Regional Cancer Centre, from which we obtained the unit.) Although the Varian GammaMed plus high dose rate brachytherapy (HDRB) unit was relocated from the old site, a fully shielded OR has been incorporated into the design of the new hospital providing a completely sterile environment that was not previously available for conducting brachytherapy procedures. A Philips MX 8000 10-slice CT scanner was installed and we are currently migrating to the Focal virtual simulation system from CMS. Clinical implementation of the XiO treatment planning system, also from CMS, is imminent. One of the exciting features of the CMS product is the broadband capability. Although the catchment for RCC is small in terms of population (on the order of a quarter of a million), the centre caters to a region the size of France. As our Radiation Oncologists can spend appreciable amounts of time in the region, having broadband access is anticipated to offer relatively unique operational advantages.

In terms of staffing, we currently have four qualified medical physicists on staff. In addition to myself, our complement includes Mr. Bans Arjune, Dr. Patrick Rapley, and Dr. Michael Tassotto. I believe it is important to note that all three of these individuals are products of our local Medical Physics Residency Program. The resident position is currently vacant (although we are in the process of recruiting). Support staff consists of two Physics Associates, a Treatment Planner, and a Machinist. In addition, for several years now we have managed to attract funding to support Dr. Sylvie Landry, a physicist dedicated to research.

Research and academic activity have been a priority in Thunder Bay for many years. While a major thrust of Medical Physics research is related to Sylvie's work with live cell imaging, there are variety of other projects that are currently underway with interests that extend from the clinically practical to the more esoteric. On the clinical side, as we move towards implementation of IMRT, there is interest in polymer gel dosimetry and adaptation of a radiation beam scanning device to address new challenges in the Quality Assurance. Pushing the envelope a bit farther are projects such as *in vivo* radiation dosimetry using magnetic resonance spectroscopy (MRS) and investigations into the use of DNA damage as a measure of radiation effects. In the past few years, there have been three graduate students supervised to successful completion of their Masters of Science in Physics. This number includes one of our Physics Associates, Isaac Tavares, who just graduated from Laurentian University with his thesis entitled *"Monte Carlo Simulation to Characterize Dose Enhancements Proximal to Dental Implants During Radiotherapy"*. The Medical Physicists also teach undergraduate and graduate courses through Lakehead University.

Although the smallest of the cancer centres in Ontario, TBRHSC-RCC has a long and rich history of delivering care to the people of northwestern Ontario, starting with the installation of an Eldorado unit in 1958. This history has benefited greatly from our being a part of the Canadian community of Medical Physicists. So, if you happen to be traveling across Canada by road, you really do not have much excuse to not drop by, grab a coffee and a Persian (to be explained when you get here), and perhaps get dragged into solving some of the world's problems…medical physics or otherwise.

Front (L-R): Bans Arjune, Diane Brett, Sylvie Landry
Back: Patrick Rapley, Peter McGhee, Robert Knutson, Michael Tassotto, Isaac Tavares; Absent: Lawrence DeGagne

Canadian College of Physicists in Medicine
Chief Examiner's Report 2006

Submitted By Katharina Sixel, Durham Regional Cancer Centre, Oshawa, ON

Membership Examination 2005

Written exam:

23 Candidates
22 in Radiation Oncology
1 in Diagnostic Radiology

18 Passed written exam

Oral Exam:

21 Candidates for oral exam
20 in Radiation Oncology (17 new candidates, 3 repeat, 1 deferred candidate from 2005)
1 in Diagnostic Radiology

18 Passed oral exam

18 successful candidates:
Wamied Abdel Raman, Jennifer Barker, Stephen Breen, Marco Carlone, Young-Bin Cho, Svetlana Denissova, Michael Gillard, Robin Kelly, Renee Larouche, Donia MacDonald, Michelle Nielsen, Balazs Nyiri, Sam Shen, Wendy Smith, Stephen Steciw, Mauro Tambasco, Ivan Yeung, Conrad Yuen.

All successful candidates were elected Members of the Canadian College of Physicists in Medicine at the Annual General Meeting on June 1, 2006 in Saskatoon.

Fellowship Examination 2006

4 Candidates
4 in Radiation Oncology

3 candidates passed

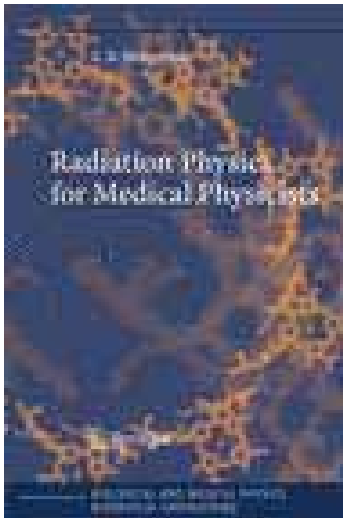
3 successful candidates:
William Ansbacher, Jason Schella, Eugene Wong

The successful candidate were elected Fellow of the Canadian College of Physicists in Medicine at the Annual General Meeting on June 1, 2006 in Saskatoon.

Congratulations to all new Members and Fellows. Welcome to the College!

On behalf of the CCPM, I thank all Invigilators and the Examination Committees of written and oral Membership exams, and of the Fellowship Exams. The exam process would be impossible without the participation our members.

Book Review:
Radiation Physics for Medical Physicists



By E.B. Podgorsak
Published by Springer; Berlin, Heidelberg, New York 2006 (springeronline.com)
437 pages, 115 illustrations, 37 tables
Price: $139.00 USD
ISBN-10 3-540-25041-7

Submitted by Jake Van Dyk
London Regional Cancer Program
London, ON

Radiation Physics for Medical Physicists is based on a set of lectures that Ervin Podgorsak has evolved over the last 25 years of teaching radiation physics to M.Sc./Ph.D. graduate students at McGill University. While there are various texts on medical physics, they generally make a quick transition from elementary basic physics to the details of the medical physics subspecialty. As indicated in the Preface, "The intent of this book is to provide the missing link between elementary physics and the physics of the subspecialties."

The book consists of eight chapters of various fundamental topics associated with radiation physics. Compared to other radiation physics texts, each chapter contains significant scientific depth including detailed mathematical descriptions of the physics involved. To summarize briefly: Chapter 1 is an introduction to modern physics; chapter 2 describes the Rutherford-Bohr atomic model; chapter 3 is on the production of x-rays; chapter 4 describes two-particle collisions; chapter 5 discusses interactions of charged particles with matter; chapter 6 is on neutron interactions with matter; chapter 7 describes the interactions of photons with matter; and chapter 8 is on radioactivity.

Using a unique approach, the introduction of each chapter contains relevant historical photographs which are described in some detail. In addition to the usual introduction of basic concepts, chapter 1 contains a detailed description of modern physics including the Einstein's special theory of relativity, Schrödinger's time-independent wave equation, the Heisenberg uncertainty principle and Maxwell's electromagnetic equations. Chapter 2 extends these concepts by giving a detailed description of the experiments that led to the Rutherford concept of the atom and the kinematics of Rutherford scattering. This then moves into the Bohr model of the atom along with its experimental verification as well as a description of the Schrödinger equation for the ground state of hydrogen. The chapter on x-ray production is perhaps somewhat more conventional in approach although the sections on synchrotron and Čerenkov radiation have more depth then what would be found in more conventional medical physics texts. The two particle collision discussion is flavored with a significant number of mathematical equations. This is followed by a good description of the interactions of particles (charged, neutrons and photons) with matter.

On the whole, this is a well-written and well-organized text and is certainly consistent with the quality of scientific work produced by Dr. Podgorsak. One can always think of things that could be added, improved or changed but in this case these would be minimal.

The six appendices also provide useful added information. Appendix 1 contains brief and interesting historical biographies of many of the scientists whose contributions have been discussed in the book. This is of special interest for those who like a historical context. The fifth appendix describes website sources for electronic databases with radiation-related information. This also is very useful since many of us spend time searching the internet for information that is only used under special circumstances or for research purposes.

So how does this book compare to the classical texts that are used for radiation physics training such as the books by Attix, Johns and Cunningham, and Khan? In a nutshell: this book has more depth but less breadth than any of the other three texts. Thus, for the theory of radiation physics at a fundamental level, Podgorsak's book provides a wonderful resource presented in a well organized and easy to learn manner, in a way not found in any other text. For broader studies as related to the specific subdisciplines of medical physics, one will have to resort to other texts. Ervin Podgorsak is to be congratulated for adding to the basic radiation physics learning tools for medical physics graduate students and researchers.

The waffle, the chocolate, the beer, the seafood, the culture and the people– a most memorable visit to Ghent, Belgium

Submitted by Eugene Wong
London Regional Cancer Program
London, ON

I had the opportunity to attend Wim Duthoy's (MD) PhD public defense at Ghent University Hospital in Belgium on Feb 11th, 2006. His promoter (supervisor) was Prof Dr. Wilfried de Neve, head of Radiation Oncology. It was an eighteen-hour plane, train and tram journey from London, Canada to Ghent, and as you will find out, it was well worth the effort.

The very day I arrived, Wim and I talked for three hours, and by the end of it, I felt that I had known him forever, and he and Prof de Neve had accomplished more than what was collected in Wim's thesis. In particular, it is Ghent's experience on the use of IMRT for re-treatment of head and neck cancer. I need only to summarize their body of work in two words: simply marvelous.

The following day was the day of Wim's defense and I started off with a meeting with Prof de Neve. Once again, within the short period of an hour, we touched on vast areas, including his philosophies on optimization of cancer treatments as well as his vision of transporting IMAT (or for that matter, any advanced technologies) to other cancer centres.

I then met with Valerie (MD) whose project involves using PET-FDG to guide IMAT treatments for prostate cancer patients who has positive pelvic nodes but otherwise clear on bone scan. She is also investigating MRS-guided localized prostate treatment. It is not uncommon to see physicians performing research under Prof de Neve for their PhD in Medical Sciences, incorporating biological imaging and IMRT/IMAT treatments.

I must add that you must meet with Gert DeMeerler, MD PhD, who took me out to have what turned out to be the best meal I had in Belgium. Werner de Gersem PhD (Physicist) and Bruno (the equivalent of our dosimetrist) also joined us. I had the opportunity to see Gert used FDGPET and CT fusion to delineate the active areas for boosts in a patient diagnosed with chordoma in the sacrum.

Bruno was nice enough to gently introduce to me some of the details of IMAT planning at Ghent, and before long, it was Wim's defense. There I met Carlos De Wagter, PhD (Head of Physics), de Deen, PhD (Gel dosimetry), Dirk Verrellen, PhD (Chief Physicist from Brussels) and others. I met more even people during the reception after Wim's successful defense, most notably Wim's friends and family.

Indy, a physician who is currently a PhD candidate under Prof de Neve, was kind enough to show me around the city of Ghent on Saturday. It was a nice and sunny day and Ghent's beauty shone through. The next day, I went to Bruges, a city about 30 minute train ride from Ghent. Not long after I arrived Bruges, it started to snow and the wind picked up. Still, I managed to see the sights and enjoyed the city.

The following two days was spent with the hard-core physicists: Marc, Bart, Geert, Filip and Werner. Thanks for Marc, we performed kV cone beam CT along with Bart on the Eleckta Synergy linac. I also discussed with Geert on commissioning small field data on Pinnacle and on the use of a diamond detector, and last but not least, hours of in-depth discussions with Werner. Werner is someone who needs further introduction: he is the mastermind behind the development of the inverse planning engine at Ghent, and is responsible for the technical IMRT/IMAT implementation there. Ghent has been performing IMRT treatment since 1996. I was humbled by the hurdles Ghent had to overcome in order to plan and deliver IMRT/IMAT treatments, and Werner's insights to contouring, plan optimization, integration of planning systems, immobilization devices, IMRT/IMAT deliveries just left me in awe.

Besides taking in and enjoying the freely flowing insights and knowledge, we had some creative moments too. I am interested in comparing ultrasound, MVCT on Tomotherapy and kV cone beam CT. We have the former two modalities and lack the kV cone beam CT at our centre back in London. I was ecstatic when I found out that Ghent is commissioning an Eleckta Synergy with cone beam CT. I spent the weekend thinking about a phantom that I could bring back to London without risking having it confiscated upon entry. Bart was very helpful and in the end, we put together Wim's thesis with an insert as well as two empty ink cartridges. In hindsight, a Belgium waffle would be very appropriate. I promised to MVCT the same setup on Tomotherapy, and share the two set of images with them. There you have it, the images from kV cone beam CT and MVCT on Tomotherapy, and I have begun thinking of ways to get invited back…

(Continued on page 119)

Figure 1: photo of the setup: An insert (a CD label folded over itself two times) was placed in the middle of Wim's thesis, on top of which we placed two empty ink cartridges.

Figure 2: A projection from the kV Cone beam CT

Figure 3: Coronal, sagittal and transverse reconstruction of the phantom with the kV Cone beam (Acquisition settings were 100kV, small diameter = 27cm, 360 degree scan, 361 projections, kVcollimator setting=20, 36.1 mAs, 1 mGy, acquisition + reconstruction (1 mm medium resolution, time= 1 min 20 seconds).

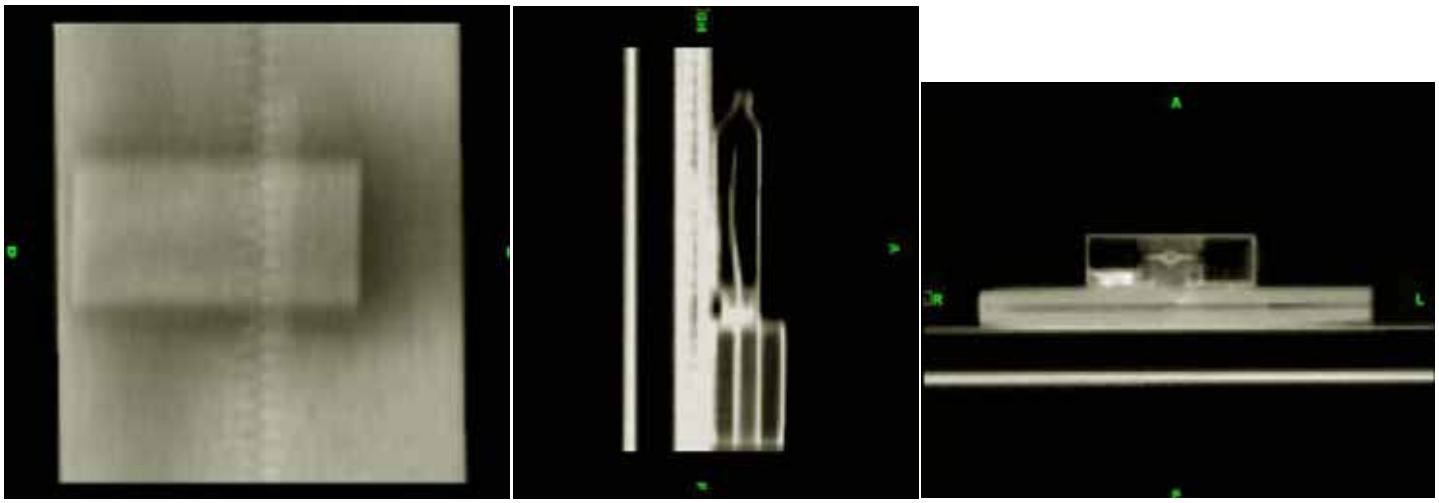


Figure 4: Reconstructed images from MVCT on Tomotherapy (3.5MV, normal resolution (4mm), acquisition + reconstruction time=5 min 25 seconds, 58 slices).

The 2006 Federal Budget and Health Care

Submitted by Ervin Podgorsak
McGill University Health Centre
Montréal, QC

The budget tabled recently by the federal government completely ignores the plight of the Canadian health care system, condemning Canadians to continued deterioration in health care services, suboptimal financial support, and creeping privatization. Of course, in comparison with most of the world, the Canadian health care is not bad; however, when it is compared to health care systems of the developed countries the conclusions should be of concern to all Canadians.

The Organization for Economic Cooperation and Development (OECD), a closed club of 30 countries, mostly developed, from around the world, provides useful statistics on the development of individual member states. Canada is an OECD country and its performance in terms of health care indicators ranges from slightly above average in life expectancy and infant mortality to significantly below average in access to physicians and high technology diagnostic equipment, such as MRI and CT scanners.

As a solution to high health care costs and long waiting lists in Canada, many interest groups are promoting privatization. However, this approach is unlikely to work. Canada already experiences a severe shortage of health care workers, thus a migration of staff from the public to the private sector will only exacerbate the staff shortages and waiting lists in the public sector without increasing the overall number of health care workers practicing in Canada. Moreover, it is not logical to surmise that a health care system run with a profit motive would be cheaper than an efficiently run public system.

Both the federal and provincial governments are responsible for health care and both subscribe to the notion that Canadians already spend too much for health care. This seems to be borne out by the OECD statistics; however, using the OECD cost statistics to condone the inaction by the federal government or, even worse, to justify the deleterious tinkering with the health care systems by provincial governments constitutes a great disservice to all Canadians. Canada spends 10% of its gross domestic product (GDP) on health care compared to a 8.6% average for the OECD countries; however, several countries, at 11%, rank above Canada, and the US is in a league of its own at 15%.

Since privatization is not the answer and greater efficiency is not achievable in the current social climate, there remains only one possible solution to the current waiting list problem: increased financial support from the federal and provincial governments. There is nothing magic in the current 10% of the GDP level; Canada can afford to spend 11% or even 12% of the GDP to bring the access to health care under control.

To solve the access problem one would need to set reasonable and achievable goals for the Canadian health care system: for non-monetary health indicators, matching the OECD average should be the minimum standard and exceeding the OECD average should be the goal. It is clear that the Federal Government, through its Canada Health Act, has the means and obligation not only to set simple and clear standards but also to produce the required cash. When the Federal Government introduced the public health care system in the 1960s, its cost sharing formula with the provinces was set at 50:50; however, with passing decades the federal share dwindled to the current level of only 25%. In the era of federal budget surpluses, the expectation that the federal government improve this obvious "fiscal imbalance" toward the provinces seems reasonable and realistic.

The main cause of Canadian waiting lists is the shortage of high technology equipment and health care personnel. For example, to attain the OECD average Canada would need to increase the number of MRI scanners by 100 from the current 150 and the number of CT scanners by 250 from the current 340 at a one-time infrastructure cost of 1 billion dollars. The 350 new imaging machines would require some 1000 new technologists, staff that is currently not available in Canada, and the additional operating expenses for equipment maintenance and staff would amount to $150 million annually.

To reach the OECD average of 2.9 physicians per 1000 population from the current level of 2.1, Canada would need to add some 25000 new physicians to its current 70000; an unrealistic goal considering that the 17 Canadian medical schools graduate only about 2000 new physicians per year and this number does not even compensate fully for retirement and emigration of physicians. At the very least, Canada should make an effort to match the US rate of 2.3 physicians per 1000 population, and to achieve this would require 6000 additional physicians at an annual cost of 1.8 billion dollars.

In principle, the Canadian health care system is universally accessible, socially just, and equitable. Unfortunately, inadequate funding and poor planning during the past two decades resulted in the current shortages of high technology equipment and health care professionals. In order to preserve the five tenets of the Canada Health Act, it is absolutely essential that the Canadian governments start taking the shortages and waiting lists seriously. Substantial increases in health care budgets would be a good start; however, the staffing deficiency has been neglected for such a long time that improvements, even with careful planning, dedication, and imagination, will be slow in coming. It is obvious, however, that the governments must stop obsessing about cost and switch their priority to providing sufficient funding to ensure high quality health services without any waiting lists. During the past year the energy cost increased by 40% and Canadians learned to live with the increase. Canadian health care can be saved by a budget increase of less than 15%; Canada can afford this, Canadians deserve this, the federal and provincial budgets should reflect this.

In Memorial: Robert Lee ("Bob") Clarke
April 17, 1922 – December 22, 2005

Submitted by Paul Johns[1], Bill Cross[2], Bog Jarosz[1], Peter Watson[1], Don Wiles[1], and the Clarke family
[1]Carleton University and [2]AECL Chalk River Laboratories

Robert Lee Clarke was born in Vermilion, Alberta on April 17, 1922 to Harold J. Clarke and Leonora Opfergelt Clarke. He was educated in Vermilion, then at the University of Alberta (1939 – 1943), where he received the Governor General's Medal upon graduating with a Bachelor of Science. He went on to McGill University (1945 – 1948) to receive a Ph.D. in Physics. He worked at the National Research Council from 1943 to 1945, and Atomic Energy of Canada Ltd. from 1948 to 1968.

In the Physics Branch at AECL's Chalk River Laboratories, Bob's research included work with the Van de Graaf accelerator and extensive measurements of activation by, and scattering of, 14 MeV neutrons. In collaboration with a chemist he also organized, and for a time taught at, a Reactor Physics School aimed primarily at students from outside Canada. A number of the graduates subsequently took positions in the Canadian Government.

He then joined the Physics Department of Carleton University where he served as Department Chair in the 1970s. He also served on numerous University committees and Senate. Bob Clarke introduced medical physics as a new area of research in the Department of Physics and led the establishment of the medical physics graduate program. He formally retired in 1987, but continued his research on therapeutic ultrasound right up until the month before he died. In addition, he spent many periods of research at the Institute of Cancer Research at the Royal Marsden Hospital in Belmont, Surrey, United Kingdom. In 2005 Carleton named him Distinguished Research Professor.

The medical physics program that Bob inaugurated has prospered. On the occasion of the fifteenth anniversary of the Ottawa Medical Physics Institute in 2004, the Robert Clarke Graduate Scholarship in Medical Physics was set up.

Devoted to Canada and to physics, Bob was a long-time member of the Canadian Association of Physicists, the Canadian Nuclear Society, and the Canadian Organization of Medical Physicists. He enjoyed many professional and personal friendships.

In 1943 he met Vera Powell at N.R.C. They were colleagues in the Optics Section, and were married in 1945. There are four children: James (Betty Lam), Gwyneth (Craig Lewis), Alan (Madeline Weld), and Brian (Sandra Cooney). There are eleven grandchildren: Owen (Carolina Ibarra), Roger (Becci Gindin) and Edwin Clarke, Brandon, Denise (Mike Billy), Eleanor and Anna Lewis; Ansel and Derwin Clarke; and Liam and Colleen Clarke; and three great grand children: Catherine, Reeva, and Mike Billy. Bob will also be remembered by Betty and Lloyd Stackhouse, Patricia Clarke (late Donald), and nephews and nieces.

His many friends enriched and broadened his life, as he did theirs. Bob's interests were wide-ranging. He enjoyed games of tennis, and later squash until early 2005. For many years he flew small airplanes, in the U.K. and in Canada. He bicycled around Ottawa and took grandchildren boating on Dow's Lake. He enjoyed concerts at the National Arts Centre, attended Wednesday meetings at Riverside Kiwanis and delivered Meals on Wheels, where his regular Christmas delivery will be missed by many. He travelled extensively in Canada and in the U.K., and in many other parts of the world from Nigeria to Japan and places in between.

Bob Clarke's last scientific conference was in Boston in October 2005. Shortly thereafter, he was diagnosed with advanced cancer. Despite the seriousness of the situation, Bob maintained his characteristic positive view. The illness was brief and he died early in the morning of December 22, 2005. A private funeral service was held on December 24. It had been Bob's wish that a public memorial be held, and this took place on Saturday January 14, 2006 at Carleton. Over 180 friends and family were in attendance to honour this remarkable man.

The Robert L. Clarke Graduate Scholarship in Medical Physics
For information please see www.science.carleton.ca/clarke or contact Elizabeth Roscoe, Development & Alumni, Carleton University, 613-520-2600 x8657 or elizabeth_roscoe@carleton.ca

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www.lap-laser.com

Contact:: Neil Johnston
naj@lap-laser.com

MDS Nordion

Phone: 1-800-465-3666
www.mds.nordion.com

Contact: Peter D'Amico
peter.d'amico@mdsinc.com

Mentor Medical Systems Canada

Phone: 1-800-668-6069
www.mentorcorp.com

Contact: Linda Desjardins
ldesjardins@mentorcanada.com

Modus Medical Devices Inc

Phone: 519-438-2409
www.modusmed.com

Contact: John Miller
jmiller@modusmed.com

Nucletron Corporation

Phone: 410-312-4110
www.nucletron.com

Contact: Kim Chambers
kim.chambers@us.nucletron.com

Resonant Medical Inc

Phone: 514-985-2442
www.resonantmedical.com

Contact: Desirée Dupuis
ddupuis@resonantmedical.com

Scanditronix-Wellhofer North America
Phone: 901-386-2242
www.scanditronix-wellhofer.com

Contact: Matthew McGinnis
mmcginnis@iba-group.com

Siemens Canada

Phone: 514-822-5141
www.siemans.com

Contact: René Boyer
rene.boyer@siemens.com

Standard Imaging Inc

Phone: 1-800-261-4446
www.standardimaging.com

Contact: Eric DeWerd
edewerd@standardimaging.com

Sun Nuclear

Phone: 321-259-6862
www.sunnuclear.com

Contact: Jeff Simon

Thomson Nielsen
Phone: 613-596-4563
www.thomson-elec.com

Contact: Mairi Miller
mmiller@thomson-elec.com

TomoTherapy Inc.

Phone: 608-824-2889
www.tomotherapy.com

Contact: Jodi Pachal
jpachal@tomotherapy.com

Varian Medical Systems

Phone: 650-424-5801
www.varian.com

Contact: Michelle Mogadam
Michelle.mogadam@varian.com

Resonant
MEDICAL

Customer Support Specialist – Product & Training

The Company

Resonant Medical researches, develops and markets 3D ultrasound image-guided adaptive radiotherapy products. Our goal is to enable fundamental improvements to radiation oncology treatment planning, verification and delivery. Resonant's RESTITU™ platform features significant advances in ultrasound hardware and software imaging to fully harness the advantages of 3D ultrasound for radiation therapy image guidance. The first offering of the RESTITU™ platform is a tumor position verification and patient alignment system, and a wide number of additional products and technologies are currently under development.

Position Description

The specialist will act as the primary after-sale interface to the customer providing customer training, assistance during clinical transition, and technical support. Dealing with a wide variety of customers and systems at various cancer centers and hospitals, he/she will assume a key role in ensuring complete customer satisfaction, perfect integration of Resonant's image-guidance platform across these diverse clinical environments, and complete mastery of our product by its users. Excellence will be attained by providing dynamic and thorough training, well adapted to the user needs. It will also be by providing attentive, high-quality support to medical professionals that will have a positive impact on the company's reputation, and directly contribute to the customers' trust and delight. The specialist will be a key contributor to the success of this rapidly growing company by assuming a number of key responsibilities:

Provide front line customer support of the company's advanced image-guidance products.

- Assist customers to achieve smooth transition to clinical operation

Assess, analyze, and remedy customer problems
Instruct and guide customers in use of product features
Receive, document, escalate, and respond to customer complaints

Coordinate and deliver customer training.

Participate in the design and update of the training material and curriculum
Participate in the coordination and scheduling of training sessions
Adapt training to the specific user needs (radiotherapists, vs physicists, vs dosimetrists etc.)
Deliver training session on customer site or in office as required

- Train customers on ultrasound scanning techniques

Coordinate the participation of experts (e.g. ultrasonographers, medical physicists, etc) in the training sessions

Occasionally, provide inputs to engineering for product improvements and development.

Qualifications

- Degree and experience as Radiotherapist (a.k.a. Radiation Oncology Technician)
- Excellent oral and written communication skills
- Comfortable with small group presentations
- Good interpersonal skills
- Dynamic, personable
- Professional, responsible, trustworthy
- Deep commitment to customer satisfaction
- Driven, self started individual motivated to work and prosper in a high-growth, high-technology medical company in the Radiation Oncology sector
- Willing and able to travel
- Experience with ultrasound scanning

Please send inquiries and resumes by email and indicate for which position you are applying.

Julia Orlando hr@resonantmedical.com

Resonant
MEDICAL

Clinical Specialist

Reports to: General Manager, Operations

The Company

Resonant Medical researches, develops and markets 3D ultrasound image-guided adaptive radiotherapy products. Our goal is to enable fundamental improvements to radiation oncology treatment planning, verification and delivery. Resonant's RESTITU™ platform features significant advances in ultrasound hardware and software imaging to fully harness the advantages of 3D ultrasound for radiation therapy image guidance. The first offering of the RESTITU™ platform is a tumor position verification and patient alignment system, and a wide number of additional products and technologies are currently under development.

Position Description

The specialist will be exposed to a wide variety of clinical technologies and systems at various cancer centers, and will ensure complete integration of Resonant's image-guidance platform across these diverse clinical and research environments. The Clinical Specialist will be a key contributor to the success of this rapidly growing company by assuming three important responsibilities:

- **Clinical integration**: interface with customer and research partners by providing assistance on advanced technological or integration issues. Troubleshoot and resolve sophisticated technical and clinical integration issues. Integrate Resonant's technology to the cancer centers and research partners' systems, workflow and protocols. Engage in continuous improvement of research, clinical and QA protocols. Excellence will be attained by providing attentive, high-quality assistance and innovative solutions to medical physicists and radiation oncologists across the continent.

- **Clinical research management**: establish and coordinate clinical research projects with a wide number of leading edge cancer centers and universities in North America and Europe. Act as a liaison between research teams in academia and Resonant's own R&D department and internal research initiatives as well as assist in publication process.

- **Clinical support**: on an occasional basis, provide customers and research partners with product training and support, and assist during transition to clinical operator. On an ad hoc basis, conduct presentations or participate in conferences.

Qualifications

- Dosimetrist with clinical experience
- Master or preferably Ph.D. and clinical experience as Medical Physicist an asset
- Interest or experience in information technology related fields
- Solid technical problem solving abilities
- Excellent oral and written communication skills
- Deep commitment to customer satisfaction and successful clinical management
- Highly interested in technology and technical advances
- Driven, self starter individual motivated to work and prosper in a high-growth, high-technology medical company in the Radiation Oncology sector
- Willing and able to travel occasionally

Please send inquiries and resumes by email and indicate for which position you are applying.

Julia Orlando hr@resonantmedical.com

Alberta Cancer Board

Associate Medical Physicist

The Tom Baker Cancer Centre invites applications for a position as an Associate Medical Physicist (Resident) in the CAMPEP approved Radiation Oncology Physics Residency Program.

Physicists within the Department of Medical Physics provide clinical physics services at the Tom Baker Cancer Centre (TBCC) which treats approximately 2500 new patients per year. Treatment delivery equipment includes one Cobalt unit, seven Varian linear accelerators, a Novalis stereotactic unit. A Trilogy unit with on-board imaging is currently being installed. Treatment preparation takes place using one of two CT simulators or an Acuity with cone beam CT, with plans generated by the Pinnacle and Eclipse treatment planning systems. The TBCC supports active clinical programs in IMRT, brachytherapy including prostate brachytherapy and stereotactic radiosurgery/therapy. There are currently ten physicist positions at the TBCC within a total Medical Physics Department staff of 45. Academic activities are conducted through the Departments of Oncology and Physics and Astronomy at the University of Calgary. A CAMPEP approved graduate medical physics program is in place with a current enrolment of seven students. In addition, the Department contributes to the teaching of Radiation Oncology residents and Radiation Therapy students. Research activities are generally directed towards on-going clinical programs and are conducted in close collaboration with the Department of Radiation Oncology.

The Associate Medical Physicist position requires a PhD in Medical Physics, Physics or a closely related discipline. Graduation from a CAMPEP accredited graduate program or equivalent academic preparation would provide applicants for this position with a distinct advantage.

The Associate Medical Physicist position (Resident) is a two year term position during which time the incumbent follows a structured program intended to provide practical training in Radiation Oncology Physics and preparation for the certification examination of the Canadian College of Physicists in Medicine.
A strong commitment to the highest clinical standards and highly developed interpersonal and team work skills are required for this position.

For further information please visit tbccmedphys.ca. Applications with the names and contact information of three references may be submitted to:

Dr. Peter Dunscombe
Director
Medical Physics Department
Tom Baker Cancer Centre
1331 – 29 Street N.W.
Calgary, Alberta T2N 4N2

Closing date: 15th July 2006

London Health Sciences Centre
London Regional Cancer Program

POSITION: **MEDICAL PHYSICIST/SENIOR MEDICAL PHYSICIST**

LOCATION: **London Regional Cancer Program, London Health Sciences Centre**
London, Ontario, Canada

The London Regional Cancer Program is committed to providing leadership in cancer treatment, research, and education and is affiliated with the University of Western Ontario. Current resources include 9 megavoltage radiation therapy machines, most with MLC and electronic portal imaging, 3 simulators (2 CT and one conventional), HDR brachytherapy, and specialty programs in helical tomotherapy, prostate brachytherapy, stereotactic radiation therapy, total body irradiation, and photodynamic therapy. This position involves participation in all aspects of medical physics related to Radiation Oncology including research and development. Research projects are currently active in helical tomotherapy, IMRT and breathing-controlled treatments, 3-D gel dosimetry for IMRT and tomotherapy verification, kilo/megavoltage on-line CT imaging, dose optimization algorithms, TCP/NTCP radiobiological modeling, and uncertainty propagation models. The successful candidate will join a dynamic Medical Physics team with a full range of dosimetry, computer, and engineering support. Opportunity also exists for close collaboration with the high profile diagnostic imaging group in London with extensive imaging technologies. The candidate will participate in teaching and supervision of Radiation Oncology residents, Medical Physics residents, and Medical Biophysics graduate and undergraduate students.

Minimum qualifications include a Ph.D. with several years of related clinical experience, and CCPM certification or equivalent. The successful candidate should be eligible for an academic appointment at the University of Western Ontario.

London, Ontario is a pleasant and affordable university and health care city of 350,000 people nestled in south-western Ontario equidistant from Toronto, Windsor (Detroit), and Niagara Falls (Buffalo). Proximity to the Great Lakes offers a wide range of recreational activities.

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

In order to be considered for this position, please submit your curriculum vitae to:

CONTACT: Julie Webster, Recruitment Consultant
Human Resources, 5th Floor PDC, University Hospital
339 Windermere Road
London Health Sciences Centre
London, Ontario, Canada, N6A 5A5
E-mail: Julie.Webster @lhsc.on.ca
Fax: 519-663-3889
For job-related questions, contact Jake Van Dyk: Jake.VanDyk@lhsc.on.ca

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