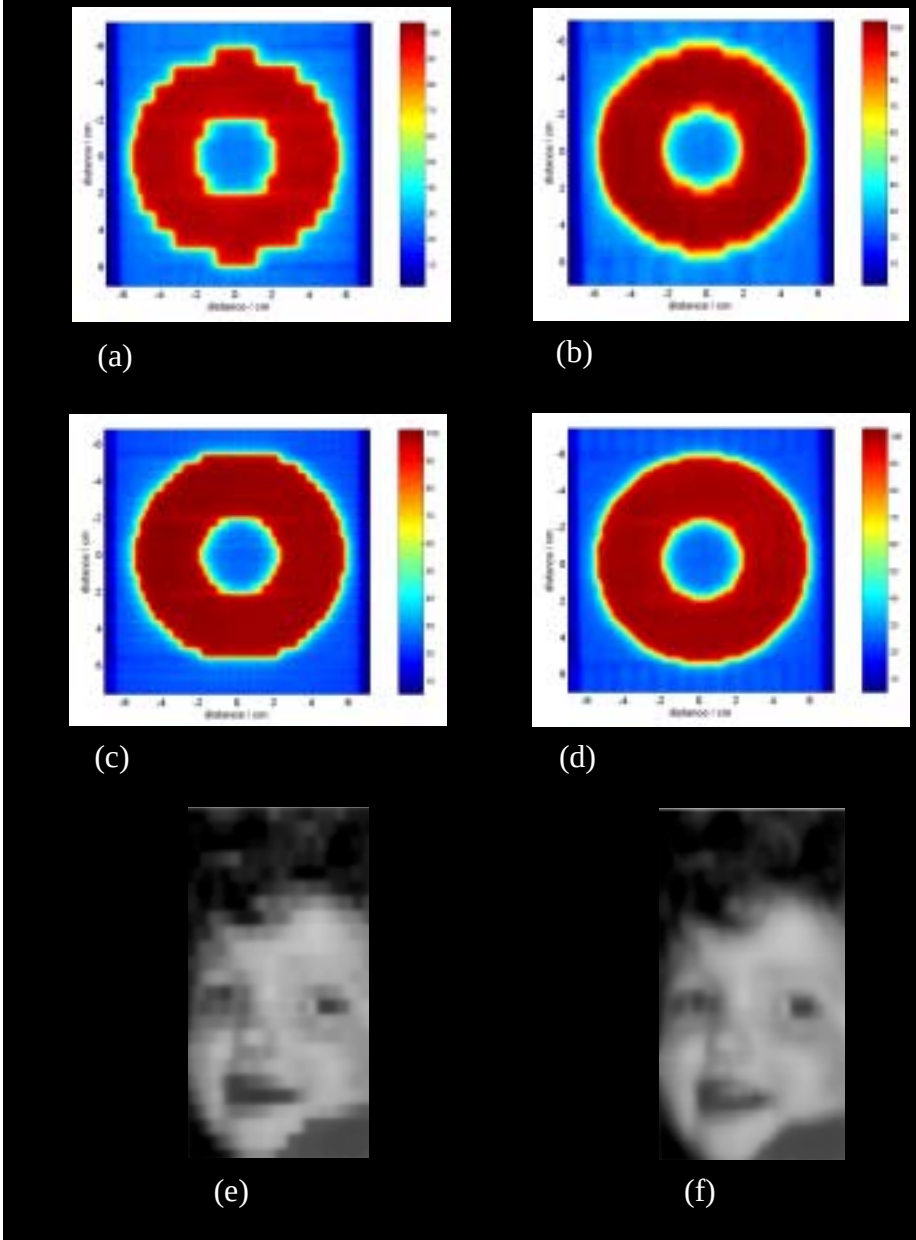
# InterACTIONS

CANADIAN MEDICAL PHYSICS NEWSLETTER
Le BULLETIN CANADIEN de PHYSIQUE MÉDICALE




## Improving Resolution for IMRT Delivery

COMP OCPM

A publication of the Canadian Organization of Medical Physicists and the Canadian College of Physicists in Medicine

**http://www.medphys.ca**

**ISSN 1488-6847**

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

48 (4) octobre/October 2002

# About our Cover

The resolution of dose distributions delivered by multileaf collimators (MLCs) for intensity modulated radiation therapy (IMRT) are limited in the direction perpendicular to leaf motion by the finite leaf width. A method previously applied to smoothing static MLC field edges was applied to dynamic IMRT delivery. This method reduces the MLC sampling distance by delivering the IMRT fluence as segments with couch offsets in the direction perpendicular to leaf motion between each fluence segment.

An annular or "donut" fluence was created and delivered with the sliding window IMRT method. The result with 1 cm MLC leaves moving from left to right is seen in Picture (a). The result when two fluences are calculated and delivered with an offset of 0.5 cm can be seen in (b). Similarly the same method was applied to 0.5 cm MLC leaf width shown in (c) and with offsets of 0.25 cm in (d). The images in (e) and (f) show visually the improvement for 1 cm MLC leaves when this method is utilised.

The resolution of IMRT delivery for 1 cm MLC leaf width can be significantly improved with this method. For the 0.5 cm MLC leaf width resolution nearly independent of direction can be attained. This method may also have application to small field IMRT for stereotactic treatments.

*Images courtesy of Peter Greer, Royal Adelaide Hospital, Adelaide, Australia, Wayne Beckham and William Ansbacher, BC Cancer Agency, Vancouver Island Centre, Victoria and Rita Mann, University of Victoria, Victoria.*


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

Pat Cadman
Saskatoon Cancer Centre
20 Campus Drive
Saskatoon, Saskatchewan, S7N 4H4
Email: pcadman@scf.sk.ca
Phone: (306) 655-2696
Fax: (306) 655-2701

Members of the Editorial Board include:

| | |
|---|---|
| Peter Munro: | peter.munro@lrcc.on.ca |
| Michael Kolios: | mkolios@acs.ryerson.ca |
| Horacio Patricinio | horatio@medphys.mcgill.ca |
| Michael Henry | |
| Email: | henry@abellshenry.com |
| Phone: | (780) 462-7974 |
| Fax: | (780) 466-0731 |

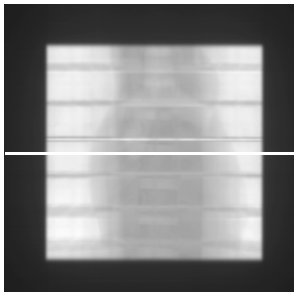
Please submit stories in Publisher 98, Word 6.0, Word 97, or ASCII text format. Hardcopy submissions will be scanned to generate an electronic document for inclusion in the Newsletter. Images in Tiff format at 300 dpi resolution are preferred. Advertising and corporate enquiries can be made to:




**Advertising Rates**

| | 1/2 page | 1 page | Addn. pages |
|---|---|---|---|
| Member Announcement | | $100 | $100 |
| Corporate Member | $150 | $200 | $100 |
| Non Profit Organisation | $225 | $300 | $125 |
| Corporate Non-Member | $300 | $400 | $200 |
| Color | Add $400 (when available) | | |

Inter ACTIONS 48 (4) octobre/October 2002



## Inside this issue:



## *CCPM BOARD*



## *COMP/CCPM Office*

Ms. Barb Callaghan
COMP Secretariat
COMP/CCPM Office
PO Box 39059
Edmonton, AB, T5B 4T8
Telephone: (780) 488-4334
Facsimile: (780) 482-4425
compoffice@shaw.ca

# Message from the COMP Chair:

At this year's COMP AGM, I inherited the duties of COMP Chair from Gino. I would like to thank Gino for the work he has done for COMP during his two-year mandate. Many important issues concerning our profession have been initiated during his term as Chair. I hope I will be able to fill his shoes.

This year's AAPM/COMP Meeting in Montréal was a tremendous success. All attendees were very impressed with the work done by the LAC under very difficult circumstances. The Palais des Congrès, where the Meeting was being held, was in the midst of major renovations. A few days before the meeting, it looked more like a construction site than a convention centre. Our congratulations to Ervin Podgorsak and his team for a job well done and for putting on a Night Out that will be talked about for many years! I would also like to thank Sherry Connors who coordinated the COMP activities at the Meeting. This was sometimes difficult to do from Edmonton.

There has been some talk that COMP's presence at the Meeting was too low key. This is probably true to some extent and I believe the Executive has learned from this meeting that we need to work closer with the Conference Committees of larger associations when organising joint meetings. However, from a scientific point of view, we were certainly a strong part of this Meeting. Two well attended and appreciated COMP/CCPM symposia were organised by John Schreiner and Gino Fallone. Our thanks to Gino and John for their fine work. Also, the YIS was a very CANADIAN affair. Five of the ten finalists and ALL THREE winners were Canadian (see the article in this issue)! My congratulations to all.

High on our list of priorities of the COMP Executive is increasing the profile of our profession. To do this, we need to try to legally define what is the position of medical physicists in our health care system. Our Professional Affairs Committee is drafting a Scope of Practice for Medical Physicists in Radiation Therapy, which will summarise our role and responsibilities in this field. The completed document will be submitted to the Canadian Medical Association, which maintains a database of Scopes of Practice for many health care professions. I would like to thank Dave Wilkins and the PAC for their continuing efforts. This document will also be an important tool in lobbying for legal recognition of our profession. We are presently one of the few health care professions in Canada that is not governed in some way by a Professional Act. Our Executive Director, Michael Henry, is actively looking into ways of advancing this issue with Provincial Legislatures and possibly organising meetings with some politicians to address this concern. Finally, if we are willing to accept responsibility for our actions, liability becomes an important topic. Our PAC is looking at what options COMP could present to its members who would be interested in obtaining liability insurance.

High on our list of priorities of the COMP Executive is increasing the profile of our profession.

I am pleased to announce that the COMP Executive has appointed Dr. Jack Cunningham and Dr. Robert Clarke as Emeritus Members of COMP. The Emeritus Category recognises retired members who have had a career of extraordinary achievement in, and contribution to, the field of medical physics. Drs. Cunningham and Clarke without any doubt fulfil this requirement. Through their devotion to the field and passion for medical physics, they have encouraged many of us to follow in their footsteps.

Finally, I would like to ask COMP members to continue their involvement in the

*(Continued on page 135)*

# Message from the CCPM President:

This is my first InterACTIONS message as president of CCPM, a post to which I feel privileged to have been elected. I would like to thank the membership for the confidence placed in me and look forward to working with the Board and the members of the CCPM to continue to further the goals and objectives of the organisation during the

next few years.

On behalf of the Board, I would like to express thanks to those Board members moving on and especially to our immediate past president, ***John Schreiner***, for his hard work and dedication to the job. He has agreed to act as Vice President for the coming year and I will be glad of his help. ***Alistair Baillie*** has reached the end of his term on the Board and I recognise and thank him for his contribution and his efficient and effective work as Registrar over a period of 5 years. I welcome ***Wayne Beckham*** to the Board and look forward to working with him over the next few years.

I also would like to recognise the significant achievement of ***Martin Jaffe*** in raising the profile of the CCPM to the level of the federal government. Health Canada has recently published ***Canadian Mammography Quality Guidelines*** (ISBN 0-662-31991-5) which states that all Medical Physicists conducting surveys of mammography facilities and providing oversight of the facility quality assurance programme:

> **"must be accredited in Medical Physics of Mammography by the Canadian College of Physicists in Medicine (CCPM) or its equivalent, or any relevant provincial/territorial licence."**

This is most likely the first piece of government documentation to recognise the CCPM.

I extend a welcome to our newly elected Members: ***Cynthia Araujo, David Choi, Bradford Gill, Joseph Hayward, Michelle Hilts, Marc MacKenzie, Paul Mobit, Paul Ravindran, Abdelhamid Saoudi, Heather Thompson, Larry Watts*** and ***Glenn Wells*** and Fellows: ***Craig Lewis, Miller MacPherson, William Parker, Horacio Patrocinio***. Congratulations to them all. I also encourage all of our younger colleagues to consider applying for a ***Harold E. Johns Travel Award for Young Investigators***, details of which are described elsewhere in this publication and on the web page.

Through the hard work and dedication of many individuals since its inception in 1979, the CCPM has achieved significant gains in terms of international recognition and professional respect for our work as Medical Physicists. However, we continue to face challenges, some new and some not so new. Our primary challenge is always to ***retain credibility of our examination processes***. To this end, the Board is making recommendations for changes to the current process. A discussion begun at the AGM in Montreal will be continued throughout the year and the membership will be hearing more about these aspects via email during the next few months.

Another significant challenge facing the CCPM is to attract application for membership from colleagues working in specialties other than radiation therapy. Our objective as defined in our bylaws is "to identify competent persons who are responsible for applications of the physical sciences in the medical field". To date, the vast majority of our 182 members have demonstrated competence in Therapeutic Radiological Physics. The Board will be working this year to ***encourage applications from the other three specialties of diagnostic Radiological Physics, Nuclear Medicine Physics and Magnetic Resonance Imaging***. Although there are question banks compiled for these specialties, applications for membership from any of the physi-

*(Continued on page 135)*

Our primary challenge is always to *retain credibility of our examination processes*. To this end, the Board is making recommendations for changes to the current process.

# Message from the Executive Director of COMP/CCPM

It is clear that it is in the public's best interest to have those practice areas that medical physicists have clearly the best professional training and preparation to remain under the scope of the profession

As the leaves begin to turn colour across this country, we look forward to the joys and challenges the new season brings - visions of the upcoming ski and winter sport season are mixed with visions of raking leaves and the work of preparing for the Canadian Winter.

In some sense, this is a metaphor for the state of health care in Canada – There are ongoing discussions and debate about the role of the government and private sector in health care. The Romanow Commission continues its work to examine the future of health care in Canada – It remains to be seen whether the Romanow Report will have the magnitude that Justice Emmett Hall's report had in the 1960's – which led to the creation of Medicare – or whether the Romanow report will be like so many other Royal Commission Reports destined to be dust gatherers in remote locations in our nation's libraries.

However, we do know that the current Royal Commission is only a part of the national discussion on the future of health care in Canada. Many provinces have initiated their own comprehensive or more focused reviews. (Alberta's was led by the former Deputy Prime Minister, Don Mazankowski).

Some of the more focused reviews have zeroed in on the role of health professions in our system. While this may pose significant challenges for Medical Physics, it also presents unique opportunities. Our colleagues in British Columbia have capitalized on the B.C. government's review of that province's Health Professions Act. The province is working toward developing a uniform regulatory framework for health professions in the province. By moving to have medical physics recognized as a profession regulated by statute, the British Columbia medical physicists have provided the precedent for such action across Canada.

The benefits of such recognition and status are significant to the profession. It is not news to medical physicists that the profession has been subject to other professions' scope of practice creeping into practice areas that are clearly best placed in medical physics. This has been able to happen because the professional scope of practice has been ill defined in legislation and regulation. It is clear that it is in the public's best interest to have those practice areas that medical physicists have clearly the best professional training and preparation to remain under the scope of the profession.

As this initiative develops, we will provide updates. We should be actively considering other jurisdictions that could present opportunities for parallel action regarding enshrining in legislation or regulation the professional practice of medical physics.

Michael Kolios has continued to work with the Communications Committee in the transformation of COMP-CCPM's communications vehicles. We look forward to the launch of the new website and the enhanced opportunity for enhancing communication in our organization. We should not underestimate the hours of work Michael and his committee have put into providing communications services for our membership. Many thanks to Michael, Pat Cadman our Interactions editor, and the other members of the committee for their ongoing commitment!

On another personal note, many members will know that Barb Callaghan, our 'Secretariat' recently had surgery – The surgery was successful and Barb has full recovery and has returned to her full duties at the Secretariat – In fact, Barb was so well organized, it seemed like she continued her work throughout the experience! Many thanks to Barb for her continued hard work!

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

Michael Henry
Executive Director
COMP/CCPM

# COMP ANNUAL GENERAL MEETING

## Montreal, Québec
## July 14, 2002

**Chair:** B. Gino Fallone / Clement Arsenault Quorum was met.
**Secretary:** Alanah Bergman The meeting was called to order at 5:30 PM by Gino Fallone.

1. **Adoption of the Agenda:**
**Motion**: A.Cottrell moved to adopt the agenda. **Seconded**: B. Jarosz. **Vote:** Carried.

2. **Minutes of COMP AGM Held July 13, 2001:**
**Motion and Second:** by members to accept the minutes from the Kelowna, BC COMP AGM. **Vote:** Carried.

3. **Business Arising from the Minutes:** No major items.

4. **Executive Director's Report: (M. Henry)** **Exec.Director is reporting here due to time constraints.

***(i) APEGBC*** – In Feb 2002, the Association of Professional Engineers and Geoscientists of BC (APEGBC) circulated a draft proposal for re-writing the B.C. Engineering Act. The wording of the document is such that it would infringe on the practice of medical physics by medical physicists in BC. M.Henry, COMP, and CCPM contacted the minister's office and it is now on record that the COMP/CCPM have requested to be a consulting party should any proposals be made to modify this act.

***(ii) Medical Physics Profile in Government*** – M.Henry has been trying establish discussion with various provincial and federal ministers. G.Fallone will be meeting with Anne McLelland (federal Minister of Health) at the end of August to provide a briefing on the field of medical physics.

***(iii) NSERC*** – Contacted president to follow up on previous requests by COMP (M.Patterson) to establish a separate funding category for medical physics. Received a positive response. A category labeled "biological and medical physics" was established in 2000.

***(iv) Tax Deductions*** – Investigated possibility of medical physicists deducting CCPM exam fees and COMP/AAPM membership dues. Initial impression is that CCPM exam fees are NOT deductible, but COMP/AAPM dues are. Consulting a tax accountant.

***(v) Canadian Nite-Out*** – Acknowledged generosity of the corporate sponsors for funding this event.

5. **CCPM Business Report: (L.John Schreiner)**

***(i) CAMPEP (Commission on Accreditation of Medical Physics Educational Programs):*** A reminder to encourage meeting / training course organizers to apply for CAMPEP points. This information can be used to document attendance for continuing education requirements.

***(ii) CCPM Board***
- Brenda Clark is the new president.
- L.John Schreiner is stepping down as President and is now Vice President.
- Alistair Baillie is leaving the CCPM board after seven years of service.
- Ting Y. Lee is stepping down as Chief Examiner and will be a General Board Member.
- Katharina Sixel is stepping down as a General Board Member and will be Chief Examiner
- Wayne Beckham has recently joined the CCPM Board as a General Board Member

***(iii)CCPM Board Policies / Procedures Handbook*** – currently being edited.

6. **COMP Chair Report: (B. Gino Fallone)**

***(i) Bylaw Change –*** There is a proposed change to the COMP bylaws that states that the address of COMP is in Edmonton and does NOT follow the address of the elected Executive Secretary. (See *Secretary's Report*)

***(ii) Licensure of Medical Physicists*** – Some discussion of instituting licensure, using the states of Florida and New York as a model. Need to evaluate whether this should be under provincial or federal jurisdiction. The Professional Affairs Committee will be investigating this issue.

***(iii) Scope of Practice Document for Medical Physics*** – The Professional Affairs Committee is assembling a

*(Continued on page 116)*

"Scope of Practice" document to help define the responsibilities of a medical physicist. Some discussion about the use of the word "certified" medical physicist or "qualified" medical physicist.

***(iv) Liability Insurance –*** The Professional Affairs Committee initiated discussions with insurance providers who may be able to assemble a COMP-exclusive liability / errors&omissions coverage package for members.

***(v) COMP/CCPM Website*** – The Communications Committee has submitted a request for proposal to several companies for website re-design and hosting services. (See *Report of Communications Committee*).

***(vi) Communications Committee Terms of Office*** – Both Michael Kolios and Pat Cadman's terms of office will be ending July 2003. The position of *Editor of InterActions* and *Councillor for Communications* will be available. Pat Cadman will be awarded a plaque for his extraordinary service to the InterActions Newsletter.

***(vii) COMP/CCPM Auditor*** – Randy Miller will be asked to audit the financial books for the 2002 Fiscal Year.

***(viii) Medical Physics Self-Checks*** – The Executive had some discussions about when a medical physicist would require a second check of their work. This is an issue of risk analysis that needs to be undertaken by individual medical physics departments.

***(x) 2002 Young Investigators' Symposium*** – there is no COMP YIS this year, only the AAPM YIS. Five students from Canada are entered in this competition. The COMP Exec voted to pay the registration fees of any YIS competitor (representing Canada) that is a COMP member.

7. **Treasurer's Report: (S.Pistorius) - overhead presentation**

***(i) Auditing of Financial Statements*** – Randall Miller audited and approved 2001 financial statements. Would like to ask him to audit the 2002 statements too**. Motion:** S.Pistorius moved to ask R.Miller to audit the COMP/CCPM 2002 financial statements. **Second:** J.Schreiner **Vote:** Carried.

***(ii) Balance Sheet*** – assets are up 15% compared to last year ($175,886). Funds from the current active account (~$57,341) are ~1.5x the estimated COMP annual expenses. Any overflow was transferred into the GIC account.

***(iii) Income Sheet*** – Including revenue from the Kelowna scientific meeting, 2001 income was $127.933.87.

***(iv) Budget Statement*** – The 2001 estimated income from membership dues was very close to that budgeted. There were many instances of not using up the funds for budgeted items.

***(v) Balanced Operating Budget –*** COMP is moving towards achieving a balanced budget every year. Currently budgeting a loss every year. A separate reserve budget of excess income will be established that can used to ensure a balanced operating budget. This reserve budget can also be used to cover one-time development costs/projects (e.g. website). Some overbudgeted operating expenses will be reassessed (e.g. committee expenses, award plaques, presidents discretionary fund)

***(vi) Scientific Meeting Revenues*** - D.Rogers asked why the scientific meeting revenues are neutral. S.Pistorius replied that historically, the meetings were not budgeted to be profit making. Discussion ensued.
**Motion:** S.Pistorius moved to direct any revenue generated at a scientific meeting into a 'reserve' fund used for development projects. **Second:** P.Dunscombe **Vote**: Carried.

***(vii) Other:***

- Question re: COMP assets having too much growth. S.Pistorius responded that as long as the COMP net worth was <$200,000 the organization can maintain its non-profit status.
- The Kelowna profit ($4,000) was less than anticipated due to abstract publishing costs in Medical Physics
- B. Jarosz inquired about the $500 budgeted for "CCPM" in 2003. S.Pistorius replied that this money is used to cover meeting (i.e. teleconferencing) costs. L.J.Shreiner stated that the CCPM is trying to encourage phone meetings (vs. traveling).
- S.Pistorius thanked Laura Dyke (Rodriguez) for dealing with the invoices for newsletter advertising

8. **Report of the Nomination Committee (M. Patterson)**

**(*i*) *Executive Positions*** – A call for nominations for Treasurer and Chair-Elect of COMP was made in the InterActions newsletter. One candidate for each position was nominated. As agreed at the 2001 AGM, a mail-out ballot was not sent and these candidates won by acclamation. The new officers are:

**Treasurer** - Horatio Patrocinio (effective Jan 1, 2003)
**Chair-Elect** - Peter O'Brien (effective July 14, 2002

G. Fallone thanked Michael Patterson for his service as Past-Chair and Stephen Pistorius for his service as Treasurer

*(Continued on page 117)*

9. **Report of the Radiation Regulations Committee (P. Dunscombe)**

Gino Fallone thanked Peter O'Brien for his service as Chair of the Radiation Regulations Committee. He welcomed Peter Dunscombe as the new chair.

***(i) New Members*** – P.Dunscombe welcomed Francine Dinelle to the Radiation Regulations Committee.

***(ii) Mandate Changes*** – The committee's main function was to review the regulations from the CNSC and any provincial organizations. The committee intends to take on a more proactive role by becoming involved in training issues and the definition of a scope of practice document for medical physicists within the sphere of radiation safety/protection.

***(iii) Intravascular Brachytherapy*** – a 1-2 page document was composed that explored the role of the medical physicist in intravascular brachytherapy.

***(iv) Radiation Safety Officer (RSO) Training –*** The role of medical physicists as RSOs was examined. The committee is taking an inventory of RSO training programs across the country. They intend to come up with a recommendation as to what training should be available to medical physicists wishing to become RSOs.

***(v) CARO Document "Quality Assurance in Radiation Therapy"*** – CARO (Canadian Association of Radiation Oncologists) presented a document to CAPCA (Canadian Association of Provincial Cancer Agencies) on the topic of standards for quality assurance in RT (including major therapy equipment). The Radiation Regulations Committee will review this documentation.

10. **Report of the Communications Committee (I. Yeung)**

***(i) Membership*** – Laura Rodriguez (Dyke) is leaving the committee imminently. She was responsible for securing advertising for the InterActions newsletter. This responsibility will be transferred to Michael Henry. Pat Cadman's term as Editor of InterActions is expiring at the 2003 AGM. He was thanked for his contribution. Michael Kolios' Executive position as Councillor for Communications will be ending at the 2003 AGM. Nominations for Councillor for Communications will be solicited. A new InterActions newsletter editor will also be sought.

***(ii) COMP Website –*** Still attempting to finalize an offer for redesign and site hosting of the COMP website. Request for Proposal (RFP) was issued to three companies in April 2002. Received one positive response, one negative response, and one request for an extension on the deadline that was granted. M.Kolios met with a representative of the AAPM website team. A very positive meeting and the group appears to be very capable of providing the service COMP needs due to the similarity of our organizations. AAPM will respond with a quote at the end of August. In the case where the COMP website cannot be up and "meeting ready" by the 2003 Edmonton meeting, the Communications Committee has a back-up plan. A private company is available that can provide all electronic resources to handle the COMP abstract/proceedings submission needs. This would be a one-time contract for the 2003 meeting only.

- P.Johns expressed concern that the AAPM will treat the COMP as simply another chapter of its organization.
- I. Yeung responded that the COMP will not be integrating with the AAPM. They will be contracted out to provide site administration and website design services.
- G.Fallone added that the AAPM will be providing website content editing tools that the Communications Committee will be using. The AAPM server will be used to host the COMP site as a separate entity.
- P.Johns questioned whether the COMP abstract structure will have to be the same as that used by AAPM.
- G.Fallone responded that no, the Communications Committee can control the abstract structure.
- C.Duzenli mentioned that the Kelowna meeting had an on-line submission process and so did WesCan.

  G.Fallone indicated that the Kelowna situation was not ideal. The code-writing was very labour intensive
  - I. Yeung added that it is preferable to retain the services of a professional web provider
  - D.Rogers added that the AAPM website staff are very good
  - M.Patterson reminded the membership that the current COMP web host went bankrupt.
  - P.Johns questioned why a Canadian company could not be found.
  - I.Yeung responded that the CARO site uses a Canadian company, but it is very small and COMPs recent experience with small, unestablished companies was not very positive

**11. Secretary's Report**

***(i) COMP Membership*** - As of July, 2002 the COMP membership is as follows:

*(Continued on page 118)*

| Category | July 2002 | July 2001 | Change |
|---|---|---|---|
| Full | 331 | 319 | +12 |
| Associate | 1 | 0 | + 1 |
| Student | 32 | 51 | -19 |
| Retired | 4 | 3 | + 1 |
| Emeritus | 10 | 9 | + 1 |
| Corporate | 17 | 22 | - 5 |
| **Totals** | **395** | **404** | **- 9** |

Two emeritus members were voted in. Dr.J.Cunningham was voted by the Executive for emeritus status in November 2001. Dr. Robert Clarke was voted for emeritus status in July 2002. The membership was encouraged to nominate retired members for emeritus status who they feel have contributed significantly to the field of medical physics during their career. A supporting letter is required.

***(ii) Changes to Dues Renewal/Application Forms*** – subcategories have been added to the forms to help COMP better characterize the membership population.

***(iii) Bylaw Changes*** – Proposed changes to "Article IX: Mailing Address" was submitted to InterActions for comment. The new wording reads "*The head office of the COMP shall be in the City of Edmonton, in the Province of Alberta. The address shall be considered permanent until such time as it is changed by the Executive and approved at an AGM of the COMP*".

**Motion:** A.Bergman moved to accept the new wording. **Second**: A.Cottrell **Vote**: Carried

***(iv) CIHI (Canadian Institute for Health Information)***

Communication established with Brent Barber at CIHI. CIHI develops and manages Canadian health databases and registries. A.Bergman sent CIHI COMP/CCPM membership statistics broken down by province for 1992 to present. The next medical professionals statistics report will be published in 2003.

12. **Conferences**

***(i) Montreal 2002.*** G.Fallone thanked the LAC for their participation. S.Connors was also thanked for organizing the Canadian Nite-Out. It was noted that there were three Canadian-sponsored Symposia at the AAPM.

- P.Johns asked why there was no CAP lecturer
- G.Fallone responded that this year COMP sent E.Podgorsak to speak at the CAP meeting, but when CAP was requested to nominate a lecturer for COMP, but no response was received.
- D.Rogers noted that Jack Cunningham won the CAP Kirkby Award this year. J.Cunningham was unable to be present to accept the award. J.Battista delivered a speech about Dr.Cunningham. E.Podgorsak read out Dr.Cunningham's acceptance speech.
- G.Fallone responded that Dr.Cunningham's award would be announced at the Canadian Nite-Out dinner

COMP has agreed to give the AAPM LAC (headed by Ervin Podgorsak) $2000 CAD from the $6500 USD AAPM meeting chapter donation (standard AAPM meeting protocol). The money will be used to promote Montreal and Canada to meeting participants.

S.Connors reported that the AAPM has been very pleased with this joint meeting. There has been ~250 Canadian participants

***(ii) Edmonton 2003 (June 5-7$^{th}$) –*** G.Fallone reported that the meeting was to be held at the U.of Alberta.

***(iii) Winnipeg 2004 (June 12 – 17$^{th}$)*** - S.Pistorius reported that this meeting will be held in conjunction with the Canadian Association of Physicists (CAP) and the Canadian Astronomical Society/Societe Canadienne d'Astronomie (CASCA) meetings. Meeting location is the Delta Hotel and Conference centre.

***(iv) 2005*** – No proposals have been made to date.

**Non-Agenda Items**

***(i) Memorial -*** Geoffrey Dean wished to acknowledge the significant contributions made by two medical physicists that passed away this year : Dr. Arthur Holloway and Dr. Monty Cohen

***(ii) Passing of the Gavel*** – G.Fallone thanked the Executive for their support during his term as chair and handed the COMP Chair Gavel to C.Arsenault, the incoming COMP Chair.

13. **Adjournment** – **Motion:** D.Rodgers moved to adjourn the COMP 2002 AGM. Motion was seconded**. Vote:** carried. Meeting adjourned at 7:00PM.

# Professional Liability Insurance
## Report from the Professional Affairs Committee

About one quarter of COMP members responding to the annual Professional Survey report receiving some income from consulting. A potential risk of independent consulting is the possibility of being named in a malpractice lawsuit due to a technical error or a professional omission or oversight. Individual Canadian medical physicists have frequently had difficulty obtaining professional liability insurance due to the insurance industry's lack of awareness of the profession of medical physics and the insurance risks involved. Canadian physicists have been excluded from the AAPM insurance plan because their insurer is not licensed to provide insurance in Canada.

A recent debate in Medical Physics[1] has highlighted various aspects of the liability protection issue. There is clear agreement that physicists doing independent consulting or contract work need to have insurance protection. However, the question also was raised about whether physicists employed by an institution should be independently insured.

Increasing complexity of treatments and heavy physics involvement in techniques such as IMRT, HDR brachytherapy, radiosurgery, etc., has increased the likelihood that the physicist could be named in a malpractice lawsuit alleging treatment error. While the cancer centre or the radiation oncologist are the most likely targets, such lawsuits tend to name any individual or organization involved, in order to maximize the chance of assigning responsibility for the error to anyone who can contribute to a settlement. Regardless of actual involvement or culpability, simply being named in a lawsuit and being forced to provide a defense could be disruptive, upsetting and financially devastating.

Medical facilities carry institutional insurance to protect themselves against legal action, and the normal expectation is that an employee performing within the scope of his employment will not be liable for damages, except in cases of gross negligence. Some organizations have a policy concerning coverage of employees in the event of a lawsuit. For example, employees of the federal government can expect legal representation provided by their employer even in the event that the interests of the employee and the employer are in conflict. How many medical physicists are aware of the details of their institution's insurance coverage, or whether there is a policy protecting employees who are named in a lawsuit? What guaranty do a medical physicists have that their interests will be adequately represented by their institution? What if the interests of the institution and the medical physicist are in conflict, for example if the reputation of the institution can be preserved by assigning blame to a physicist?

Individual medical physicists are in the best position to assess their own level of risk, and decide if their institution's insurance and policies provide a adequate levels of protection against potential liability. However, in the event that a COMP member needs professional liability protection, the Professional Affairs Committee is in the process of working with an insurance provider to put together a package of insurance tailored to the needs of medical physicists. This provider, Aon Reed Stenhouse, is a large company with offices across Canada, who has established similar programs for the Canadian Association of Social Workers and the Canadian Counselling Association. Over the next couple of months we will be developing the details of the plan and finalizing the costs, with the goal of creating a link from the COMP website to a site with information and downloadable application forms. There will likely be several levels of coverage available, according to individual needs. This plan will be available only to COMP members, and will be entirely optional, with no costs or benefits to COMP as a whole. Members are encouraged to consider their own situation and needs for insurance coverage, and watch for further details of this plan in Interactions and on the COMP website.

Dave Wilkins
Councillor for Professional Affairs

1. Point / Counterpoint: "Medical physicists need professional malpractice insurance". M. Davis, J. Masten, W.R. Hendee, Medical Physics, **29**:1147, June 20

# CAMPEP Announces New Accreditation Fees

The Commission on Accreditation of Medical Physics Education Programs (CAMPEP) wants COMP Membership to be aware of an increase in fees. The fees affected relate to application for first time or renewal accreditation of either medical physics graduate education (pre-doctoral) or residency programs. Effective immediately the fee is now $ 4000. All questions should be directed to the appropriate Review Committee chair as listed on the CAMPEP website (www.campep.org)

Ed McCullough

# Exit Dosimetry: Quo vadis

**By Stephen Pistorius and Boyd McCurdy**

Medical Physics, CancerCare Manitoba
Department of Physics and Astronomy, Department of Radiology, University of Manitoba

**Introduction**

Since the first recorded radiotherapeutic procedure by Emil Grubbe in 1896, significant improvements in the localisation and treatment of cancer using ionizing radiation have occurred. It can however be argued that while the accuracy in the delivery of the dose to the tumour is today significantly better than it was in 1896 or even in 1976 our methods of verifying the dose delivered to the patient are not much changed. While the radiotherapeutic objective is essentially the same as it was over 100 years ago, the spatial and dosimetric accuracy and precision with which we are required to deliver the dose has increased significantly. This is particularly true for an era where 3D Conformal Radiotherapy (3DCRT) and Intensity Modulated Radiation Therapy (IMRT) is likely to increase in use. For tumour localisation we now routinely use three-dimensional fusion of MRI and CT images and more and more centres are starting to supplement this with PET imaging. Highly conformal, gated 3D treatments promise consistent treatment of the intended volume thereby minimising complications while allowing the probability of cure to be increased by boosting the target dose. All this however comes at a price. The quality assurance requirements at each stage of the radiotherapy process can be quite onerous and it is not clear if the criteria and techniques, that have been developed for 3D CRT, will be appropriate or sufficient for MLC based IMRT.[1] This leaves us with the question -- Quo vadis -- where are we headed, as far as exit dosimetry is concerned? With the technical and biological advances that we are likely to encounter in the coming years it is probably appropriate to view our destination as a horizon, visible as a beacon but never eliminating the need for continual discovery and improvement. However, before we can look at where we need to go, we need to establish where we are.

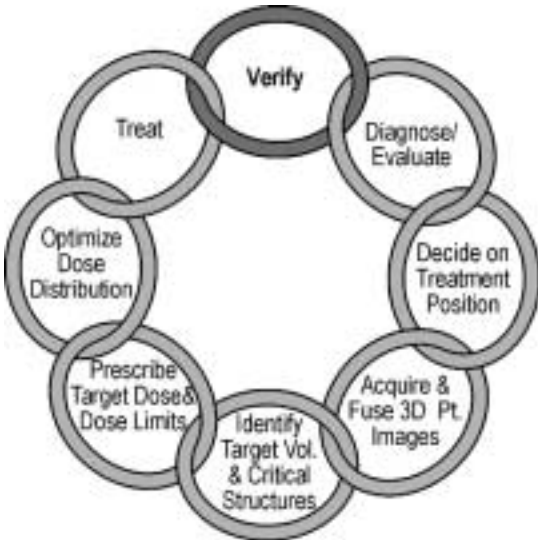



**Figure 1**: The radiotherapy process can be illustrated as a chain, with each link being a critical step in the process. The errors and uncertainties in each of these steps contributes to the overall accuracy and hence to the probability of a successful treatment. The ability to verify the treatment is crucial, and closing the chain allows us to evaluate the treatment and ultimately the clinical outcomes.

The current reality is, that while the improvements in 3D target localisation, treatment planning and treatment delivery have the potential to accurately conform the dose to our various constraints, the increased complexity in both the equipment and our techniques increases the probability for equipment and human error. In spite of the improvements to date, uncertainties in each of the various stages up to and including the actual delivery of the radiation are still in many cases less than ideal and the propagation of errors through the radiotherapy chain are often significant. When coupled with greater demands for dosimetric accuracy and precision, the need for real-time treatment verification becomes crucial. Ultimately, the only way of ensuring that the actual treatment given to the patient conforms to that prescribed, is to carry out real-time, in-vivo dosimetry. This is easier said than done.

**Treatment Verification**

Treatment verification techniques can be grouped into two broad categories. For many years, radiographic film and, more recently, electronic portal imaging devices (EPID's) have been used to verify geometric treatment set-up. Dose verification has historically been carried out using point dose detectors to estimate the dose being delivered from entrance and/or exit dose measurements. Point dose detectors, such as thermoluminescent detectors (TLD's), solid state (diode and MOSFET) detectors and miniature ionization chambers are used in many centres and are able to estimate the exit dose to an accuracy of ~3-5%, but only to a couple of points at a time. Unfortunately, these static dose measurements only serve to confirm the dose at those selected points and cannot easily be used to verify that the patient is, in general, being accurately treated. The complexity of 3DCRT and MLC-IMRT requires real-time dose verification at many points in 3D patient space if we are to ensure that the dose delivered by each field sums to produce the prescribed distribution. While film can provide high resolution 2D dose images for dosimetric treatment verification it has a non-linear dose response curve with the slope of the sensitometric curve being dependent on photon beam energy, depth and field size.[2] Its inability to produce real-time images also limits its usefulness for dynamic treatment verification. Even so, in the last decade we have seen some attempt to utilise film or film/screen combinations for dosimetric purposes.[3-5] The absolute accuracy of film under controlled circumstances can be as high as 5%. Unfortunately the high atomic number of the screen phosphor makes the detector sensitive to the number of low energy scattered photons detected, which in turn is dependant on the patient-detector geometry and design. Absolute dosimetry results also require close control of the development process, which is relatively long, and so film is more suited to relative measurements where real-time information is not required. In recent years, the emergence of area detectors with the potential for measuring dose,[6,7] together with a better grasp of the physics that allows the calculation of the expected exit dose for a particular

*(Continued on page 121)*

geometry,[8-14] is making real-time exit dose verification a reality. This promises to be the crucial link that will enable the radiotherapy chain (see figure 1) to be closed and may allow automatic real-time treatment verification, even for the most complex of cases.

**Electronic Portal Imaging Devices**

Although fluoroscopic detectors go back to the early 60's, the wide use of Electronic Portal Imaging Devices (EPID's), particularly for dosimetric verification is a more recent development.[15-19] Much of the recent impetus has come from a need to be able to monitor the changing leaf pattern and complex dose profiles found in Intensity Modulated Radiation Therapy (IMRT) systems.[20,21] While a number of research groups have shown promising dosimetric results using the earlier metal-phosphor fluoroscopic type of system, non-linearity's in the light detected by the camera relative to the dose, due in part to the optical glare, the poor quantum efficiency of the detector and the low probability of a light photon generated in the phosphor actually being detected by the camera, make these systems less than ideal for exit dose measurements. Various groups have developed scanning linear arrays of diodes, crystals or ionization chambers that are able to provide resolutions of 1 to 3 mm.[16] However, this type of detector will only see a small portion of the field at any one time, which not only decreases the detector efficiency but also reduces the value of this type of system for the verification of dynamically changing fields.

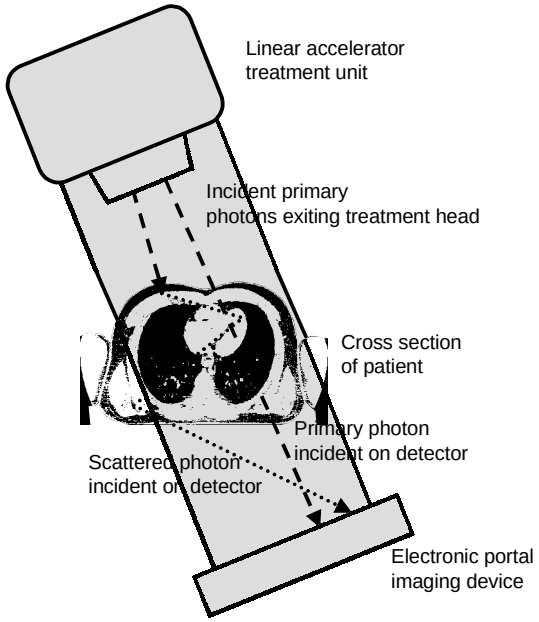



**Figure 2**: Illustration of treatment unit, patient, and exit dosimeter (electronic portal imaging device). Photons may undergo complex interactions within the patient before entering the detector, or may go straight through suffering no interactions at all.

Another approach to EPI has been to use a matrix of liquid ionization chambers that, unlike the bulky fluoroscopic systems, are thin and compact. However the most exciting recent development has been that of the amorphous silicon flat panel imager.[22] The detector can be used either in a "direct" mode or in an "indirect" mode where an overlying metal-phosphor screen is used to increase the efficiency of the detector by converting the incoming x-rays to optical photons. In this mode the close proximity of the phosphor screen to the detector plane provides a significant improvement in efficiency over that of fluoroscopic systems. While initial tests have shown that a-Si detectors have some clear advantages in terms of image quality, the high atomic number and the optical photon spread in the phosphor still provides challenges for accurate exit dosimetry. The availability of these flat panel imagers has also driven further development in megavoltage cone-beam CT. With the improvements in detectors and the availability of cone-beam CT algorithms, the required dose is getting smaller and image quality is improving. With the inclusion of more sophisticated scatter correction and dose deposition algorithms,[10,23] the use of EPID's to verify, not only the 3D patient geometry, but also the patient dose is close to becoming a clinical reality.

**Treatment Dose Verification Methods**

**Challenges**

Over the last 50 years, ongoing research efforts have advanced our understanding of the physics of radiation transport within the patient. This has lead to dramatic improvements in the accuracy of algorithms used to calculate the dose delivered to the patient. Only recently has significant effort been made to extend the dose calculation beyond the patient to include exit dosimeters, with current approaches concentrating on applications involving electronic portal imaging systems. Commercial EPID's are usually at some distance (20-60 cm) behind the patient (see figure 2). This introduces a variable air gap that many patient calculation algorithms cannot accurately account for and is the first of several challenges facing exit dosimetry algorithms. The transport of primary radiation is trivial, and can be calculated using ray-tracing techniques. The scattered radiation transport, on the other hand, is dependent upon the patient geometry and anatomy, incident photon beam characteristics, and size of the air gap.[8,10] For a large field size, close to the patient, the scatter can account for about 30% of the detector dose, decreasing to insignificant levels for small field sizes, far from the patient. In order to account for this, there have been several approaches proposed to calculate the scatter fluence. An additional problem lies in trying to accurately model the dose deposited in the detector system particularly in those designs that utilize high atomic number materials. Since most patient dose calculation approaches assume the patient is similar to water, one cannot simply apply previously developed patient dose algorithms to exit dosimetry. The energy dependence of these systems means that to accurately predict the dose deposited within the detector, the incident photon energy spectrum must be known. This is a simple calculation for the primary photons, but much more complex for the scattered photons. The last significant challenge for exit dosimetry algorithms is also shared by patient dosimetry calculations: we need to perform the most accurate calculation possible in a clinically feasible amount of time. Exactly how fast this needs to be done will depend on the approach that will be taken to validate the dose distributions.

**Methods**

Monte Carlo simulation has been widely used to study the

*(Continued on page 122)*

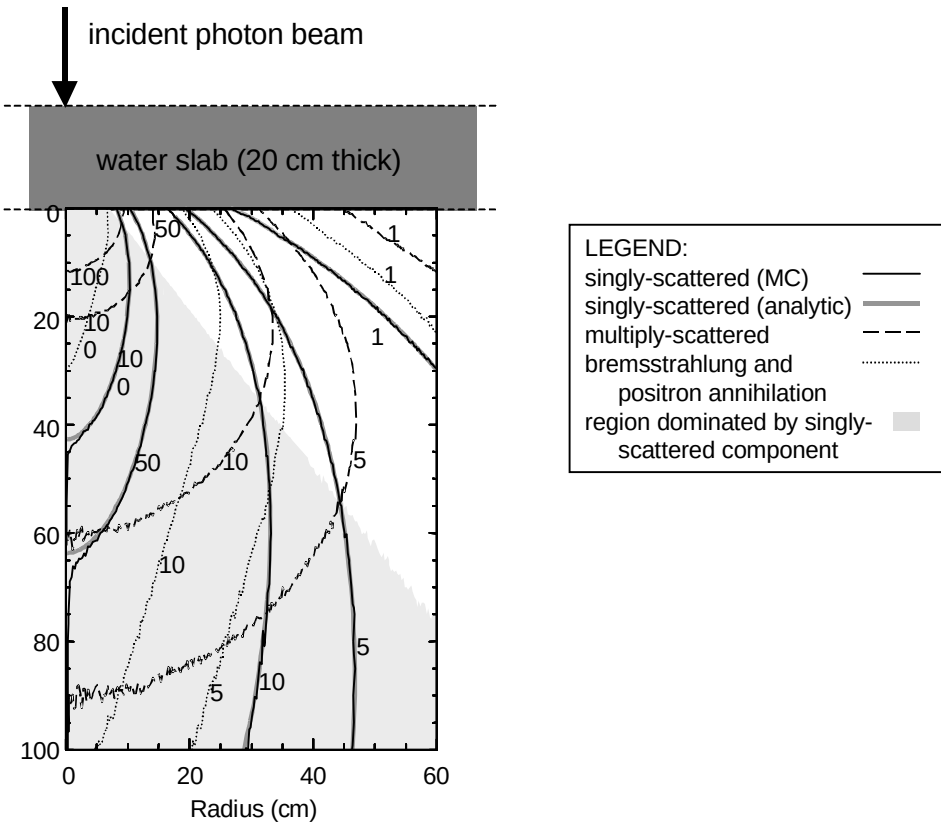



**Figure 3**: tour map of scattered photon fluence behind a 20 cm thick slab of water, due to an incident pencil beam of polyenergetic photons (24 MV). Contours are in units of $10^{-6}$ photons/cm$^2$/incident photon. The Monte Carlo results for the singly-scattered photon component compares well with the analytical calculations. The singly-scattered fluence dominates all other components of scatter in the shaded region.

radiation transport across the air gap that separates patient from detector,[8-11] and to characterize the response of the exit dose detector to incident radiation.[8,13,14,24,25] Since the photon scatter generated within the patient is complex, dependent upon patient anatomy and incident beam shape and energy, simpler scenarios such as an infinitesimally narrow photon beam incident upon a homogeneous and uniformly thick slab of water are simulated to elucidate the underlying physics. This gives insight into the composition and magnitude of the resulting photon scatter pattern, and we see how this changes with increasing distance between the detector and the patient (figure 3). In this example, a polyenergetic spectrum of photons typical of a clinical, 24 MV linear accelerator is incident upon a 20 cm thick, homogeneous slab of water. The resulting pattern of scattered photons emanating from the water has been tracked to identify the manner in which the photon was created. Compton scattered photons (singly- and multiply-scattered), bremsstrahlung and positron annihilation photons have been followed. These Monte Carlo results have been partially validated by comparing the singly scattered result to exact analytical calculations. The region where singly scattered photons dominate the total scattered photon fluence is shown by shading, and the pattern indicates a geometric dependence. This example reveals the relative importance of the bremsstrahlung and positron annihilation photons, which is in contrast to the results for a 6 MV beam, where this scatter component is negligible.

Monte Carlo simulation is also very useful for characterizing the response of complex detector systems to radiation. Detector systems often consist of thin, multiple layers of a variety of materials. Since many of these materials are of a much higher atomic number than the patient, incident radiation behaves differently in these detectors than it would in the patient. Monte Carlo simulation of the radiation transport within the detector has been employed to characterize the energy response of the detector. By plotting the total deposited energy versus the incident photon energy, the detector response curve is attained. Several Monte Carlo calculated detector response curves are given in figure 4. These illustrate the difference in radiation response between water equivalent detectors and higher atomic number detectors, specifically the increased importance of the photoelectric cross section in the high atomic number detectors.

**Exit Dose Algorithms**

Initial attempts to calculate exit dose involved applying a patient dose algorithm to include both patient and exit dosimeter in the calculation space. This approach achieved good results under restricted situations (small air gaps of 5 cm, and using a water equivalent detector)[26] but becomes less accurate for air gaps of 10 cm

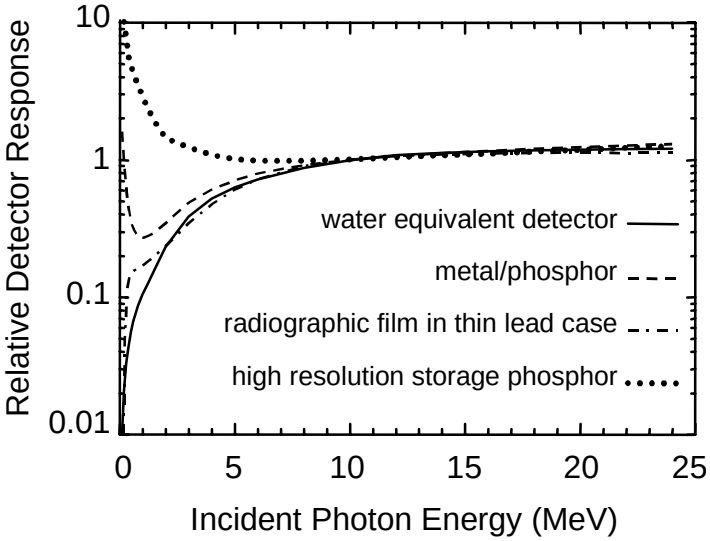



**Figure 4**: Energy response of a variety of portal imaging detectors. The most common design is the metal/phosphor type, where a layer of scintillating phosphor converts deposited radiation energy to optical photons, which then form an image. Notice the significant increase in detector response for incident photons below ~1 MeV, due to an increase in the photoelectric interaction cross section.

*(Continued on page 123)*

or more. Furthermore, almost all patient dose algorithms assume the radiation energy is deposited in water, while the most common portal imaging designs incorporate high atomic number materials (i.e. metal/phosphor).

The three-dimensional, superposition algorithm has been applied to the exit dosimetry problem with good results demonstrated for a water equivalent detector at large air gaps.[27] Currently, work needs to be done to extend this approach to the high atomic number materials that comprise most commercial portal imaging systems, where the underlying assumption that dose is being deposited in water leads to significant errors.[28] Variations of the three-dimensional superposition approach exist,[29, 30] where only the single Compton scattered component of the total photon scatter is calculated. These approaches are purely analytical, taking advantage of the well-known equations describing Compton kinematics, Klein-Nishina cross-sections, and the inverse square effect. While providing an exact solution for singly scattered photon fluence entering a detector, multiply scattered photons are ignored, so in practice the detector must be far enough away from the patient so that the multiply-scattered component is negligible.

Another exit dose calculation technique involves the application of pencil-beam scatter kernels. These are similar to the point-interaction scatter dose kernels discussed above, but describe the scatter distribution behind a uniform water slab resulting from an incident, narrow ('pencil') beam of photons. When these scatter kernels are convolved (in 2D) with the incident beam fluence map, the distribution of scatter dose in the exit dosimeter is obtained. There have been several approaches taken to obtain these scatter kernels. One method is to perform a large number of measurements and analyse the data to derive experimentally based scatter dose kernels, valid for a specific detector[31]. Another approach is to employ Monte Carlo simulation techniques to calculate these kernels.[32] Alternatively, one may exactly calculate the singly-scattered component of the pencil beam scatter fluence kernels analytically, and approximate the multiply-scattered fluence component.[33] Recently, it has been demonstrated that the calculation may be more easily generalized by separating the scatter fluence calculation from the detector dose calculation (i.e. converting incident fluence to dose.)[13] In this technique, pencil beam scatter fluence kernels are used to calculate the patient scatter fluence entering the detector,[10,12] which is subsequently integrated with pencil beam dose kernels describing the conversion of incident fluence (both primary and scatter) to dose within the detector system.[13,14] By separating the algorithm into two steps, we can easily tailor the dose conversion portion to any of the variety of available detector systems.[13,14] Figure 5 contains example images for a 6 MV photon beam incident on the chest of a humanoid phantom, with a detector located approximately 20 cm below the exit surface of the phantom. In these images the heart is visible between the two lungs, the regular, horizontal lines in the images being due to the phantom being sectioned in transverse slices. Errors in alignment show up as sharp edges in the difference image. The quality of comparison between the measured and calculated images is within recommended clinical tolerances.[34,35] This approach could also be used to calculate scatter estimates in order to improve the image quality for megavoltage and cone-beam reconstruction computed tomography.[13,23]

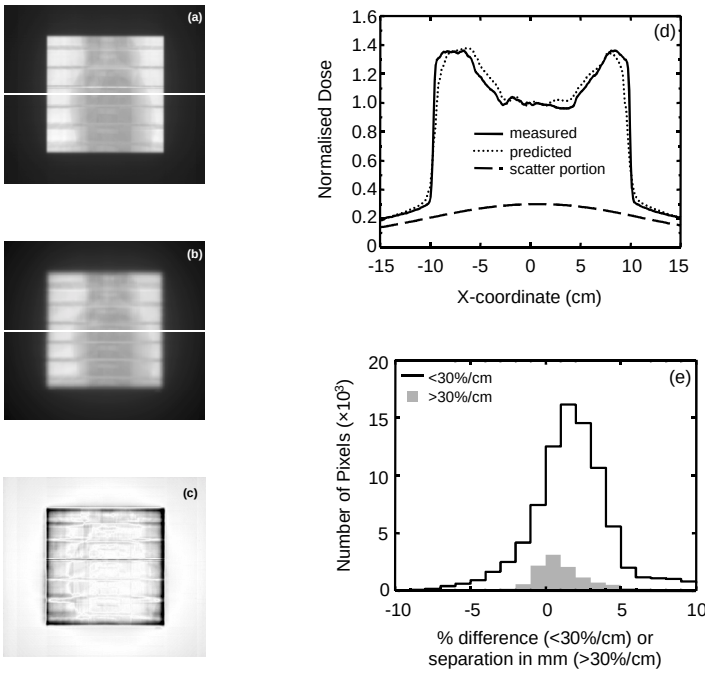



Figure 5: Data for a 15×15 cm$^2$, 6 MV photon field, incident on the chest of a humanoid phantom. The images include the measured image using an electronic portal imaging system (a), the calculated image using the algorithms developed by McCurdy and Pistorius (b), and the difference between the measured and calculated images (c). Comparison profiles valid at the horizontal line in (a) and (b) are presented in (d), where the importance of the scatter dose is evident. Histogram analysis of the difference image is presented in (e), where the analysis is divided into two regions representing low dose gradient (<30%/cm) and high dose gradient (>30%/cm). Low dose gradient pixels are compared in terms of differences in percentage dose. The high dose gradient region corresponds to edge features in these images, and these pixels are compared in terms of millimeters of separation (i.e. how far apart is a particular edge in the images).

Finally, one could apply Monte Carlo simulation techniques to calculate the dose deposited in any exit dosimeter. But, as with patient dose calculations via Monte Carlo methods, real time exit dosimetry calculations are not yet clinically feasible due to the long calculation times involved. The length of calculation time required to solve the exit dosimetry problem is compounded by the extremely small volumes of the detectors (thicknesses often < 1 mm), which require more incident particles to be simulated to achieve a solution within a given statistical uncertainty. Also, the number of primary and secondary particles incident on the detector decrease with increasing detector-patient distance, again requiring more incident particles to obtain a given level of accuracy in the simulated result.

**Conclusions**

The evolution of portal imaging technology has lead to us to the cusp of having area-detection systems capable of acquiring

*(Continued on page 124)*

real-time, digital, dose weighted images of the patient that, with correct interpretation, will be able to identify dosimetric errors during cancer treatment. Recent advances in the understanding of scattered photons emanating from the patient and image formation in portal image detectors, have allowed predictive algorithms to be successfully validated. To fully utilize portal imaging technology for dose verification and not just geometric verification, it is critical that we be able to predict the image formed in the detector system and then to be able to compare and interpret the differences that occur. This is an area ripe for investigation particularly if we want to be able to identify any deficiencies in MLC based IMRT treatments. This comparison and interpretation will need to occur in real-time, to allow correction of dynamic treatments. Expert systems or artificial intelligence algorithms may be the only approaches powerful enough to not only quantitatively assess measurable differences, but more importantly to intelligently interpret these differences and recommend corrective action(s).

Furthermore, by reversing the predictive algorithms or applying them iteratively with feedback mechanisms, one may potentially back-project a measured portal image into a 3D patient dose distribution, estimating what dose was actually given. Unfortunately, this simple approach relies on the (incorrect) assumption that the patient anatomy acquired in the CT simulator does not change during the course of treatment. However, by combining a megavoltage CT acquisition at various intervals during a treatment course, one may gain enough new patient information to re-optimize the treatment plan. Alternatively, one could describe the patient anatomy with deformable models, and have these models adjusted based on an evaluation as to the cause of measured versus predicted image differences. Both of these approaches lead to the concept of 4D-planning, where treatment plans are adjusted to compensate for changes in the patient as the several weeks of treatment time elapse.

While the challenges are still significant, the rewards are greater, with the potential for "elimination of all procedural errors in radiotherapy treatments."[15] Future utilization of area-dosimetric information may be include feedback via 4D planning to allow significant improvements in overall dosimetric accuracy, which in turn may lead to improvements in patient outcome.[36] Much effort has been spent in overcoming the bulk of these challenges, and once we are able to identify the source and importance of the errors which lead to differences between measured and predicted dose images, we will truly be able to argue that we have closed the radiotherapeutic chain.

**Acknowledgement**

This article is, in part, based, on the article by B. McCurdy and S. Pistorius entitled, "Exit Dosimetry: Closing the Radiotherapy Chain" which was published in Physics in Canada, Volume 58, pp 71-77, 2002.

*References*

1. Low DA.. "Quality assurance of intensity-modulated radiotherapy" Semin Radiat Oncol 12(3): 219-28 (2002).
2. Danciu C, Proimos BS, Rosenwald JC, Mijnheer BJ., "Variation of sensitometric curves of radiographic films in high energy photon beams" Med Phys 28(6): 966-74 (2001).
3. Fiorino, C., del Vecchio, A., Cattaneo, G. M., Fusca, M., Longobardi, B., Signorotto, P., and Calandrino, R., "Exit dose measurements by portal film dosimetry," Rad.Oncol. 29:336-340 (1993).
4. Ebert M, Kron T., "Portal films for relative exit dose determinations" Australas Phys Eng Sci Med 17(2): 71-8 (1994).
5. Stasi M, Casanova Borca V, Fiorino C. "Measurements of exit dose profiles in 60Co beams with a conventional portal film system," Br J Radiol. 70(840):1283-7 (1997).
6. Webb, S., *The Physics of Three-Dimensional Radiation Therapy*, Institute of Physics Publishing, Bristol, 1993.
7. Shalev, S., "Megavoltage Portal Imaging", in *Teletherapy: Present and Future*, edited by J. Palta, and T. Mackie, Advanced Medical Publishing, Madison, USA, 1996, pp. 445-469.
8. Jaffray, D.A., Battista, J.J., Fenster, A., and Munro, P., "X-ray scatter in megavoltage transmission radiography: physical characteristics and influence on image quality," Med. Phys. 21:45-60 (1994).
9. Swindell, W, and Evans, P.M., "Scattered radiation in portal images: a Monte Carlo simulation and a simple physical model," Med. Phys. 23, 63-73 (1996).
10. McCurdy, B.M.C., and Pistorius, S., "Photon scatter in portal images: Physical characteristics of pencil beam kernels generated using the EGS Monte Carlo code" Med. Phys. 27(2):312-320 (2000).
11. Yeboah, C. and Pistorius, S., "Monte Carlo studies of the exit photon spectra and dose to a metal/phosphor portal imaging screen", Med. Phys. 27(2): 330-339 (2000).
12. McCurdy, B.M.C., and Pistorius, S., "Photon scatter in portal images: Accuracy of a fluence based pencil beam superposition algorithm" Med. Phy. 27(5): 913-922 (2000).
13. McCurdy, B.M.C., and Pistorius, S., "A two step algorithm for predicting portal dose images in arbitrary detectors" Med. Phy. 27(9):2109-2116 (2000).
14. McCurdy, B.M.C., Luchka, K., and Pistorius, S., "Dosimetric investigation and portal dose image prediction using an amorphous silicon electronic portal imaging device" Med. Phy. 28(6):911-924 (2001).
15. Leong, J. "Use of digital fluoroscopy as an on-line verification device in radiation therapy", Phys. Med. Biol. 31:985-992 (1986).
16. Boellaard R, Essers M, van Herk M, Mijnheer BJ., "New method to obtain the midplane dose using portal in vivo dosimetry" Int J Radiat Oncol Biol Phys 41(2): 465-74 (1998).
17. Pasma KL, Kroonwijk M, Quint S, Visser AG, Heijmen BJ., "Transit dosimetry with an electronic portal imaging device (EPID) for 115 prostate cancer patients" Int J Radiat Oncol Biol Phys 45(5): 1297-303 (1999).
18. Bogaerts R, Van Esch A, Reymen R, Huyskens D., "A method to estimate the transit dose on the beam axis for verification of dose delivery with portal images" Radiother Oncol 54(1): 39-46 (2000).
19. Broggi S, Fiorino C, Calandrino R., "A simple and robust method for in vivo midline dose map estimations using diodes and portal detectors" Radiother Oncol 58(2): 169-78 (2001).
20. Webb, S., *Intensity-Modulated Radiation Therapy*, Institute of Physics Publishing, Bristol, 2001.

*(Continued on page 125)*

21. Ploeger LS, Smitsmans MH, Gilhuijs KG, van Herk M., "A method for geometrical verification of dynamic intensity modulated radiotherapy using a scanning electronic portal imaging device" Med Phys 29(6): 1071-9 (2002).
22. Munro P., "Portal Imaging Technology: Past, Present, and Future" Semin Radiat Oncol 5(2): 115-133 (1995)
23. Spies L, Ebert M, Groh BA, Hesse BM, Bortfeld T., "Correction of scatter in megavoltage cone-beam CT" Phys Med Biol 46(3): 821-33 (2001).
24. Keller, H., Fix, M., Ruegsegger, P., "Calibration of a portal imaging device for high-precision dosimetry: a Monte Carlo study", Med. Phys. 25:1891-1902 (1998).
25. Kausch, C., Schreiber, B., Kreuder, F., Schmidt, R., and Dössel, O., "Monte Carlo simulations of the imaging performance of metal plate/phosphor screens used in radiotherapy" Med. Phys. 26(10):2113-2124 (1999).
26. Wong, J.W., Slessinger, E.D., Hermes, R.E., Offutt, C.J., Roy, T., and Vannier, M.W., "Portal dose images I: quantitative treatment plan verification," Int. J. of Radiat. Oncol. Biol. Phys. 18:1455-1463 (1990).
27. McNutt, T.R., Mackie, T.R., Reckwerdt, P., and Papanikolaou, N., "Calculation of portal dose using the convolution/superposition method," Med. Phys. 23(4): 527-535 (1996).
28. Sauer, O.A., "Calculation of dose distributions in the vicinity of high-Z interfaces for photon beams," Med. Phys. 22(10):1685-1690 (1995).
29. McCurdy, B.M.C., and Pistorius, S. "Analytical Prediction of First Scatter Energy Fluence into a Portal Imaging Device", 5th International Workshop on Electronic Portal Imaging, [abstract] (1998).
30. Ozard, S.R., Grein, E.E., "Analytical calculation of the portal scatter to primary dose ratio: an EGS4 Monte Carlo and experimental validation at large airgaps" Phys. Med. Biol. 46: 1719-1736 (2001).
31. Pasma, K.L., Heijmen, B.J.M., Kroonwijk, M., and Visser, A.G., "Portal dose image (PDI) prediction for dosimetric treatment verification in radiotherapy. I. An algorithm for open beams," Med. Phys. 25(6):830-840, (1998).
32. Hansen, V.N., Swindell, W., and Evans, P.M., "Extraction of primary signal from EPIDs using only forward convolution," Med. Phys. 24(9), 1477-1484, (1997).
33. Spies, L., and Bortfeld, T., "Analytical scatter kernels for portal imaging at 6 MV" Med. Phys. 28(4): 553-9 (2001).
34. International Commission on Radiation Units and Measurements. *Determination of Absorbed Dose In a Patient Irradiated by Beams of X- or Gamma Rays In Radiotherapy Procedures*. Report No. 24, Bethesda, Maryland, U.S.A., 1976.
35. American Association of Physicists in Medicine. *Quality Assurance for Clinical Radiotherapy Treatment Planning.* Report No. 62, College Park, Maryland, USA, 1998.
36. Boyer, A.L, and Schultheiss, T., "Effects of dosimetric and clinical uncertainty on complication-free local tumor control,", Radiother. Oncol. 11:65-71 (1988).

# Canadian Physicists Awarded at AAPM 2002

### *Young Canadian Investigators Swept Prizes at AAPM YIS 2002*

In accordance to the traditional strong presence and performance of Canadians at AAPM Young Investigators Symposium, there were 5 Canadians among the 12 finalists at YSI in the July AAPM meeting in Montreal. This year, young Canadian investigators didn't do a good job – but a superb one! In fact, Canadians swept all three prizes! The 1st prize winner was Deidre Batchelar of London Regional Cancer Centre and Robarts Research Institute in London, 2nd prize winner was Parminder Basran of Tom Baker Cancer Centre in Calgary and the 3rd prize went to Seemantini Nadkarni of Robarts Research Institute in London. The titles of their talks are as follows:

1. Imaging Bone Mineralization Using Coherently Scattered X Rays – D. Batchelar, I. Cunningham
2. Functional CT with a Conventional Scanner to measure Regional Lung Perfusion – P. Basran, I. Kay, D. Spencer
3. Retrospective Cardiac Gating for Three-Dimensional (3D) Intravascular Ultrasound (IVUS) Imaging Using an Image-Based Technique – S. Nadkarni, D. Boughner, A. Fenster

*Congratulations to all three of them and we are very proud of our new generation of medical physicists in Canada!*

From left to right: Seemantini Nadkarni, Deidre Patchelar and Parminder Basran (picture provided by Patricia Lindsay)

### *Canadian Physicist Awarded with AAPM Fellowship*

Dr. Peter Dunscombe of Tom Baker Cancer Centre in Calgary was awarded with the AAPM Fellowship at this year's AAPM meeting. The AAPM Fellowship is to honor "members who have distinguished themselves by their contributions in research, education, and leadership in the medical physics community."

### *Canadian Physicists Received Farrington Daniels Award*

Drs. David Jaffray and Jeffrey Siewerdsen of Princess Margaret Hospital/Ontario Cancer Institute in Toronto were co-recipients of this year's Farrington Daniels Award which is awarded to the best paper in dosimetry published in Medical Physics in 2001. The award winning paper is entitled "High Resolution Gel-dosimetry by Optical-CT and MR Scanning" by M. Oldham, J.H. Siewerdsen, A. Shetty and D.A. Jaffray.

# William Que Awarded Elekta Award of Excellence

Dr. William Que from the medical physics department at the Toronto Sunnybrook Regional Cancer Centre has received the Elekta Award for Excellence. This award is given by the American College of Medical Physics for the best Radiation Professional Paper published during 2001. Dr. Que received the award for his paper "Radiation Safety Issues Regarding the Cremation of the Body of an I-125 Prostate Implant Patient", published in the Journal of Applied Clinical Medical Physics.

Peter O'Brien

# McGill Medical Physics Unit Reunion

**By Michael Evans**
Medical Physics Unit, McGill Iniversity

The recent AAPM annual meeting held in Montreal this year was an occasion for many of us to re-acquaint ourselves with old friends and colleagues working across North America and beyond. To take advantage of this opportunity, the Medical Physics Unit of McGill University hosted an alumni reunion on Sunday July 14, 2002, for graduates and staff associated with the MPU over the last quarter century. The reunion was held on familiar territory at the Livingston lounge of Montreal General Hospital. Due to the already full scheduling of AAPM the reunion began at 9 pm, and a light buffet was served. Staff and alumni were welcomed by Dr. Podgorsak and a rogues gallery showing old and recent photos of the invitees, as collated by Francois Deblois, played in the background. Alumni were invited (forced?!) to pose with Dr. Podgorsak for a photo-op beginning with the first graduates of the MPU (Sherry Connors and George Mawko : 1981) and continuing to the most recent group of current students scheduled for graduation this year. As well a group photo was taken with the Ph.D. graduates from the program, and present and past staff. A selection of photos appears below. Of the 110 M. Sc. and 17 Ph.D. graduates the MPU has produced to date, most were contacted and it was estimated that about 60 were able to participate in the reunion. In addition another 10 ex-staff members were able to attend. Comments were made on the success of the program in placing graduates all over North America and Ms. Margery Knewstubb, the graduate secretary, was thanked for keeping everyone in line. Dr. Geoff Dean insisted on a rebuttal – and in turn thanked Ervin for his many efforts over the years on behalf of the MPU, and the medical physics community in general. On a sad note, it was brought to the attention of the guests that the founder of the Medical Physics Unit, Dr. Montague Cohen, had recently passed away, and a moment of silence was held in his honour. The evening was a pleasant way of recognizing the achievements of both the MPU program and its alumni, and who knows, it may perhaps become a scheduled event at future AAPM meetings!

Michael Evans :M.Sc. 1985.

*(Continued on page 130)*

Figure 1: 1981 graduates Sherry Connors and George Mawko with E.B. Podgorsak and Mrs. Mariana Podgorsak (seated).

Figure 2: 1991 graduates Chantal Audet, Katharina Sixel and Brennan Mac-Donald.

Figure 3: M.Sc. and Ph.D. hopeful graduates for 2002.

Figure 4: Ph.D. graduates along the years: Martin Lachaine, George Mawko, Noel Blais, Gino Fallone, Francois Deblois, Chantal Audet, Corey Zankowski, Katharina Sixel, Tony Falco and Brennan MacDonald.

Figure 5: Past and present staff.

# Sylvia Fedoruk Award – 2002

In 1986, the Saskatchewan Cancer Agency established the Sylvia Fedoruk Prize in Medical Physics to honor Sylvia Fedoruk for her 35 years of dedicated and distinguished service to Saskatchewan's cancer program as a Medical Physicist.

This award is presented for the best paper on a subject falling within the field of medical physics, relating to work carried out wholly or primarily within a Canadian institution and published during the past calendar year. This is the fourteenth year the prize has been awarded.

## *Winner:*

"Dosimetric investigation and portal dose image prediction using an amorphous silicon electronic portal imaging device"
Med. Phys. 28: 911-924 (2001)
**B.M.C. McCurdy[a], K. Luchka[b], and S. Pistorius[a],**
CancerCare Manitoba[a] and BC Cancer Agency[b]

### *Runners-up:*

"On few-view tomographic reconstruction with megavoltage photon beams"
Med. Phys. 28, 1679-1688
**Stephen Loose and Konrad Leszcynski**

"A two-source model for electron beams: Calculation of relative output factors"
Med. Phys. 28, 1735-1745
**J.Z. Chen, J. VanDyk, C. Lewis, and J.J. Battista**

*!!! Congratulations !!!*

# Canadian College of Physicists in Medicine Examination Schedule 2003

**Membership Examination:**

Applications due: 10 January 2003
Examination date: 15 March 2003
Fee: $150.00

Decisions will be announced on February 7

**Fellowship Examination:**

Applications due: 11 April 2003
Examination date: 4-June 2003
Fee: $200.00 (in Edmonton)

Decisions announced on May 6. (or later for those who do the membership exam)

Note: The application forms, exam study guide, and sample exams are available on the COMP web site under the heading "Certification with CCPM". All new candidates for membership and fellowship must use the new (dated 2003) application forms.

For further information contact the Registrar:

**Dr. Christopher Thompson. Registrar, CCPM**
**Montreal Neurological Institute. # 798**
**3801 University St.**
**Montreal, Quebec, H3A 2B4**

**Christopher.Thompson@McGill.Ca**

# CCPM Chief Examiner's Report

## July 14, 2002

**By Ting Lee**

**Membership Examination**

| | | | |
|---|---|---|---|
| 20 | Candidates from 12 Canadian centres, 1 US | 12 | Pass |
| 19 | Radiation Oncology | 8 | Fail |
| 1 | Nuclear Medicine | 60% | Pass |

Pass candidates: Gill Bradford, Abdelhamid Saoudi, Glenn Wells, Cynthia Araujo, Joseph Hayward, Michelle Hilts, Marc MacKenzie, Heather Thompson, Larry Watts, David Choi, Paul Mobit, Paul Ravindran

Invigilators: Narayan Kulkarni, Jim Meng, Jean MacPhee, Alex Vitkin, David Wilkins, Ting-Yim Lee, Narinder Sidhu, David Spencer, Ron Sloboda, Brenda Clark, Darcy Mason, and Rasika Rajapakshe

Examination Committee: Peter Dunscombe, Jerry Battista, Jake van Dyke, Rob Barnett, George Mawko, Katharina Sixel, Ting-Yim Lee

*All successful candidates were elected Members of the Canadian College of Physicists in Medicine at the Annual General Meeting on July 14, 2002 in Montreal*

**Fellowship Examination,**

| | | | |
|---|---|---|---|
| 4 | Pass | 4 | Fail |

Pass Candidates: Miller MacPherson, William Parker, Horacio Patrocinio, Craig Lewis

*All successful candidates were elected Fellows of the Canadian College of Physicists in Medicine at the Annual General Meeting on July 14, 2002 in Montreal.*

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

# EPI2K2 – A Big Pain in the Butt!

**By Peter Munro,**
**Ginzton Technology Center, CA**

The EPI2K2 International Workshop on Electronic Portal Imaging was held 27th-29th June 2002 at the University of British Columbia in Vancouver, BC. This represents the 7th such workshop and the first time that the meeting has been held in Canada. The meeting had 171 attendees from 12 countries, 46 proffered oral presentations, six refresher courses, six invited presentations, 16 posters, and seven presenters who received travel awards. More information about the meeting can be found at http://www.epi2k2.ca. Organized by Rasika Rajapakshe with much help from Kurt Luchka, Shlomo Shalev and a large group from various British Columbia cancer centres, the many international visitors came away with a very positive impression of Canadian hospitality. Indeed, the only complaint raised was about the hard wooden seats in the lecture hall that made sitting for extended periods quite painful.

Rasika Rajapakshe receives a signed T-shirt from the scientific committee in recognition of his outstanding organization of the EPI2K2 workshop, as Kurt Luchka looks on. Note the infamous "pain in the butt" seats on the right hand side of the photograph.

Talking about pains in the butt, one of the recurring themes at the meeting was the use of prostate marker seeds to monitor motion of the prostate during radiation therapy. Eleven of the 46 proffered oral presentations mentioned prostate markers in either their title or abstract and about five other papers had some reference to marker seeds in their presentations. At the end of the conference, Paul Blood - one of the invited speakers, added slides of prostate marker seeds randomly to his presentation, just to be part of this dominant theme of the meeting. In addition to implanted marker seeds, another device, called Beam Cath™ was described. This is a catheter containing an inflatable balloon and radiopaque markers that can be placed in the urethra. Once inserted, the balloon is inflated and one end of the catheter is attached to a pulley and weight system to apply a well defined force on the catheter. This force is aimed at to positioning the catheter and its markers at the same location relative to the prostate from day-to-day. Photographs of the system had most of the audience (the male portion, anyway) grabbing at their groins for protection, since the system looked like a medieval torture device!

There was a surprising consensus about the importance of organ motion in increasing the uncertainty in target volume positioning. Many studies showed that uncertainties due to prostate motion are equal in magnitude to set-up uncertainties, with most prostate motion in the anterior-posterior and superior-inferior directions. Left-right motion was generally much smaller. This is consistent with the base of the prostate being attached to the pubic symphysis and rotating about this fixed point. Three presentations (two from UCSF) compared the use of the BAT transabdominal ultrasound with prostate marker seeds. All of the talks concluded that the BAT device had only small benefits and one talk concluded that BAT ultrasound was "not accurate enough for high precision IMRT". Problems included inter-observer variability in identifying the correct location of the prostate, difficulties with obese patients, and the inability to account for rotations of the prostate about its base – BAT only corrects for translations. This is quite a disappointment, not only for the manufacturer, but also for patients desiring a non-invasive method of identifying prostate position. I believe that transabdominal ultrasound can have an important role in radiation therapy, but clearly the quality of the ultrasound images and the ability to identify the boundary of prostate must improve considerably for this to be possible.

One of the most noticeable advances from previous workshops is image quality. Amorphous silicon imagers are becoming the standard with Varian Medical Systems (aS500), Elekta (iViewGT) and Siemens Medical Solutions (un-named) all offering, or about to offer, electronic portal imaging devices (EPIDs) based on amorphous silicon flat panel imagers. Both the Siemens and the Elekta panels are manufactured by Perkin-Elmer (formerly EG&G Amorphous Silicon) while Varian manufactures its own panel. One presentation compared the performance of these three systems. The Siemens and Elekta systems perform similarly but not identically, since Siemens is testing various metal plate and phosphor screen combinations, including a system without a front metal plate. Because the pixel size is 0.40 mm x 0.40 mm, the Perkin Elmer panel exhibited better spatial resolution than the Varian panel (pixel size 0.78 mm x 0.78 mm) when the test phantom was placed on the surface of the image receptors. However, when the phantom was placed at the isocentre, to measure the performance of the entire imaging chain (x-ray source + image receptor), the performance of all of the systems was similar. Clearly, most – but perhaps not all – of the advantage of smaller pixels is lost when geometric penumbra is included in the image performance tests. Probably of much more importance than pixel size is how the timing of imager readout and accelerator pulsing is co-ordinated. In this area Siemens appears to have an edge. In one of its readout modes the imager readout is turned off while a short irradiation is delivered and then one image frame is

*(Continued on page 135)*

**EPI2K2** *(Continued from page 134)*

readout from the imager. This is identical to the "pulse progressive, target integration" readout method that Aaron Fenster and I developed for TV camera-based EPIDs about 15 years ago. The advantage is that only a small radiation exposure is required to generate high quality images, making this mode of operation ideal for localization (e.g., double exposure imaging).

One of the goals of the meeting is to encourage clinical use of EPIDs and so the organizers encourage talks from therapists that describe how these devices have been employed clinically. One of the keys appears to be making sure that EPIDs are seen as a tool to help therapists/radiographers set-up their patients better and not simply as a convenient way to replace portal films, which are reviewed later by radiation oncologists. The main advantage of EPIDs is their rapid feedback about patient positioning, which is wasted if one needs to wait for approval by the radiation oncologist. This represents a major change in philosophy that is well accepted in Europe, especially the Netherlands, is becoming accepted in Canada, but is not yet well accepted in the USA. There were some encouraging signs, however, including one presentation from Mollie Pelliegrino, a therapist from the Mayo Clinic, which described a "physician-directed therapist intervention" protocol. This protocol empowered the therapists to identify patients with large set-up variability whose positions could be measured and adjusted without direct intervention by the radiation oncologist. If portal imaging is to become clinically meaningful technology, therapists will have to become the end-users of the information generated by the EPIDs.

In addition, to the above topics, there were a wide variety of other topics presented including: Q/A of EPIDs, Q/A of accelerator performance using EPIDs, megavoltage cone-beam CT, Monte Carlo modeling of EPID response for portal dosimetry, and verification of IMRT delivery using EPIDs. Clearly, there were a wide variety of topics presented.

In many ways this conference was similar to a COMP meeting and these similarities contributed to its success. All meals, including a sumptuous conference banquet aboard a cruise ship called the MV Britannia, were included in the relatively modest registration fee; the meeting lasted for 3 days with no parallel sessions; the meeting was held on a university campus so that most attendees could find accommodation close to each other; the moderate number of attendees made finding colleagues at the meeting easy; and plenty of time was set aside for informal discussions during coffee and lunch breaks. Although it is very difficult to quantify, the impression that I received at the end of the meeting was that most attendees, and certainly all of the scientific program committee, were very impressed with the social and scientific aspects of the conference. Given its success, I am sure that many people are looking forward to EPI2K4, which is tentatively scheduled for 29th June - 1st July, 2004 at the University of Sussex, Brighton, U.K.

**COMP Chair** *(Continued from page 112)*

Organisation. Every year, positions are available on the Executive and/or its Committees and we are always looking for new blood to help us in our work. So don't be shy, there will always be room for individuals who want to get involved.

P.S. This is the first of my messages to the membership as Chair of COMP. I have always read the messages from the previous Chairs and wondered how many members actually read this column. If you have read all the way to the end, how about sending me an e-mail to let me know. No text required just a title "COMP Chair Message". Stay tuned to hear the results!

Clément Arsenault, Chair of COMP

**CCPM President** *(Continued from page 113)*

cists working in these fields is rare and clearly we are not addressing the needs of this section of the medical physics community. ***Terry Peters*** has agreed to provide a focal point for discussions on this topic. If you have any suggestions or comments that could help, please contact him.

Recently, we have received ***applications for membership from outside North America*** and while we do consider these applications carefully, I must remind applicants that the CCPM requires three references, one of which must be from a Fellow of the CCPM or a medical physicist certified by the ABR or the ABMP.

Lastly, I am pleased to announce that, due to major efforts by the Board over the last 2 years, we have completed the first version of a ***CCPM Policies and Procedures*** document. Although writing these policies was not an exciting task and led to somewhat heated discussion on several occasions, this document will undoubtedly prove essential for the smooth running of the CCPM. I would like recognise the foresight and effort of ***Peter Dunscombe*** to initiate the work and write the first draft and ***Alistair Baillie*** for compiling the first edition.

There has been some discussion recently on whether these editorials are read by the membership. In this message, I have attempted to raise awareness of some of the issues facing the CCPM. Please feel free to contact me at any time on any of these or other issues that you believe we, as your elected representatives, should be addressing.

Brenda Clark

# Pictures from Annual COMP Meeting

# Pictures from Annual COMP Meeting

# From The Editor:

In Saskatoon, the river bank has begun to turn a golden hue that warns of the muting of summer's rampant greening; the neighborhood furnaces yawn and creak as they are awakened by the shrill call of the frosted autumn lawns. Hey!, even a newsletter editor has his moments of prose, don't ya know.

To me, fall is a time for change, and this would also seem to be true also for the COMP and CCPM membership as we welcome new members and executive. InterACTIONS has also been affected. Lara Rodriguez will be leaving the editorial board and will be devoting her time and energy to being a new mother. We would like to thank Lara for managing the advertising for InterACTIONS. This can be a very time consuming effort and Lara's help is very much appreciated. Mike Henry will be the new contact for advertising in InterACTIONS and I thank him for taking on this responsibility.

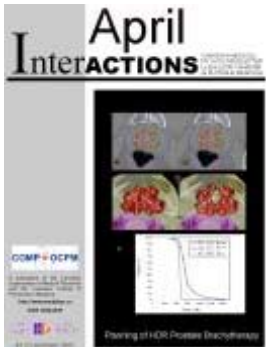
The communication committee is looking at ways to streamline the creation and production of the newsletter. Although nothing has been finalized, we hope to offload some of the layout and production tasks so that the editor may be less involved with the time consuming mechanics of newsletter production. Hopefully, these incentives will make the job easier for future editors (and the position of editor easier to fill). We will keep you posted.

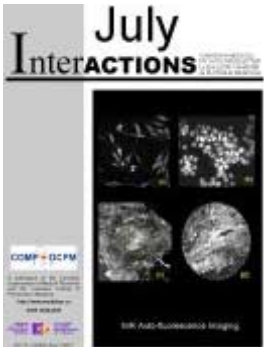
Finally, as I prepare myself for the cool fall days there seems to be a new source of energy to focus on the things that need to be done at home and at work. I hope some of the invigoration of fall finds you.

Pat Cadman
InterACTIONS Editor

# Wanted

## An Editor for all seasons



To begin July 2003

For futher information contact:

Pat Cadman
pcadman@scf.sk.ca
(306)655-2696

## *Funding of Medical Physics Research Projects in Ontario*

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

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

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

**MDS-Nordion Cancer Care Ontario Grants**
**(2002-2003)**

| Applicants | Cancer Care Ontario Location | PROJECT TITLE | Amount Approved |
|---|---|---|---|
| E. Wong, J. Chen, K. Jordan, S. Karnas | London | Towards Inverse Planning for Photon and Electron Beams | $12,000 |
| A . Kerr, G. Salomons, L.J. Schreiner | Kingston | Detector Array for CT Imaging and Dose Reconstruction with a Cobalt-60 Tomotherapy Unit | $14,276 |

**Congratulations to these awardees !**

The next competition will been scheduled early in the new year 2003.

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

# CORPORATE MEMBERS

**ADAC-A Phillips Medical Systems Co**
540 Alder Drive
Milpitas CA 95035 USA
Phone: (408) 321-9100
Fax: (408) 577-0907
website: www.adaclabs.com
*Contact: Ms. Jennifer L. Anderson*
janderson@adaclabs.com

**Best Medical International**
7643 Fullerton Road
Springfield VA 22153 USA
Phone: (703) 451-2378
Fax: (703) 451-8421
website: www.best-medical.com
*Contact: Mr. Krishnan Suthanthiran*
krish@best-medical.com

**CNMC Company Inc.**
2817-B Lebanon Pike
Nashville TN 37214 USA
Phone: (615) 391-3076
Fax: (615) 885-0285
website: www.cnmcco.com
*Contact: Mr. Ferd Pusl*
CNMCsales@earthlink.net

**CSP Medical**
1055 Sarnia Road, Unit B2
London ON N6H 5J9 Canada
Phone: 1-800-265-3460
Fax: 1-800-473-7710
website: www.cspmedical.ca
*Contact: Mr. Steve Gensens*
sgensens@cspmedical.com

**Donaldson Marphil**
3465 Cote des Neiges #602
Montréal QC H3H 1T7 Canada
Phone: 1-888-933-0383
Fax: (514) 931-5554
website: www.donaldsonmarphil.com
*Contact: M. Michel Donaldson*
donaldson.marphil@qc.aibn.com

**Elekta Canada**
114 Gartshore Drive
Whitby ON L1P 1N8 Canada
Phone: ( 514) 298-0744
Fax:
website: www.elekta.com
*Contact: Mr. Jacques Verhees*
jacques.verhees@elekta.com

**Harpell Associates Inc.**
1272 Speers Rd, Unit 2
Oakville ON L6L 2X4 Canada
Phone: (905) 825-2588
Fax: (905) 825-0234
website: www.harpellassociates.com
*Contact: Mr. David Harpell, P.Eng.*
David@harpellassociates.com

**Hilferdine Scientific Inc.**
85 Denzil Doyle Court
Kanata ON K2M 2G8 Canada
Phone: (613) 591-5220
Fax: (613) 591-0713
website: www3.sympatico.ca/hilferdine
*Contact: Mr. Sean Eckford*
hilferdine@sympatico.ca

**Landauer, Inc.**
2 Science Road
Glenwood IL 60425 USA
Phone: (708) 755-7000
Fax: (708) 755-7016
website: www.landauerinc.com
*Contact: Mr. William Megale*
sales@landauerinc.com

**LAP of America**
1755 Avenida Del Sol
Boca Raton FL 33432 USA
Phone: (561) 416-9250
Fax: (561) 416-9263
website: www.lap-Laser.com
*Contact: Mr. Neil Johnston*
naj@lap-laser.com

**MDS Nordion**
447 March Road
Kanata ON K2K 1X8 Canada
Phone: (800) 465-3666
Fax: (613) 591-3705
website: www.mds.nordion.com
*Contact: Mr. Peter D'Amico*
pdamico@mds.nordion.com

**Mentor Medical Systems Canada**
1333 Boundary Rd, Unit 10
Oshawa ON L1J 6Z7 Canada
Phone: (800) 668-6069
Fax: (905) 725-7340
website: www.mentorcanada.com
*Contact: Mr. Norm LeRoux*
nleroux@mentorcanada.com

**Modus Medical Devices Inc**
17 Masonville Crescent
London ON N5X 3T1 Canada
Phone: (519) 438-2409
Fax:
website: www.modusmed.com
*Contact: Mr. John Miller*
jmiller@modusmed.com

**PTW-New York Corporation**
201 Park Avenue
Hicksville NY 11801 USA
Phone: (516) 827-3181
Fax: (516) 827-3184
website: www.ptwny.com
*Contact: Mr. Steve Szeglin*
ptw@ptwny.com

**Scanditronix Wellhofer North America**
3150 Stage Post Drive, Ste 110
Bartlett TN 38133 USA
Phone: (901) 386-2242
Fax: (901) 382-9453
website: www.wellhofer.com
*Contact: Mr. Dan Roberts*
droberts@swna.org

**Siemens Canada Limited**
2185 Derry Road West
Mississauga ON L5N 7A6 Canada
Phone: (905) 819-5747
Fax: (905) 819-5884
website: www.siemens.ca
*Contact: Mr. Dean Willems*
dean.willems@siemens.ca

**Standard Imaging Inc**
7601 Murphy Drive
Middleton WI 53562-2532 USA
Phone: (608) 831-0025
Fax: (608) 831-2202
website: www.standardimaging.com
*Contact: Mr. Eric DeWerd*
edewerd@standardimaging.com

**Thomson Nielsen**
25B Northside Road
Nepean ON K2H 8S1 Canada
Phone: (613) 596-4563
Fax: (613) 596-5243
website: www.thomson-elec.com
*Contact: Ms. Mairi Miller*
mmiller@thomson-elec.com

**Varian Medical Systems**
3100 Hansen Way, M/S MGM
Palo Alto CA 94304-1038 USA
Phone: (650) 424-6650
Fax: (650) 493-5637
website: www.varian.com
*Contact: Ms. Jan Roth*
JRoth@os.varian.com

# Queen's University
# Centre for Neuroscience Studies

## A TIER 2 CANADA RESEARCH CHAIR (TENURE-TRACK POSITION) IN FUNCTIONAL IMAGING.

The Centre for Neuroscience Studies at Queen's University in Kingston, Ontario, Canada is building a new Imaging Centre that includes a high-field scanner for functional magnetic resonance imaging for research purposes. The new facility will support both human and animal imaging protocols. Queen's University now invites applications for a tenure-track position in Imaging Physics. The successful applicant will be nominated by Queen's University for a prestigious Tier II Canada Research Chair in Functional Imaging and is expected to develop an independent research program and to join with members of the **Centre for Neuroscience Studies** and the **Behavioural Research And Imaging Network of Ontario** (including Drs. Ravi Menon at Robarts Research Institute, University of Western Ontario and Randy McIntosh University of Toronto) to install and develop functional magnetic resonance imaging technology and medical physics at Queen's University. The successful candidate must hold a Ph.D. in medical physics in the area of magnetic resonance imaging with at least two years of postdoctoral training, preferably in the area of functional imaging. Salary will be commensurate with experience.

*Queen's University is committed to employment equity and welcomes applications from all qualified women and men, including visible minorities, aboriginal people, persons with disabilities, gay men and lesbians.*

Applications including curriculum vitae, copies of recent publications, one page statement of research interests and names of three referees should be sent to Dr. Douglas P. Munoz, Director, Centre for Neuroscience Studies, Room 106 Abramsky Hall, Queen's University, Kingston, Ontario Canada K7L 3N6. Telephone (613) 533-6360; Fax (613) 533-6840. Review of applications will commence on November 29th, 2002 and will continue until the position is filled.

RYERSON UNIVERSITY

*Canada's leading university for applied education with over 40 career-oriented undergraduate and graduate programs, distinguished by their relevant curriculum and applied research, scholarly and creative activities, Canada's largest Continuing Education Division, offering courses and certificates for personal and professional development.*

## Canada Research Chairs
## Faculty of Engineering and Applied Science
## Ryerson University

The Faculty of Engineering and Applied Science, Ryerson University, invite applications and nominations for three Canada Research Chairs, one Tier I and two Tier II, in the following areas:

**Aersospace**
Advanced Materials and Aircraft Structures in the Department of Mechanical, Aerospace and Industrial Engineering

**Environmental Science**
Environmental Science of the Urban Environment in the Department of Chemistry, Biology and Chemical Engineering

**Medical Physics / Bioengineering**
Development of Novel Therapeutic and Imaging Methods and Applications in the Department of Mathematics, Physics and Computer Science

The key objectives of the Faculty's research and graduate programs include **Technology Innovation and Industrial Development** particularly related to *Aerospace, Computing, Communication and Networks, and Information Technology, Energy, Environment, Medical Physics/Bioengineering, Structures, Materials and Surface Science, and Transportation and Road Safety*. The three new positions will join two other Chairs recently established in Multimedia and Sustainable Construction. The University research plan can be found along with more detailed description of each position at www.ryerson.ca/ors. Information on the CRC program can be found at www.chairs.gc.ca.

Allocation of Tier I and II Chairs will be based on the quality of the candidates for the respective positions. A Tier I candidate is expected to be an established and senior researcher eligible for appointment at the rank of Professor. Appointments for Tier II Chairs may be at the rank of Assistant or Associate Professor. Chairholders are expected to carry out a vigorous program of independent, externally funded research and will possess: the potential to attract graduate students, ability to establish collaborations with scientists in universities, industry and government, both nationally and internationally, and a demonstrated excellence in research. The successful candidates will be required to teach undergraduate and graduate courses, supervise research students, contribute to curriculum development and participate in administrative service to the University, Faculty and Department.

Applications and nominations for the position should be sent to: Dr. Steven N. Liss, Associate Dean, Faculty of Engineering and Applied Science, Ryerson University, 350 Victoria Street, Toronto, Ontario M5B 2K3, or email at: sliss@ryerson.ca. Applications should include a curriculum vitae, statements describing the proposed research program (5 year plan) and teaching interests, three examples of recent and relevant publications, and names of three references. Applicants should indicate whether they are seeking a Tier I or Tier II level appointment. The anticipated starting date is July 2003.

*Ryerson University has an employment equity program and encourages applicants from all qualified individuals including women, Aboriginal peoples, persons with disabilities, and members of visible minorities. Members of designated groups are encouraged to self-identify. In accordance with the Canadian immigration requirements, this advertisement is directed to Canadian citizens and permanent residents of Canada..*

# Radiation Oncology

**Call us at 1-800-265-3460 to receive a free CD-ROM product catalog:**

**Radiation Oncology—Radiology—Mammography—Ultrasound—MRI—CT—Nuclear Medicine**


**Be sure to visit our website at www.cspmedical.ca for a variety of:**

**Free Contests & Giveaways, Product Specials, New Product Information, Quote Requests, Industry News. . . and more.**

**Coming Soon! E-commerce for on-line purchasing and product information.**

- Audio/Video Products
- Cardiac Products
- Cassettes, Grids & Screens
- Compensation Filters
- Dose Calibrators
- Film Digitizers
- Film Viewing & Marking
- Furniture, Carts & Stools
- Injectors
- Imaging Tables & Accessories
- Ion Chambers & Cables
- IV Stands & Accessories
- Lead Products
- Meters
- Patient Monitors
- Patient Positioning & Handling
- PET & 511 Products
- Phantoms
- Positioning Lasers
- Printers
- Radiation Protection
- Signs & Labels
- Software
- Sources
- Survey Meters & Probes
- Supplies
- Test Tools
- Thyroid Uptake Systems
- Tissue Mimicking Materials

**...and much more**

CSP Medical
Your Complete Source for Medical Accessories

***Call today for a no-obligation quote.***

1055 Sarnia Road, Unit B2, London, ON N6H 5J9

**Phone:** 800-265-3460 **Web:** www.cspmedical.ca
**Fax:** 800-473-7710 **E-mail:** info@cspmedical.com