InterACTIONS

CANADIAN MEDICAL PHYSICS NEWSLETTER
Le BULLETIN CANADIEN de PHYSIQUE MÉDICALE

Inaugural COMP Winter School 2010

Diffraction Enhanced Imaging at the Canadian Light Source

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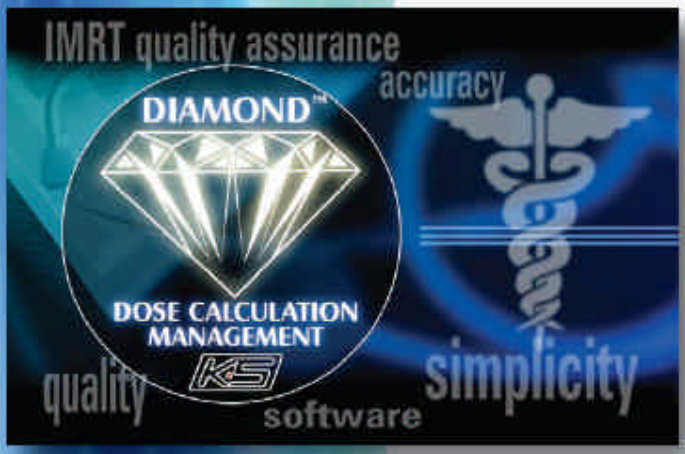

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InterACTIONS

Volume 56, Number 2– avril/April 2010

Cover Image

Top: Group picture of the 2010 COMP Inaugural Winter School, held in Banff, AB from Jan 24 – 28th , 2010. The timely theme of the Winter School was "Quality and Safety in Radiation Oncology". Read reviews of the Winter School on pages 55 and 56 and an important article on software testing based on a Winter School presentation on page 57.

Bottom: Diffraction enhanced image (DEI) of a 12 day old chicken. This image was acquired at the BioMedical Imaging and Therapy (BMIT) Facility at the Canadian Light Source (CLS) using 40.4 keV and ~77 mGy @ entrance plane. Feature article is on page 46.

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Message from the COMP President

Mr. Jason Schella

This will be my last Inter*ACTIONS* article as COMP President. Effective at the Annual General Meeting in June in Ottawa, I will be stepping into the role of past-President and Peter McGhee will be taking over as COMP President. It has been an eventful two years and I am sure that Peter will continue to build COMP into a great organization as we strive to provide increasing value to our membership. I want to thank all the board members for their hard work and support over the last 2 years. It has been a very rewarding experience and I am glad that I was able to be a part of it.

This year, two board members are finishing their terms and I want to give them special thanks. **Stephen Pistorius** will be stepping down as past-President. His advice has been particularly helpful and he has been instrumental in setting COMP on its present direction. **Patrick Rapley** will be stepping down as Secretary. He has given a lot of insight into the inner workings of COMP and has been a great asset. I will miss working with them.

2010 COMP ASM - Ottawa

Preparations are in high gear for this year's meeting. The Local Arrangements Committee (LAC), led by Malcolm McEwen, is working hard to make this a successful meeting. As always, I am looking forward to seeing all of the great research that will be presented this year. We are striving to offer more content to our membership and we will be offering several "break-out/ educational" sessions at this meeting. Please refer to the scientific program for more details.

2010 COMP Winter School

Our inaugural winter school was held in January. The topic was "Quality and Safety in Radiation Oncology" and the faculty was world class. Those who attended were greatly impressed with the quality and content offered. Congratulations to **Marco Carlone, Sherry Connors, Nancy Barrett and Gisele Kite** on a job well done. You can view the press release on the COMP home page under the heading "**Experts Gather to Explore Quality & Safety in Radiation Oncology**". We look forward to the 2011 Winter School.

The topic of the Winter School proved to be very timely given the recent New York Times articles regarding radiation therapy treatment errors. In response to these articles, the COMP press release mentioned above was sent to major Canadian news agencies to show that we take the issue of safety seriously. Though I don't think that it was clearly stated in the NYT articles, radiation therapy is one of the safest modes of medical intervention. This is due in large part to the work of Medical Physicists worldwide. This can also be said for any of the specialties that involve Medical Physics.

On a similar topic, during the Winter School it was decided to pursue a national collaboration between the CAMRT, CARO, COMP and the Canadian Partnership Against Cancer (CPAC). Representatives from each organization will form a committee whose goal will be to promote radiation treatment quality.

COMP has also been working with the CAR to help promote their Bone Mineral Density Accreditation program. A part of this will involve a BMD learning session to be held during this year's ASM. Information regarding the proposed new COMP Award category will be available shortly.

As always, I would like to thank those who take the time to volunteer on the various committees as well as those who are volunteering in other ways (reviewing abstract submissions, LAC, etc…). COMP would not be able to function without their help.

If you wish to volunteer with COMP in some way, feel free to contact me at jason.schella@cdha.nshealth.ca or Nancy Barrett at nancy@medphys.ca. There is always room for you.

If you have an article that you would like to share with other COMP members, publishing through Inter*ACTIONS* is a great way to do it. Cheers.

Message from the CCPM President

Most medical physicists have experienced this. Over appetizers at a neighbour's backyard barbecue or at some hospital function, someone relies on a familiar conversation-starter: "So, what do you do?" The response of "I'm a medical physicist" is met with either a blank stare, the immediate need for a drink refill, or a quick change of subject to the overabundance of garlic in the guacamole.

Most of us are accustomed to working away in the background in relative obscurity, with only a few closely allied professions having any understanding or awareness of what we do, or even of our existence. Sometimes this is can be irksome, such as having to explain yet again to an administrator why the physics department exists, or why we can't put a Linac in the physics office area and have it treating patients by Monday. But I think some physicists like it this way – with obscurity comes the freedom to do what we want, and we can hope that those who don't understand what we do at least find us mysterious and exotic.

Being unaccustomed to scrutiny, it has been a surprise for our profession to be on the front page recently, and to be center stage at a US Congressional subcommittee on February 26. The New York Times ran two front page articles (January 23 and 25) as well as a lead editorial on medical errors in radiation therapy. While predictably sensational in tone, the articles were generally accurate and discussed some issues particular to American medical physicists but familiar as well to Canadians: software errors; the rush to market of new technologies; education, credentialing and licensure of medical physicists; reporting of errors in radiation therapy; and general regulatory oversight of the use of radiation in medicine.

These features in the New York Times cast a looming shadow over the impeccably timed COMP Winter School on Quality and Safety in Radiation Oncology, held in Banff in January. The content was excellent, and dealt with a range of professional, legal and ethical issues which are often shortchanged in education programs and the Annual Scientific Meeting, but which may have found a forum in the Winter School. Incident reporting systems, new approaches to quality assurance, legal obligations of medical physicists, software engineering, and many other topics were covered by top-notch faculty, within a meeting format that encouraged participation and the free exchange of ideas. Marco Carlone, Sherry Connors, Nancy Barrett, and the COMP Science and Education Committee are to be congratulated for the initiative and execution of this important meeting, which is expected to turn into a much anticipated and well attended annual event.

In response to New York Times coverage, a US Congressional subcommittee on February 26 heard from AAPM, ASTRO, various experts and patient representatives. While the overall benefits of the medical use of radiation are not in question, the testimony (transcripts of which are available on the AAPM website) included calls for a national database for reporting of radiation therapy errors, accreditation of institutions offering radiation therapy, tracking of CT dose as part of the patient record, and national regulations for training and certification of medical physicists.

Any action upon these recommendations by American authorities will likely have an impact on this side of the border. With the recent decision by the CCPM to require graduation from a CAMPEP-accredited

Dr. David Wilkins

graduate or residency program in order to sit the membership exam in 2016, and the relative sufficiency of accredited programs in this country compared to the US, the Canadian medical physics profession is in a good position to meet any requirements for training and certification that might be imposed in the future.

However, challenges remain. While most radiation oncology physicists in Canada are certified by the CCPM (or ABR), many are not. The CCPM needs to continue efforts to encourage all eligible clinical physicists to seek certification (extending certification in French would be a good place to start). All graduate and residency programs in Canada should be seeking CAMPEP accreditation; CAMPEP has indicated its willingness to accredit French-language programs. The number of medical physicists certified in the nuclear medicine, diagnostic radiologic physics and MRI subspecialties remains small.

Message from the Executive Director of COMP/CCPM

.Celebrating COMP Volunteers

April is the month in Canada where we celebrate the contribution of volunteers (April 18 – 24 is National Volunteer Week). Here are some of the activities COMP volunteers are involved in:

- Serving on the COMP Board to set future direction, provide leadership and ensure the financial health of the organization
- Planning events – The ASM, the CCPM Symposium, the Winter School
- Coordinating the abstract submission process for the ASM and reviewing abstracts
- Serving on committees – Professional Affairs, Communications, Science and Education, RSTSAC, Awards, Gold Medal
- Developing strategies to expand the COMP membership base and to reach out to under-represented constituencies
- Keeping the website fresh and up to date
- Editing and coordinating the publication of the COMP newsletter
- Writing articles for the newsletter
- Judging award submissions
- Representing the medical physics community to other organizations

COMP is very fortunate to have so many dedicated volunteers and on behalf of the medical physics community in Canada, I would like to take this opportunity to say thank you!

Our Membership is Growing

We are pleased to welcome 27 new members so far in 2010 – a very positive sign for our organization. The names of the new members are published in this newsletter and I invite you to join us in welcoming them to our community.

Our Students are Engaged

The newly formed COMP Student Council is a highly engaged group that has many ideas for making the most of their COMP membership. Watch for the soon to be launched section of our website that will be dedicated to our student members.

Join us in Ottawa – June 16-19, 2010!

The Ottawa Local Arrangements Committee and the Conference Committee have been working hard to create an event that will be top-notch both in terms of scientific content and networking. The event will start with the icebreaker reception Wednesday evening at the penthouse level of the Crowne Plaza Hotel, which features a panoramic view of downtown Ottawa and the Ottawa River. Scientific sessions begin on Thursday morning at the hotel. The final banquet will be held on Friday evening at the world class **National Gallery of Canada** which is housed in an eye-catching glass and granite building and has a large collection of drawings, paintings sculptures and photographs for viewing. As we did at the 2009 meeting, we will be offering special sessions for imaging physicists, associate members and students.

The following are important dates for the 2010 ASM:

March 31st – end of early bird registration for exhibitors
April 2nd - abstract submission deadline
April 16th – end of earlybird registration for delegates
April 29th – deadline for the group rate at the Crowne Plaza Hotel

Please visit http://www.physics.carleton.ca/comp2010/ for more information about the meeting. **If you haven't already done so, register today!**

As always, please feel free to contact me at nancy@medphys.ca or Gisele Kite at admin@medphys.ca at any time with your feedback and suggestions.

Ms. Nancy Barrett

Did You Know?

Inter***ACTIONS*** is published four times a year

January , April, July, October

Next deadline for the July issue is **June 1!**

Get your material in early!

CNSC Feedback Forum

Clarification of Licence Posting Requirements

Kavita Murthy, Director
Class II Nuclear Facilities and Equipment Division
Canadian Nuclear Safety Commission
CNSC, Ottawa ON

Background

The purpose of Part 14 *"Notice of Licence"* of the General Nuclear Safety and Control Regulations is to require the licensee to notify all interested parties that the activities carried out at the site in question are authorized under a CNSC licence. Historically, *GNSCR part 14* replaced a licence condition (#573) that was once a part of all AECB licences. This condition stated:

"This licence, or a copy thereof, shall be conspicuously posted at all specific locations listed in Section V and shall be available at all other locations where the radioactive prescribed substances listed in Section IV are used or stored."

The format of licences has changed since use of this condition was discontinued. Sections IV and V referred to in the text above have now been replaced by an appendix to the licence called "Locations of Licensed Activity". The phrase "*all specific locations listed in Section V*" referred to the site of the licensed activity (For example, if Cancer Agency XYZ operated clinics or "sites" A, B, and C under a single licence, it would have to post that licence at each site); while the phrase "*at all other locations ...listed in Section IV …or stored."* referred to actual rooms where the activity was conducted. Consequently, under this obsolete licence condition, licensees were essentially required to post a copy of their licence in every room where licensed activities were conducted, such as linear accelerator vaults, HDR suites, brachytherapy treatment rooms and isotope storage areas.

Many an RSO will tell you this eventually becomes an irritating administrative headache, as the number of licensed locations and licence amendments increases, so does the probability that you'll forget to post the correct licence somewhere, sometime.

The purpose of this article is to clarify what is required under GNSCR part 14 and to point out that ***posting of the actual licence at every room is not your only option.*** This regulation replaced licence condition #573 with more general requirements for posting.

GNSCR Part 14

The full text of *GNSCR 14* is given in the box. It has three sections. Section 14(1) deals with posting requirements for permanent sites and is the focus of this article. Section 14(2) outlines posting requirements for mobile field operations, which is generally not relevant to a cancer treatment centre. For completeness, it is discussed briefly at the end of this article. Section 14(3) notes the exemptions from the posting requirements and is self-explanatory

Where to post?

Section 14(1) requires the posting, "in a conspicuous place", of a "notice of licence" (more on this later) at each "site" where a licensed activity is carried on. So what does this imply?

First, a "conspicuous" place is one that is *"open to the view; obvious to the eye; easy to be seen; plainly visible; manifest; attracting the eye"* (Webster's Dictionary). So, it must be in a reasonably public place, not one that is hidden or locked or inaccessible. For example, having the licence available only on the local intranet is not sufficient, as it allows only certain individuals access to the information.

Second, provided that the licence itself does not contain any condition requiring posting at a specific location, then the "notice of licence" must be posted at each "site" of the licensed activity. (As with the obsolete licence condition, this simply means that if a Cancer Agency XYZ operates multiple centres or "sites", the appropriate licences must be posted at each site.) While a specific condition related to where the licence shall be posted is not normally in a Class II licence, it may be a part of other licences that CNSC issues. Also, in the Class II case, if a document submitted by the licensee as part of their licence application states exactly where a "notice of licence" will be posted, then it becomes a condition that must be complied with. (For example, if you submit a document to the CNSC stating that you will post the licence on the bulletin board across from the RSO's office, then we expect to find the licence there during inspection).

Finally, note that there is no requirement to have the licence posted at the entrance to each room or bunker at the site, only at the site itself!

What to post?

The "notice of licence" can be either one of the two notices referred to in either GNSCR 14(1)(a) ***or*** 14(1)(b). GNSCR 14(1)(a) refers to a copy of the licence (main body only, the licence appendices should not be posted due to security requirements), along with a notice stating where the remaining documents (appendices and any document referred to in the licence) and records can be found.

Alternatively, GNSCR 14(1)(b) does ***not*** require posting of the actual licence. It simply requires a notice which should include the following:

Excerpt from the General Nuclear Safety and Control Regulations

Notice of Licence

14. *(1) Every licensee other than a licensee who is conducting field operations shall post, at the location specified in the licence or, if no location is specified in the licence, in a conspicuous place at the site of the licensed activity,*

(a) a copy of the licence, with or without the licence number, and a notice indicating the place where any record referred to in the licence may be consulted; or

(b) a notice containing

(i) the name of the licensee,

(ii) a description of the licensed activity,

(iii) a description of the nuclear substance, nuclear facility or prescribed equipment encompassed by the licence, and

(iv) a statement of the location of the licence and any record referred to in it.

(2) Every licensee who is conducting field operations shall keep a copy of the licence at the place where the field operations are being conducted.

(3) Subsections (1) and (2) do not apply to a licensee in respect of

(a) a licence to import or export a nuclear substance, prescribed equipment or prescribed information;

(b) a licence to transport a nuclear substance; or

(c) a licence to abandon a nuclear substance, a nuclear facility, prescribed equipment or prescribed information.

1. A statement indicating that the site (Clinic A) is operated by the licensee (Cancer Agency XYZ) under a CNSC licence.
2. Identification of the activities (e.g., "operate a medical accelerator facility", "servicing of Class II prescribed equipment") authorized for that site.
3. A statement specifying what type of equipment (e.g., linear accelerator, HDR remote afterloader with Ir-197, manual brachytherapy with I-125) is authorized for use at the site.
4. A statement informing the reader where the licence documents can be consulted.

If a licence is posted, regardless of where it is located, it must be the correct version of the correct licence.

Many centres now choose to simply post the notice of licence per *GNSCR* 14(1)(b). Since this notice does not have to refer to a specific licence number or version, it can be worded such that it does not require updating unless the types of licensed activities at the site change (For example, if your centre had only linacs and added HDR).

Some licensees have chosen to post such a "notice of licence" at the entrance of each bunker, but even this is not required, although it is good practice to at least have a simple statement to the effect that the bunker is under a CNSC licence and directing the reader to a centralized location containing the full "notice of licence". All this could easily be consolidated with the other CNSC requirement to post the emergency contact information at the entrance to the bunker.

GNSCR 14(2) applies if the licensed activity is conducted at a field location. It requires that a full copy of the licence (not including the referenced documents, but including all the appendices) be available at the location of the field activity. This could be an activity conducted out doors or an activity conducted at another site. This would apply to third party service licence holders and certain other types of licensed activities, not usually encountered in the cancer centre environment.

If you have any questions or comments related to this article, or any other articles featured in the CNSC Feedback forum, please contact me at Kavita.Murthy@cnsc-ccsn.gc.ca

Feature Article

Now Accepting Users: 05B1-1 Beamline at the BioMedical Imaging and Therapy (BMIT) Facility at the Canadian Light Source (CLS)

Tomasz W. Wysokinski,[1] Dean Chapman,[2] Paul C. Johns [3] and Brad Warkentin [4]

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[2] Dept. of Anatomy and Cell Biology, University of Saskatchewan, Saskatoon, SK
[3] Dept. of Physics, Carleton University, Ottawa ON

Introduction

The Canadian Light Source (CLS), which opened in 2005, is the sole synchrotron in Canada and represents Canada's largest scientific (~$200 million) endeavour in three decades. The CLS houses over a dozen specialized beamlines supporting a broad range of research and industrial applications using x-rays spanning energies from the far-infrared to over 100 keV. The addition of two biomedical beamlines created BMIT (BioMedical Imaging and Therapy), one of a handful of dedicated biomedical synchrotron facilities worldwide. BMIT is a world-class facility [1, 2] providing unique, synchrotron-specific imaging and therapy capabilities for research on biomedical systems ranging in size from tissue specimens to mice to humans to the extremities of horses. Core research programs include cancer imaging and therapy, human and animal reproduction, spinal cord injury and repair, cardiovascular imaging and disease, bone growth and development, mammography, developmental biology, gene expression research, and development of novel/improvement of existing imaging methods and devices.

BMIT has been broadly supported by the Canadian medicalresearch community and notably by medical physicists. Our community's efforts are now bearing fruit: funded by CFI and partners in 2003, construction of BMIT is largely complete, with the focus now on final commissioning. One of BMIT's beamlines is now accepting proposals for the first operational run scheduled to begin in May 2010.

Experimental Facilities & Research Possibilities

The BMIT facility consists of two beamlines: the *bending magnet* (BM) beamline (05B1-1), which covers an energy range of 8 - 40 keV, and the *insertion device* (ID) beamline (05ID-2), a higher flux beamline spanning 40 - 100+ keV. The BM beamline is now open for research, while the ID line is still under development and is expected to be fully operational some time in 2011. An overview of the characteristics of the BM beamline are given in the Table below.

The BM beamline offers a number of unique medical physics research capabilities. Several novel imaging techniques are available, including Diffraction Enhanced Imaging (DEI) **(Figs. 1 & 2),** K-Edge Subtraction (KES) and Phase Contrast Imaging (PCI). The flexible design of the experimental hutch (POE-2) allows use of these techniques in both computed tomography (CT) and projection modes, with either filtered white or monochromatic X-ray beams. Additionally, the beamline will host new imaging methods, such as those based on diffraction to delineate structural aspects of tissues, absorption spectroscopy, and fluorescence detection. For all techniques, specimens can be positioned with sub-mm precision using one of several stages. In 2010, an upgraded stand for DEI experiments will be installed and an improved detector stage will be developed and commissioned, completing the BM beamline. Imaging capabilities at BMIT are also augmented by numerous state-of-the-art detector technologies, including several CCD detectors from Hamamatsu and Photonic Science, an LDRD "Siberia", and flat panels from ANRAD and Hamamatsu. Experiments requiring imaging capabilities exceeding those of conventional techniques (e.g. very high resolution or low contrast detection) are excellent candidates for research at BMIT.

Status	Accepting Letters of Intent (LOI)
Source / Parameter	Bending Magnet; / 173 µm (s_x) x 30 µm (s_y)
Monochromator	Double Crystal Bragg Si (2,2,0)
Spectral range	8 – 40 keV (filtered white or monochromatic)
Brightness	1.5×10^{11} ph/s/mr^2/0.1%bw/mA @ 10 keV
Resolving power	10^{-4}
Beam size / Divergence	240 mm (V) x 7 mm (H) @ 25 m / 10 mrad x 0.2 mrad

BMIT is also attractive to researchers developing improved instrumentation and methods for imaging and dosimetry. The BM beamline's fan beam can assist with device devel-

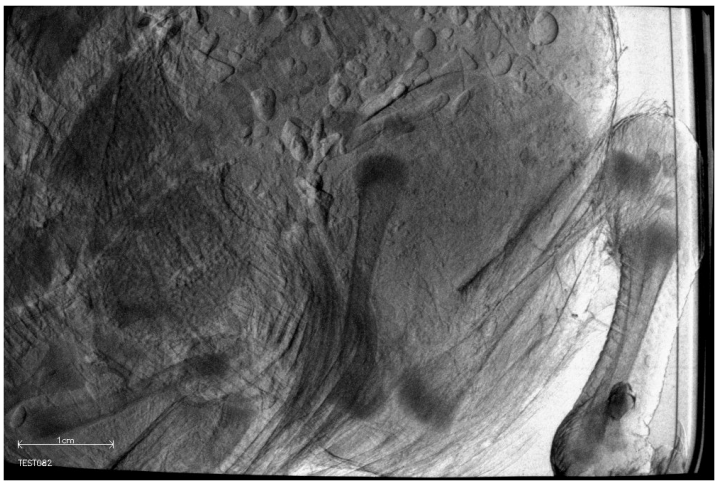

Figure 1. DEI Imaging (40.4 keV, ~77 mGy @ entrance plane) of a 12 day old chicken.

opment, and the availability of monochromatic x-rays provides interesting possibilities for detector characterization (i.e. energy dependence of the MTF, phase contrast imaging, etc.). BMIT is also currently commissioning an OCTOPUS-IQ scanner from MGS Research for a 3D gel dosimetry program applicable to radiotherapy. The BM beam can be collimated down to 25 µm wide slits of radiation, making it also useful for testing micro-dosimetry or micro-irradiation programs.

In 2009, several experiments were performed on the BM beamline as part of commissioning activities, including the first live animal imaging on BMIT and the evaluation of components for Microbeam Radiation Therapy (MRT).

Guidelines for Preparing a BMIT Proposal (Letter of Intent, LOI)

1. Contact the beamline scientist (see below),
2. Register as a CLS User through the CLS website,
3. Create an online proposal.

Proposals from COMP members for year 2010 will be considered on an ongoing basis until the access time pool is used up. Proposals for the first half of 2011 will be considered and reviewed in September 2010. Access to the CLS is based on peer review, with an emphasis on excellent science producing publishable results.

Training

Upon visiting the CLS, the process of becoming a User is completed by undergoing straightforward safety training, completion of a some paperwork signed off by one's home institution, and training specific to the BMIT facility.
Users may also apply to be accepted to the Summer School:

http://www.lightsource.ca/education/summerschool/

For more information, contact:

Tomasz Wysokinski, Beamline Scientist
tomasz.wysokinski@lightsource.ca
1-306-657-3710 / 1-306-657-3629

or other authors of this update, or visit
http://www.lightsource.ca/experimental/bmit.php
http://www.lightsource.ca/experimental/intent_letter.php

http://www.lightsource.ca/bmit/

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Wysokinski, T.W., Chapman, D., Adams, G., Renier, M., Suortti, P. and Thomlinson, W. Nucl. Instr. Meth. in Phys. Res. A. In Press, (2010).

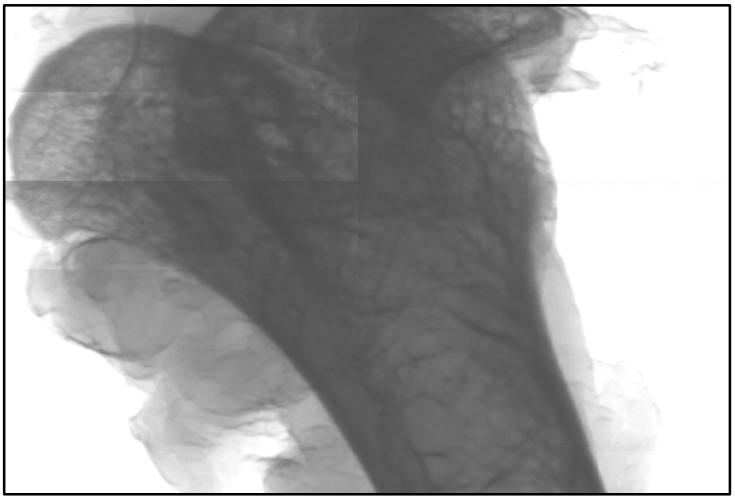

Figure 2. High resolution DEI image of a chicken bone.

EDUCATIONAL NOTE

A comparison of medical physics training and education programs – Canada and Australia

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Abstract

An overview and comparison of medical physics clinical training, academic education, and national certification/ accreditation of individual professionals in Canada and Australia is presented. Topics discussed include program organization, funding, fees, administration, time requirements, content, program accreditation, and levels of certification/ accreditation of individual Medical Physicists. Differences in the training, education, and certification/accreditation approaches between the two countries are highlighted. The possibility of mutual recognition of certified/accredited Medical Physicists is examined.

Key words clinical training, academic education, certification, accreditation, medical physics

Introduction

Canada and Australia share many similarities, not least of which is that both countries have small yet vibrant medical physics communities. The purpose of this article is to present an overview and comparison of the clinical training and academic education programs in both countries. Academic education provided through university affiliated graduate or post-graduate studies and clinical training provided through hospital or cancer treatment facility programs will be examined. Accreditation and certification processes will also be reviewed. The Canadian and Australian training programs are part of an international trend moving away from informal "learning on the job", towards a standardized curriculum for medical physics academic education and clinical training. This is important in an era of rapidly evolving and cross-specialty technology, to ensure best possible patient care. Information on the current status of recognition of foreign trained medical physicists in both countries will also be presented. Since the topic of training is a dynamic one, the reader is reminded that this article represents a snapshot in time. It should be noted that the Australian and New Zealand programs are the same as implemented by the Australasian College of Physical Sciences and Engineers in Medicine (ACPSEM) which includes members from both countries. For the purposes of this paper, the comparison is between Canada and Australia.

Before beginning the discussion two items should be addressed: 1) the terminology used, and 2) an organizational comparison. Terminology can be somewhat confusing, so it is helpful to review how some terms are defined in this discussion. Both countries use 'accreditation' to define the official recognition of a minimum quality level obtained by an academic education program. These programs are referred to as graduate programs in Canada and as postgraduate programs in Australia but essentially refer to M.Sc. or Ph.D. university programs with coursework components. Both countries also may apply accreditation to clinical training programs.

Clinical trainees are referred to as 'residents' in Canada and 'registrars' in Australia. Canada uses 'certification' to define official recognition of a minimum quality level obtained by an individual person. Currently there are two levels of certification achievable through the CCPM (Canadian College of Physicists in Medicine): the 'Membership' level indicates basic competency as a medical physicist, and the 'Fellowship' level indicates more experienced abilities. The CCPM offers certification in four subspecialties: radiation oncology, diagnostic radiology, magnetic resonance imaging, and nuclear medicine. A list of medical physicists with CCPM certification is available publicly. Australia uses 'registration' where individuals are placed on a Register of Qualified Medical Physics Specialists[1]. There are two types of registration based on qualifications, experience and accreditation: Unlimited and Limited. Unlimited registration has two categories. Category 1 applies to individuals holding ACPSEM accreditation. In Australia individuals may achieve accreditation via assessment and examination by the accreditation panels (either radiation oncology, radiology, or nuclear medicine). Category 2 applies to exceptional circumstances for individuals (Australian and overseas) who do not hold ACPSEM accreditation but possess evidence of significant advanced level competency. Applicants to this category undergo a rigorous assessment by the relevant accreditation panel, which may involve some examination. Limited registration has three categories and includes a transition period to allow for current practicing medical physicists (Australian and overseas) to achieve Unlimited registration. The transition period will end on December 31st, 2010 unless extended by the ACPSEM.

Therefore, in Canada, both academic education programs and clinical training programs may be *accredited*, while professional recognition of a medical physicist is achieved through *certification*. In Australia, academic education and clinical training facilities are *accredited*, while professional recognition of a medical physicist is most commonly achieved through *accreditation* then *registration.*

Furthermore, there are several relevant organizations in the two countries and they have somewhat different roles to play. In Canada, three main Medical Physics organizations exist: (1)

the Canadian Organization of Medical Physics (COMP), which is the professional body of Medical Physicists within Canada, (2) the Canadian College of Physicists in Medicine (CCPM), which is the certifying body of individual Medical Physicists within Canada, and (3) the Commission on Accreditation of Medical Physics Educational Programs (CAMPEP), which oversees accreditation of both academic education and clinical training programs, and is actually a North American program jointly sponsored and run by Canadian and American Medical Physicists. CAMPEP sponsoring organizations are: the American Association of Medical Physicists, the American College of Medical Physics, the American College of Radiology, and the Canadian College of Physicists in Medicine. As of writing, membership is approximately 581 in COMP including nearly 100 student members and 80 international members[2], and 294 in CCPM (248 in radiation oncology, 20 in diagnostic radiology, 10 in magnetic resonance imaging, and 16 in nuclear medicine)[3]. In Australia, a single organization exists to handle professional organization, accreditation, and registration tasks: the Australian College of Physical Scientists and Engineers in Medicine (ACPSEM). Within the ACPSEM, special boards and panels are established for specific functions. The Professional Standards Board (PSB) is responsible for academic education, clinical training, university course accreditation, and facility accreditation. The PSB also approves appointments to the Register of Qualified Medical Physics Specialists[1]. The Radiation Oncology Accreditation Panel (ROAP) is responsible for assessment and examination of individuals for accreditation in the specialist field of radiation oncology. Similarly, the specialty fields of radiology and nuclear medicine are handled by the Radiology Accreditation Panel (RAP) and the Nuclear Medicine Accreditation Panel (NMAP), respectively. As of writing, membership of ACPSEM is approximately 500, which includes medical physicists, academics, biomedical engineers, and companies. Some 40 members are outside Australia and New Zealand. From a December 2008 national survey funded by the Commonwealth Government Department of Health and Ageing, in Australia (still in preparation) there are 193 radiation oncology medical physicists (ROMPs), and a further 57 registrars, practicing in the field. Of the 193 ROMPs approximately 140 hold or are in the process of gaining accreditation. The 2006 publication by Round[4] shows that in nuclear medicine there were 29 physicists considered "qualified" with a further 11 "in training", while in radiology there were approximately 16 physicists considered "qualified" with a further 9 "in training". For both specialties of nuclear medicine and radiology, the number of these "qualified" individuals who held accreditation was not stated. The ACPSEM training program to become an accredited Medical Physicist is currently the Training, Education, and Accreditation Program (TEAP). Each facility that receives accreditation agrees to implement the TEAP and train registrars according to the TEAP requirements.

Two appendices are provided to assist the reader. Appendix A contains a list of acronyms used in this work while an historical timeline is provided in Appendix B.

The path to becoming a medical physicist

Canada and Australia have similar building blocks in the overall path to becoming a clinical medical physicist (i.e. a relevant university degree plus appropriate 'hands on' clinical training), but they are organized somewhat differently. This is mainly due to the differences in the organization of the involved professional groups, as outlined in Table 1. Through the ACPSEM, the TEAP provides an umbrella which encompasses all the components that lead to accreditation, including academic education via a Medical Physics postgraduate qualification from a university with ACPSEM course accreditation, clinical training in a hospital which has ACPSEM accreditation for training, and ultimately an accreditation examination for the individual. Interestingly, due to this integrated approach TEAP is somewhat similar in structure to the recent proposal in North America for a degree of professional doctorate in medical physics[5,6], although not named as such. In Canada, since there are multiple groups involved in organizing the academic education, clinical training, and certification, these elements are provided in a more compartmentalized or serial approach – typically in the order of completing academic education (i.e. graduate degree), followed by clinical training (i.e. residency), ideally through programs accredited by CAMPEP. Certification of the individual through CCPM would then follow. The content and structure of CAMPEP accredited graduate and residency programs in medical physics are well defined[7,8], as they are in Australia[9,10] via TEAP.

Comparison of academic education

Accreditation of graduate programs

In Canada, currently five out of 17 graduate programs are accredited by CAMPEP, however at this time there is no requirement for accreditation of graduate programs. Some minor variability in program details exists between accredited graduate programs, but larger variability exists amongst non-accredited programs (ie. in terms of course content and courses offered, publication, and presentation requirements). There is growing pressure for graduate programs to become accredited due a recent proposal that they will be a requirement for certification of an individual Medical Physicist[11] in 2016 (see discussion in Need for Accredited Training/Education Programs below). Program accreditation is valid for five years before renewal is required. In Australia, four post–graduate programs in Medical Physics are accredited by the ACPSEM Professional Standards Board with another one currently in progress. Some variability in program detail exists between accredited programs but core components are the same. Initially a two-year provisional accreditation is awarded. Program accreditation is on a five-year renewal cycle.

Fees for accreditation of graduate program

In Canada, graduate programs pay CAMPEP a fee to process the application for accreditation. This typically involves payment by the university, although the healthcare organization (ie. hospital or cancer treatment facility) hosting the graduate program may handle this. The fee covers site visit expenses while the remainder of the accreditation work is performed on a volunteer basis. In Australia, from 2003-2009, Universities pay an accreditation fee including site visit costs. As of 2010, they will pay an application fee, an accreditation fee (including the majority of site visit costs) and an annual reporting fee.

Infrastructure and staff funding

The majority of Canadian graduate programs have infrastructure funded primarily through the health-care organization that offers the program. Staff involved in the delivery of graduate coursework and supervision of graduate research will

(Continued on page 59)

CITATION AWARD 2009

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

A few years ago I wrote an article for *Interactions* (Vol. 50, pp. 29-32) in which I suggested that the ground rules for the Sylvia Fedoruk Award should be changed. I argued that it is laborious and inevitably subjective to try to identify the "best" paper published in our field each year. Many papers are never even considered because the range of journals in which medical physicists publish is so broad. I proposed a simple, objective solution that would recognize the paper published in a given year that was cited most often over the next ten years. For the past five years I have announced an annual winner in *Interactions*. The rules (invented by the author) are simple and similar to those established for the Sylvia Fedoruk Award: the work must have been performed mainly at a Canadian institution, only papers in peer-reviewed journals are considered, review or popular articles are not eligible, and the paper must be "medical physics" – for example, articles dealing with clinical application of a mature imaging technology are not included, even if medical physicists are co-authors. The winner is determined from data in the Web of Science maintained by the Institute of Scientific Information (ISI) including citations in their conference data base except as noted in the table below.

For 2009 the winner, cited 201 times since publication, is:

D. H. Simpson, C. T. Chin and P. N. Burns, Pulse inversion Doppler: A new method for detecting nonlinear echoes from microbubble contrast agents, IEEE Transactions on Ultrasonics Ferroelectrics and Frequency Control 46: 372-382 (1999).

Abstract: A novel technique for the selective detection of ultrasound contrast agents, called pulse inversion Doppler, has been developed. In this technique, a conventional Doppler or color Doppler pulse sequence is modified by inverting every second transmit pulse. Either conventional or harmonic Doppler processing is then performed on the received echoes. In the resulting Doppler spectra, Doppler shifts from linear and nonlinear scattering are separated into two distinct regions that can be analyzed separately or combined to estimate the ratio of nonlinear to linear scattering from a region of tissue. The maximum Doppler shift that can be detected is 1/2 the normal Nyquist limit. This has the advantage over conventional harmonic Doppler that it can function over the entire bandwidth of the echo signal, thus achieving superior spatial resolution in the Doppler image. In vitro measurements comparing flowing agent and cellulose particles suggest that pulse inversion Doppler can provide 3 to 10 dB more agent to tissue contrast than harmonic imaging with similar pulses. Similar measurements suggest that broadband pulse inversion Doppler can provide up to 16 dB more contrast than broadband conventional Doppler. Nonlinear propagation effects limit the maximum contrast obtainable with both harmonic and pulse inversion Doppler techniques.

A very close runner up, cited 195 times and worthy of honorable mention:

R. D. Hoge, J. Atkinson, B. Gill, G. R. Crelier, S. Marrett and G. B. Pike, Investigation of BOLD signal dependence on cerebral blood flow and oxygen consumption: the deoxyhemoglobin dilution model, Magnetic Resonance in Medicine 42: 849-863 (1999).

Abstract: The relationship between blood oxygenation level-dependent (BOLD) MRI signals, cerebral blood flow (CBF), and oxygen consumption (CMRO2) in the physiological steady state was investigated. A quantitative model, based on flow-dependent dilution of metabolically generated deoxyhemoglobin, was validated by measuring BOLD signals and relative CBF simultaneously in the primary visual cortex (V1) of human subjects (N = 12) during graded hypercapnia at different levels of visual stimulation. BOLD and CBF responses to specific conditions were averaged across subjects and plotted as points in the BOLD-CBF plane, tracing out lines of constant CMRO2. The quantitative deoxyhemoglobin dilution model could be fit to these measured iso-CMRO2 contours without significant (P less than or equal to 0.05) residual error and yielded MRI-based CMRO2 measurements that were in agreement with PET results for equivalent stimuli. BOLD and CBF data acquired during graded visual stimulation were then substituted into the model with constant parameters varied over plausible ranges. Relative changes in CBF and CMRO2 appeared to be coupled in an approximate ratio of similar to 2:1 for all realistic parameter settings.

For the record, here are the winners from previous years:

1994: R. M. Henkelman, G. J. Stanisz, J. K. Kim and M. J. Bronskill, Anisotropy of NMR properties of tissues, Magnetic Resonance in Medicine 32: 592-601. Cited 129* times in 10 years and 202 total.

1995: D. W. O. Rogers, B. A. Faddegon, G. X. Ding, C.-M. Ma and J. Wei, BEAM: A Monte Carlo code to simulate radiotherapy treatment units, Medical Physics 22: 503-524. Cited 310* times in 10 years and 592 total.

1996: A. Kienle, L. Lilge, M. S. Patterson, R. Hibst, R. Steiner and B. C. Wilson, Spatially resolved absolute diffuse reflectance measurements for

(Continued on page 58)

56TH Annual Scientific Meeting of COMP and CCPM Symposium
June 16 – 19, 2010
Ottawa, Ontario

February, 2010	**Early registration begins**
February 22, 2010	**Online abstract submission begins**
April 2, 2010	**End of abstract submission**
April 30, 2010	**End of early registration**

LAC Update: SPECIAL ASM OPPORTUNITIES

NRC workshop – this 1-day meeting hosted by the Ionizing Radiation Standards group at NRC will cover primary standards, calibrations and research capabilities. Date – Wednesday 16th June, 8:30 am – 5 pm

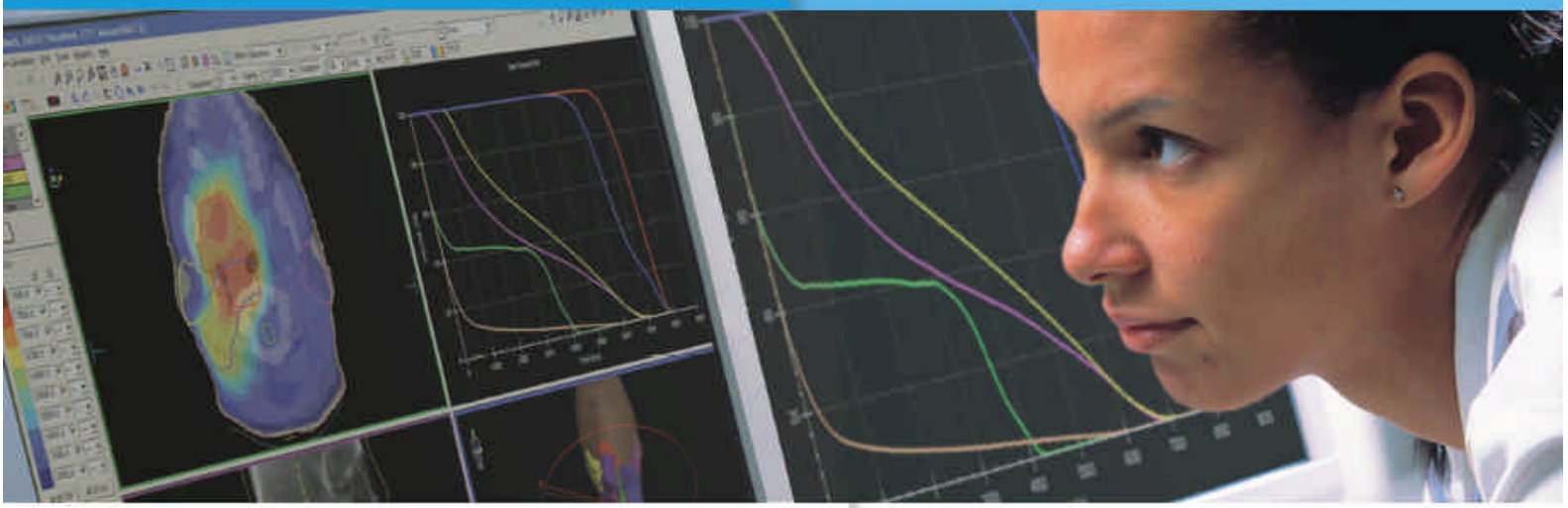
Tour of BEST Theratronics –this tour will show off what the company is doing in the field of radiation therapy and radionuclide imaging. Date – Wednesday 16th June, 3:30 pm – 5:30 pm
Note – a bus will be available to take those interested in both events from the NRC workshop to the BEST Theratronics facility.

Tour of The Ottawa Hospital Cancer Centre – the brand new state-of-the-art cancer centre will be opening its doors on the afternoon of the final day of the conference. Date – Saturday 19th June, 2 pm – 4 pm

Tour of The University of Ottawa Heart Institute – a great opportunity since radionuclide imaging is likely to be a major theme of this year's meeting. Date – Saturday 19th June, 2 pm – 4 pm

Check the Local Arrangements Committee website – **www.physics.carleton.ca/comp2010** - for program and special events updates.
Contact the LAC for any questions at **info_comp2010@physics.carleton.ca**

Beyond doubt there's certainty



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COMP Winter School 2010 Photos. Top: group picture. Bottom left, participants working hard. Bottom right, hardly working.

Reviews of COMP Inaugural Winter School 2009

Do you like to discuss Failure Modes and Effect Analyses (FMEA)? Do you like to discuss FMEA while sitting in a hot spring? Do you like to discuss FMEA while sitting in a hot spring after a beautiful day of skiing/boarding?

Well, if you were not in Banff , AB from Jan 24 – 28th , 2010 for in inaugural COMP Winter School, then you were definitely missing out on something special. Held at the Banff Park Lodge, 13 faculty members delivered very high quality lectures and workshops on various themes related to Quality and Safety in Radiation Oncology. There were approximately 55 attendees representing almost every province in Canada. In addition, we were joined by several of our colleagues from the US. The group was diverse professionally and there was a very nice mix of physicists, radiation oncologists, radiation therapists and even one administrator.

The theme of meeting was very timely given that the day before we convened; a disturbing article was published in the New York Times detailing several situations involving the gross misadministration of radiation therapy. To view the article, go to: **http://www.nytimes.com/2010/01/24/health/24radiation.html.**

The keynote speech was delivered by Dr. Bill MacKillop, a radiation oncologist from Kingston Regional Cancer Centre / Queen's University. He made a convincing argument for the need for health services research in terms of measuring, understanding and improving health care system performance. It is possible to define an ideal achievable goal for these metrics and to measure on a clinic-by-clinic or province-by-province basis how the health care system is meeting their goals. There is a lot of focus on quality assurance for treatment planning and delivery of radiation therapy. Dr. MacKillop highlighted a need to have a quality assurance system in place farther upstream and downstream from this component. Is it really necessary to have different treatment strategies and prescriptions by different radiation oncologists for the same stage disease? What about follow-up after a course of radiation therapy has been completed? Is there a systematic way (for non-study scenarios) to track whether new techniques (e.g. IMRT) or different clinics are producing different outcomes for patients in terms of side-effects, recurrence and overall survival?

A lot of emphasis was also placed on factors that contribute to errors in treatment planning / radiation delivery. Several lectures presented methods on how to develop a systematic way to identify and prioritize weaknesses in the radiation therapy process and to ensure that these weaknesses never realize into errors and adverse incidents for an actual patient. A major topic was Failure Mode and Effects Analysis (FMEA) which is a risk-assessment tool used to identify deficiencies in processes that could lead to errors. It also allows you to prioritize processes that have either a high risk of occurring or a high impact on a patient's treatment. A natural partner to FMEA is called Fault Tree Analysis (FTA). This is a technique that allows you to identify where in a processes, protective measures would be most effective. Several resources were presented that provide a means to report, classify and track incidents (or near misses) when they do occur. There was much discussion about the reporting (or not) of near miss incidents and how to take this information to help identify problem areas in the system.

The conference was not completely focussed on the technical nature of identifying, preventing and analyzing errors. A fascinating component of the conference involved presentations on the legal and ethical implications of radiation therapy errors. There was a lively debate on the issue of disclosure – when, if, how etc. Insight from a professional medical ethicist and a health care defence lawyer provided a fresh perspective on these issues. It was re-iterated that the process of disclosure of an incident to a patient should always be done as a team effort, and that prior consultation with legal council is critical.

A recurring theme throughout these lectures was the concept that major radiation therapy incidents are rarely attributable to one single cause. Often, these incidents are an unfortunate alignment of human, technical, or software errors along the treatment process which individually might be considered small. We had many diagrams of "Swiss Cheese" models and "Spinning Holey-Disc" models which not only illustrated the issue clearly, but possibly left some of us hungry and dizzy.

Hopefully, I have been able to convey the timeliness and usefulness of this inaugural Winter School. As you can tell, there was a lot of information – and it was presented in different ways: lectures, open-floor discussions, and small-group workshops. But it wasn't all work, work, work. Tuesday, there were morning lectures, followed by 7 hours of free time during the day. After a tasty meal, it was back to school for a couple more hours. So YES, there was some skiing under

brilliant blue skies, possibly some trips to Lake Louise, a convenient Robbie Burns Day to celebrate, and of course brontosaurus-sized steaks to consume. The atmosphere was collegial and the relatively small size of the meeting combined with many tasty communal meals made for great networking opportunities. It is rumoured that the Winter School will be heading east next year with a similar educational theme, so plan on attending!

Alanah Bergman, PhD, MCCPM
Vancouver Cancer Centre
Vancouver, British Columbia

In the interest of full disclosure, I have an office across the hall from one of the organisers of the inaugural COMP Winter School, and I assisted, albeit in a *very* peripheral way, with check in for the event. Apart from that, I am completely unbiased, and feel I can speak freely. So, in the spirit of honesty and without regard to any career limiting repercussions for my frankness ...

The theme of the 2010 inaugural COMP Winter School was "Quality and Safety in Radiation Oncology", which felt particularly timely given the publication of the first of a series of New York Times articles on radiation accidents on the very first day of the conference. The faculty, who wasted no time in including references to the articles, were certainly well versed on the subject. Not just focusing on our own sub-specialities and QA issues in medical physics, the school invited experts in engineering, law, the social sciences, software design and medicine. That being said, the faculty and attendees were, naturally and unsurprisingly, heavily skewed towards medical physicists, but that is to be expected -- welcome, even, given what well spoken, well rounded and remarkably attractive people we tend to be. Despite the skew, there was a definite interdisciplinary flavour to the event, with some administrators, RTTs and radiation oncologists in the audience, as well as some diversity within the faculty.

The format was a mixture, with most of the presentations being in lecture format where I learned a spate of new jargon, things like Failure Mode and Effect Analysis, Human Factors, Process Control, Process Maps, Incident Learning, Error Fault Trees, Value Stream Mapping and Risk Priority Numbers. There were, on the second to last day, a number of workshops running concurrently in the afternoon, and the final morning was devoted to summarizing and giving feedback on these workshops. I personally found the feedback / panel discussion to be quite useful since it was only possible to attend 3 of the 9 workshops, and I was certainly interested somewhat in hearing what went on in the other workshops.

The lectures were interesting, with some understandable degree of overlap. There were numerous references to the so-called Swiss Cheese Model of failures, as well as the forthcoming AAPM TG 100 -- the latter being hardly surprising given that half of the members of the Task Group were faculty at the Winter School! The workshops I attended were useful, allowing us to get a flavour of the process of, for example, creating part of a Fault Tree and assigning Risk Priority Numbers, as well as severity values and occurrence probabilities. There was, however, not quite enough time in any of the workshops, but perhaps that is to be expected when trying to compact what is normally a major undertaking in to such a short time frame.

There were some minor audio problems, the course materials were largely not available in advance of the school and I could have done without the social scientist, personally, but those are minor complaints. The overall feel was somewhat similar to the AAPM Summer School (minus the large accompanying monograph), but with some notable differences. Notable differences include smaller size of the event, location (hotel as opposed to campus dormitories) and the inclusion of workshops, giving a more practical, less theoretical feel to the event. The smaller size of the event was highly conducive to networking, as was the scheduled 'day off' -- which, in fairness, was not really a day off as we made up for it with the early morning / later evening sessions.

There were a number of personal highlights. I thoroughly enjoyed the keynote address by Mackillop, with his call to strive for better access, quality, and efficiency, as well as a wake up call that not all of us are tracking and reporting outcomes. The talk by Wassyng was quite interesting and drove home the point that just because we *can* write software does not mean we are software experts, and possibly neither are the commercial programmers we deal with. There was also someone, and I can't recall who, who shared his personal habit of annoying vendors when they're doing interactive demos by pushing all the wrong buttons, because that way he learns how these systems fail when people do unexpected things. I also enjoyed the later evening networking events known as "going for beer".

The current plan, as I understand from my colleague across the hall, is to repeat the Winter School every year, and change the topic every two years. That is to say the 2011 Winter School will have mostly the same faculty and focus in an eastern location (Mont Tremblant, I believe), and the next new topic will be rolled out for the next Western Edition of the COMP Winter School in 2012. For those who are interested in the topic and able to attend the Eastern edition in 2011, I highly encourage you to attend. The event is worthwhile, and I expect it to be, like a well seasoned stew, even better when served up the second time.

Marc MacKenzie, PhD, FCCPM
Cross Cancer Institute
Edmonton, Alberta

COMP Inaugural Winter School 2010

Software for Medical Devices: Why Testing is Not Enough

Alan Wassyng, Tom Maibaum and Mark Lawford
The McMaster Centre for Software Certification
Faculty of Engineering, McMaster University

Note: *The field of Radiation Oncology has come to rely on technology, computer controlled devices, and software in a comprehensive way such that that we could not practice our field without this advanced technology. Many of those who use computers in Radiation Oncology tacitly assume that the software we use has been demonstrated to be safe and is well tested by its manufacturer. The inaugural COMP Winter School was recently held at Banff, January 24 - 28, 2010, and it explored the general subject of Safety and Quality in Radiation Oncology. The subject of software safety was discussed by Professor Alan Wassyng, who is the Acting director of the new McMaster Centre for Software Certification, and of the Software Quality and Research Laboratory at McMaster University. This lecture generated much discussion as participants learned that testing software is not as effective as many had previously thought, and that the only way to ensure the safe function of software is through a rigorous development strategy conducted by well qualified people, and testing complemented by mathematical analyses. The following article is a summary of this discussion; it was kindly provided by Professor Wassyng and his colleagues so that the broader COMP community could also benefit from his presentation.—* ***Marco Carlone, COMP Councillor for Science and Education.***

Software is a pervasive enabling technology. It has changed the way we build aircraft, nuclear powered generating plants, cars, trains – and medical devices. It has enabled us to build devices far more capable and far more complex than those without software support. However, software is subtly different from other engineering technologies. Building high-integrity software-enabled devices has proven to be more difficult than people expected. At least part of the difficulty stems from the fact that many industrial developers exhibit a wide-spread lack of understanding of three crucial questions:

1. Why does software fail?
2. How do we construct correct, safe and reliable software in a cost effective way?
3. How do we certify that software based systems are safe and effective?

Although these three questions are current research topics, there is significant knowledge and some agreement amongst many academics – at least on questions 1 and 2. So, why is much of the software industry out of touch in this regard? We feel that it is simply because of the huge gap that has grown between software engineering industry and academia. Academics seem to be somewhat out of touch with what is required to build reliable software under realistic industrial conditions, and industrial developers seem to be unaware of genuine advances in software engineering methods and principles, and seem unwilling to invest in improvements. We don't know what happened first, but the current situation is decidedly unhealthy for both industrial developers and academics in software engineering. Luckily enough, there is a growing group of software researchers in industry, and this group may be able to start bridging the gap more effectively than we have witnessed in the past decade or two.

Software fails because of faults in the logic of the software. These faults may be introduced through a poor requirements process; through errors in the software design; and through incorrectly implementing the design in code. They can also be introduced through inadequate protection against hardware and user errors. Probably the largest cause of software faults is the complexity of the application. Software applications are amongst the most complex man-made entities in the modern world. It is often just too much for the development team to retain intellectual control over that complexity – and so, errors are made. It is also well documented that the vast majority of faults are a result of incorrect or poorly understood or poorly documented requirements. A historical examination of failures seems to support the idea that many serious failures occur through the simultaneous triggering of a number of faults, some of which may even have been known but thought to be inconsequential.

We believe that there is evidence that too many manufacturers of medical devices do not employ state of the art software development practices. The usual approach is not nearly rigorous enough and extremely seldom is it supported by mathematical analyses, as would be the case for any other critical engineered artifact. Well-known principles like *information hiding*, that facilitate maintainability, are either not understood or not used. Current practice relies on testing to *test quality into the product* - post development. This is almost always a recipe for failure. Quality needs to be built into the development process, all the way through. The goals of software development can be summed up as follows:

- If built according to the requirements specification, the application will be successful (validation).
- The application is built to specification (verification).
- The application will "likely" deliver "safe" behaviour in the face of hardware or software malfunction or user confusion (fault tolerance).
- The application will continue to be correct and safe over its lifetime (maintainability).

Testing can play an important role in both validation and verification. It should never be the only means of analysis. We know that we cannot test for all input combinations for any product of any reasonable complexity! Given this fact, and the fact that most companies rely on testing alone to ensure conformance, it is no wonder that we regularly hear of catastrophic malfunctions in the medical device field. It is pretty much a given, that in all those malfunctions, the system will have been "thoroughly" tested – for days-on-end – and they still failed. Testing has to be complemented by mathematical analyses and verifications wherever feasible. Our ability to perform more of these mathematical verifications in the future, and/or build software using correctness

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Appendix B

Australasia	**Canada**
1977 - ACPSEM formally declared.	1955 – CAP DMBO formed (precursor to COMP and CCPM).
1988 - ARECQA accreditation specific to radiotherapy equipment commissioning and QA commenced.	1979 - CCPM formed.
1997 - ARMP accreditation commenced.	1984 - Written membership certification exam commenced (no sub-specialty differentiation).
2003 - ANMP accreditation commenced. 2003 - ROMP TEAP commenced in New Zealand.	1989 – COMP formed.
2004 - ROMP TEAP commenced in Australia.	1994 - Introduced certification exam content specific to each of the four sub-specialties (Radiation Oncology, Diagnostic Radiology, Nuclear Medicine, and Magnetic Resonance)
2006 - AROMP accreditation commenced.	1995 - CAMPEP formed to accredit graduate programs and clinical training programs.
2010 (Dec. 31) – ARECQA accreditation ceases taking applicants.	2004 - Addition of oral component to CCPM membership certification exam.
	2016 - Requirement for individuals sitting the membership certification exam to be trained by a CAMPEP accredited academic education or clinical training program (only a proposal at time of writing).

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by construction methods, will be key to improving the dependability of the systems.

Certification or licensing of products enabled by software needs a thorough overhaul. Most current regulations that apply to software enabled devices are predominantly process-based. This is in stark contrast with licensing of physical products. These are almost always regulated through product-focused standards and licensing requirements. The current FDA regulations that pertain to software are primarily process-based. Good software processes are invaluable to the manufacturer. We agree on that. The assumption that the use of a good software development process can guarantee the dependability/quality of the software application itself is completely flawed. The regulatory/certifying agent tasked with evaluating the safety and effectiveness of the product must not rely on audits of the development process. Product-focused evaluations are difficult, mainly because of our lack of knowledge as to how to evaluate software products, but we have no choice – that is what is needed. It is also what is done in other engineering disciplines. A side-benefit of a product-focused regulatory regime is likely to be much better predictability of the licensing process for manufacturers of medical devices.

What can we suggest?

- Regulators should use a product-focused approach to certification. This does not imply zero interest in the software process. In fact, an idealized software process has to be agreed upon, so that manufacturers and regulators both understand what products and associated evidence are required.
- Regulators should examine interim products in the idealized software lifecycle and perform audits of those products.
- Regulators should insist on defence-in-depth strategies! Defence-in-depth must be applied to both the process, and to the product itself.
- The industry should examine whether separation of control and safety functions is feasible – as is done in the nuclear power industry in Canada. This has the effect of lowering the complexity of the safety component, and advancing efficacy of the control component.
- In general, lowering the complexity of the devices should be vigorously championed. In some cases, for example, billing system links are creeping into radiation devices. This seems to be totally contrary to reducing unnecessary complexity.
- Testing must be complemented by mathematical analyses and verifications.
- Regulators should insist on a suitably qualified work force. The world of medical devices is no place for software developers who are not well educated in rigorous software engineering.

(Continued from page 49)
most often have nil-salaried university appointments. Since healthcare in Canada is administered by the individual provinces, this means that provincial health care monies are the source of a significant portion of medical physics graduate program funding (both infrastructure and staff delivering courses/supervising students). However, there are a few examples where a tenured position in medical physics exists at a university, with the salary being directly supported by the university. Typically these academic positions do not exist in isolation and are often bolstered by staff and resources from a local health care facility. There also exist pure research positions supported with grant funding. The ACPSEM accredited postgraduate courses offered by the universities are funded by normal university funding mechanisms. The staff delivering the coursework and research supervision are university academics. Some subjects within courses are given by clinical medical physicists in association with the university.

Graduate student funding

In Canada, funding for the academic education of an individual (for example tuition, textbooks, living expenses) is the responsibility of the individual. However most graduate programs will not accept students without a reasonable guarantee of funding being available. Funding is usually parceled out in 1-3 year terms, with the student applying for studentship support to local, provincial or national funding bodies in a competitive environment. In Australia, some courses attract coursework fees which must be paid by the registrar. Financial support to offset these costs is sometimes provided from national, private practice or state sources to individual registrars, once they are enrolled in TEAP. Scholarship support is also offered by some states to students taking postgraduate courses but not enrolled in TEAP.

Graduate program supervisor

In Canada, the graduate student supervisor is either an adjunct faculty (i.e nil-salaried) or full faculty member of the university through which the graduate program operates. In addition to meeting local university requirements, these persons would be reviewed as part of the CAMPEP accreditation of the graduate program. The situation is the same in Australia. The role of the supervisor may be shared with a clinical medical physicist for a hospital based research project, if someone with an adjunct appointment is not on site.

Graduate program content

In CAMPEP accredited programs in Canada, curriculum will be consistent with recommendations[12] of AAPM Report Number 79 "Academic Program Recommendations for Graduate Degrees in Medical Physics". In non-accredited programs, curriculum will be similar but demonstrate more inter-program variability. Since all Australian medical physics graduate programs are accredited, their curriculum is consistent as defined by the TEAP documentation for university course accreditation[10]. University accreditation is currently under review by the PSB.

Comparison of clinical training

Accreditation of clinical training programs

Most Canadian clinical training programs for Radiation Oncology specialization (8 out of 10) are currently accredited by CAMPEP. At this time only one institute offers an accredited clinical training program for Diagnostic Imaging specialization. Accreditation ensures a standardization of curriculum and evaluation for the individual being trained. There is increasing pressure for non-accredited residency programs and informal clinical training programs to become accredited, due to a recent CCPM proposal that would require individuals seeking certification to have passed through an accredited program. This is discussed further in the Need for Accredited Training/Education Programs section below. Smaller clinical training programs may have difficulty covering all CAMPEP training requirements (for example, if they do not offer brachytherapy treatment). The AAPM TG133 report[13] proposes affiliations between accredited programs and non accredited programs offering clinical training positions, in order to increase the capacity for accredited clinical training. This option is currently being examined by several Canadian institutions and in fact has been successfully trialed at a pair of Canadian centres over 2007-2009.

All Australian clinical training facilities are accredited through ACPSEM's Professional Standards Board. To date 24 radiation oncology facilities have received accreditation but no nuclear medicine or radiology facilities are yet accredited. Some smaller centres have difficulty covering brachytherapy components (including rural and private centres). Inter-centre collaboration is required to gain accreditation by the PSB in such cases. Low staffing levels in radiology and nuclear medicine limit inter-specialty rotations.

Fees for accreditation of clinical training program

Canadian programs applying for accreditation pay CAMPEP a fee to process the application and offset the cost of a site visit. This involves payment by the organization where the training program is offered. In Australia, clinical departments pay an accreditation fee (including site visit costs) for clinical training accreditation. From 2010, they will pay an application fee, an accreditation fee (including the majority of site visit costs) and an annual reporting fee.

Infrastructure and staff funding

Canadian clinical training programs are offered through health-care facilities and therefore provincial funding would be used for both infrastructure and staff performing the training. Training duties would be in addition to normal clinical workload. Australian clinical training programs are offered through health-care facilities (public and private), and therefore sources of funding may be state or private. Training is provided by clinical physicists as a part of their duties, in addition to their normal clinical workload.

Training position funding

Canadian accredited training positions are usually fixed term positions that are permanently funded by the institute offering the position. Since these are health-care institutes, this funding is provincial in origin. There are some examples where a term training position may be funded on an 'as needed' basis, instead of permanently. Australian training positions may be funded through a mixture of local, state, private and federal funds. All stakeholders recognize the need to train more medical physicists and funding support for training positions is increasing each year. The federal government offer financial incentives to public and private facilities to create clinical training positions. The majority of funding has been for ROMP registrar positions but recently funding has been provided for nuclear medicine and radiology registrars in Victoria. Further federal funding support is currently under negotiation for more training positions around Australia.

Administration of clinical training program

Canadian training programs are administered by local Medical Physicists from the department offering the training position.

Table 1. *Organizational involvement in the accreditation/certification of Medical Physics academic education, clinical training, and individual competency.*

Task	Australia	Canada
Accreditation of M.Sc./Ph.D. programs	ACPSEM - PSB	CAMPEP
Accreditation of clinical training programs	ACPSEM - PSB	CAMPEP
Certification/Accreditation of individual Medical Physicists	ACPSEM Accreditation Panels	CCPM
Professional body	ACPSEM	COMP

In Australia, ACPSEM provides administration and coordination support with the aid of federal government funding for 1.75 FTE staff (funding ceases June 30, 2012) and ongoing TEAP fees. Additionally state and federally funded Clinical Program Coordinators and Preceptors provide localized support to registrars and clinical trainers for radiation oncology. These additional positions are employed directly in the public or private facilities and not by ACPSEM. They have proved pivotal to the success of TEAP Radiation Oncology to date. This year the federal government has provided funding support to ACPSEM to employ 0.75FTE staff to provide administration and coordination support for TEAP Nuclear Medicine and TEAP Radiology. Clinical supervisors must be approved by the ACPSEM Accreditation Panels. There must be at least one accredited individual in the facility, or an equivalent as approved by the Accreditation Panel. By 2010, a supervisor must be on or eligible to be on the ACPSEM's Register of Qualified Medical Physics Specialists.

Length of clinical training

Accredited Canadian clinical training programs are normally two years in length. It is emphasized here that these programs are purely clinical training and do not include academic education in pursuit of a university degree. Currently, if a trainee enters a CAMPEP accredited clinical training program with incomplete didactic medical physics training, the program length may be extended to allow the trainee to pursue remedial education. However this option may disappear on July 1, 2012. After that date, trainees entering accredited clinical training programs may be required to have completed all didactic components present in accredited graduate programs[14]. Non-accredited clinical training may or may not have distinct time frames defined, and may be somewhat dependent on available funding.

The Australian TEAP ranges from three years in length (minimum full-time equivalent clinical experience) up to five years depending on all or part of the academic education (M.Sc. or Ph.D.) being taken concurrently within the training period. Currently there is an even mix across the three and five year timelines. Clinical training may be undertaken in the minimum three years if the person has completed their M.Sc. or Ph.D. upon entry into TEAP. The length of training time may be affected by the funding available, since positions may be specially funded, existing, or newly created permanent positions.

Clinical training content

For accredited Canadian programs, content will be consistent with recommendations[15] of AAPM Report Number 90 "Essentials and Guidelines for Hospital-Based Medical Physics Residency Training Programs". For example, content for the radiation oncology specialty training includes interstitial and intracavitary irradiation, radiopharmaceuticals, external beam megavoltage irradiation (both with low energy and high energy), electron beam therapy, radiographic/fluoroscopic simulation, CT-based virtual simulation, computerized dose planning, physical treatment planning, construction of treatment aids, calibration and monitoring of radiation therapy equipment, and radiation safety procedures.

The Australian training consists of core clinical training areas and ancillary areas in other specialties and nonclinical areas. Currently the ACPSEM radiation oncology clinical training guide[9] that outlines clinical training program content, is adapted from the IAEA documentation[16]. It contains 38 core competencies, each requiring three levels of progressive attainment and they cover the five main ROMP areas of external beam treatment, dosimetry, treatment planning, brachytherapy and radiation safety. There are a further 20 requirements related to five ancillary areas: clinical introduction; professional studies & quality management; research, development and teaching; imaging and nuclear medicine. The nuclear medicine and radiology frameworks are currently under review and may well use a similar approach by adapting IAEA programs.

Progressive assessment

Canadian accredited clinical training programs assess their trainees regularly, primarily through oral examination. This examination is performed at natural points in the training, such as at the end of a clinical module. Typically five or more assessments are made throughout the two year period.

The Australian program also has local competency assessments at regular intervals based on the three levels noted above and approved by the clinical supervisor of the registrar. Assessment methods and criteria are currently under review. Furthermore, registrars are reviewed annually by the ACPSEM TEAP Co-ordinator. The complete TEAP for radiation oncology is currently under review by an external consultant, funded by the federal government. Findings will become available in 2010.

Comparison of certification/ accreditation process for individual medical physicists

Levels or types of certification/ accreditation

In Canada, the CCPM offers two levels of certification for an individual. The 'Membership' level verifies basic competence as a Medical Physicist. Although not legally required to practice Medical Physics in Canada, it is commonly required for permanent employment. The 'Fellowship' level, available after seven years of relevant experience, attempts to verify competence for more senior duties. This second level of certification is also not legally required but may have implications on salary or responsibilities of the individual. Certification is available in four sub-specialties including radiation oncology, diagnostic imaging, nuclear

medicine, and magnetic resonance imaging. In Australia, a single accreditation level is available for an individual. Accreditation is available in three specialties of radiation oncology, radiology, and nuclear medicine. The accredited individual is eligible to be listed on the ACPSEM Register of Qualified Medical Physics Specialists Unlimited Category 1. The pre-cursor to the current TEAP training system for radiation oncology, ARECQA, ceases taking applications on Dec. 31, 2010. In radiation oncology, persons first entering the profession after Jan. 1, 2006 can only attempt the new ROMP accreditation (AROMP) via the TEAP. Nuclear medicine and radiology specialties require new entrants into the profession to train via TEAP.

Exam fees

In Canada the individual currently pays $450 to sit the certification exam (on average about 20 individuals sit the exam annually). In Australia the individual currently pays $1300 per year during their TEAP training program. From 2010, the fee has been split into an annual administration fee and fees for each examination and will double once federal government funding support ends. About 6 ROMP registrars sit their final examinations annually, with this number expected to rise to about 15 by 2012. No nuclear medicine or radiology registrars have yet taken examinations but should begin to do so in 2010.

Exam format

The Canadian certification exam at the Membership level employs a similar format for all four sub-specialties. A 5-hour written exam assesses knowledge in four areas including general medical physics, radiation safety, the area of the specific sub-specialty, and radiation protection/ radiation biology. If successful, the candidate proceeds to a 1.5 hour oral exam focusing on practical clinical knowledge in their sub-specialty. The Canadian certification exam at the Fellowship level provides a consistent format for all four subspecialties. This format is comprised of the individual delivering a 30 minute oral presentation followed by presentation-specific questioning, then broad questioning relevant to the individuals subspecialty. The Australian accreditation has written, oral, and practical exams. In radiation oncology for TEAP trainees, a written exam (2.5 hours), an oral exam (1 hour), and a practical exam (2 hours) are required. In addition to these examinations, 1 publication, 1 conference presentation, a submission (containing examples of significant clinical work), plus annual reviews and a postgraduate degree (M.Sc. or Ph.D.) are required. Successful completion of all requirements leads to Accreditation in Radiation Oncology Medical Physics (AROMP). The previous accreditation method (ARECQA) will be closed to applications after Dec. 31, 2010, and involves a 3 hour written exam and 3.5 hour practical/oral exam.

Recognition of foreign certified/ accredited medical physicists

In Canada, the CCPM does not formally recognize any foreign certifications. However, the Canadian certification approach at the Membership level has typically been kept similar to the ABR (American Board of Radiology) certification system, the USA certifying body for Medical Physicists, in terms of format and content. Although there is no formal recognition of Canadian and USA certification by their respective certifying bodies (CCPM and ABR), the certification exam similarities have been enough to allow significant movement of trained medical physicists between the two countries. Historically employers in each country recognize these certifications as being equivalent. In US states where practicing Medical Physicists require state licensure (these currently include New York, Florida, and Texas), Canadian certification is legally recognized as equivalent to American certification. Note that the US NRC may require evidence additional to the Canadian 'Membership' certification for designation as a Radiation Safety Officer, depending on specific state regulations. There is a mechanism whereby the Fellowship level of certification may be attempted by foreign-trained medical physicists holding certification from outside Canada without having previously obtained Membership certification. Specifically, the current bylaws state (III.2.a), "…medical physicists working in Canada and certified as competent by an appropriate organisation in another country may be eligible for Fellowship at the discretion of the Board."

ACPSEM does offer time limited recognition of some foreign certifications through the Limited registration system outlined above. UK, Canadian and American systems are specifically mentioned. Foreign certifications are also assessed in the examination processes of accreditation whereby some exemptions may be granted. In Australia the employer is also able to evaluate the accreditation/ certification of foreign trained Medical Physicists. There are currently ACPSEM PSB initiatives to investigate mutual recognition via the Register of Qualified Medical Physics Specialists and these will be pursued by ACPSEM with the aid of recent funding by the federal government. It is not a mandatory requirement for medical physicists to be registered in Australia. At the moment registration is a voluntary process for individuals being regarded as an enhancement of professional status. Some jurisdictions require accreditation for radiation licensing purposes and the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) describes a "qualified expert" in its code of practice[17] and links this to ACPSEM registered medical physicists in its associated safety guides. It is expected that authorization will occur in the next few years, and federal funding has also been received by the ACPSEM to pursue the possibility of mandated registration in some form.

Discussion of differences

This section highlights the main differences between Medical Physics training in Canada and Australia and provides further discussion. One significant difference is the chronological ordering of training. The Canadian system entails a serial approach to completing academic education then completing clinical training, while the Australian system provides mechanisms for both a serial model as well as a parallel model where academic education and clinical training are delivered together. The advantages of a serial approach include: simplicity for the trainee, simplicity for administration, and it introduces a logical break if the individual decides to pursue a different career path. However, it may be argued that a parallel approach allows integration of didactic material with relevant clinical training, which may benefit the trainee. In addition, in the parallel approach implemented in Australia, the trainee receives a professional salary and additional research project and funding support that may not be normally available to postgraduate students. However time management can be a major issue for some trainees. A second difference is the length of time required for clinical training. A two year minimum is required in Canada while a three year minimum is required in Australia. A shorter training period provides a benefit to the trainee and employer (if in a short-staffing situation) of a quicker entry into a professional position. However, a longer training period should allow for more clinical experience to be obtained. A longer training period ap-

proach provides the benefit of delivering more comprehensive training to an individual and consequently providing better trained individuals to employers. A rather significant difference exists in the implementation of program accreditation, for both graduate education and clinical training, and its' requirement for individual certification/accreditation. The Australian accreditation exam for individual Medical Physicists requires that the individuals receive both their academic education and clinical training through accredited facilities. This approach promotes high quality and consistency of training. The Canadian certification exam for individual Medical Physicists does not yet require promotion through an accredited clinical training program or accredited academic education program. While somewhat more flexible, this approach inherently allows more variability in training compared to the more stringent method where all aspects of education and training need to be obtained through accredited facilities. The CCPM plans to include an accredited program requirement, but not until 2016. One final notable difference is in the format of the certification/accreditation exam for individual Medical Physicists. Both exam processes involve written and oral components, however the Canadian certification exam does not require a practical component while the Australian accreditation exam does. A practical exam may be a useful and direct method of evaluating a specific skill or skill set. However, practical exams are very resource-intensive to administer, are difficult to objectively evaluate, and the examinee may be quite intimidated thus performance may be different than if they were in a familiar clinical environment. To combat the latter difficulty, the approach of conducting examinations in the registrar's department is being piloted by the ACPSEM in 2010.

The need for accredited training/ education programs

Arguably, the most important recent development impacting Canadian clinical training of Medical Physicists is the requirement by the ABR that by 2012, all individuals applying to sit the national certification exams for Medical Physicists in the USA be graduates of a CAMPEP accredited Medical Physics academic education program *or* clinical training program (ie. M.Sc., Ph.D. or residency) and by 2014 all individuals applying to sit the national certification exams in the USA be graduates of a CAMPEP accredited Medical Physics clinical raining program[2,13,18]. To maintain the current informal equivalency between Canadian and American certifications, the CCPM is considering implementing similar requirements to those of the ABR[11,18]. Specifically, the CCPM is considering adding a requirement[11] for graduation from either a CAMPEP accredited clinical training program or CAMPEP accredited graduate program, for certification exams taking place on and after 2016. The Australian process for accrediting individual medical physicists also has a similar requirement, but with a much earlier timeframe: Registrars sitting the national accreditation exam will be required to have fully completed the accredited training programs for exams taken after Dec. 31, 2010. Experienced medical physicists (Australian, New Zealand or overseas) wishing to gain accreditation after that date will need to apply to the relevant accreditation panel for an assessment against TEAP competencies and assessment requirements. A formal procedure for this has not yet been developed. While in Australia the training requirement has been approached with a structured development of accredited academic education and clinical training programs, the development in Canada (and the USA) has been much more disjointed. For the purposes of this discussion, it is worth focusing on the fact that the accredited training program requirement for individual accreditation/ certification is an impending reality in both Australia and Canada (and the USA) but will be realized in Australia several years earlier.

The ABR requirement has caused much concern in North America regarding the current, widely–recognized lack of training capacity in accredited North American programs. Indeed, the shortage of trained medical physicists is an international problem and one that both Australia and Canada (in addition to other countries) are trying to address. For example, in December 2008 there was a 15% vacancy rate of ROMP positions in Australia. The AAPM TG 133[13] proposes alternate models of training medical physicists within the practical constraints of what the current North American training infrastructure can offer. Over the next few years the prevalent solution will most likely include the addition of accredited training capacity via the accreditation of non-accredited and informal clinical training programs, including the use of clinical training positions at satellite facilities associated with accredited central facilities. It is recognized that additional funding for expansion of training programs is required immediately to meet the human resource demands of the profession in the coming years[13]. In Australia, the addition of human resources for existing and future expansion of radiotherapy services has been addressed by government funding for additional training positions and supporting infrastructure[19], although for the time being the added training burden is carried by experienced medical physicists as part of their workplace duties. There is an obvious delay before many of these additional trainees can be used to fill vacancies at a qualified level.

Possibility of mutual recognition

Mutual recognition of certification/ accreditation of Medical Physicists would benefit employers by providing a more liquid pool of well-trained labour. Individual Medical Physicists would benefit since they would have greater ability to pursue broader employment opportunities. If recognition were implemented unilaterally (as opposed to bilaterally), the offering country would possess a competitive advantage in attracting qualified Medical Physicists. In Australia, the ACPSEM does have a mechanism for placing foreign trained Medical Physicists on the Register of Qualified Medical Physics Specialists through Unlimited Category 2 designation. This requires an evaluation of the individual's accreditation/certification and may require some formal examination. In Canada, the CCPM does not currently have a mechanism to recognize foreign trained Medical Physicists, which does represent a significant challenge to mutual recognition. However, with some effort on the part of the certification/accreditation bodies from countries with significantly similar academic education and clinical training programs such as Canada and Australia, one could envision that some form of mutual recognition could be arranged. This effort could be particularly challenging for organizations operating mainly through member volunteerism. Focusing on the main differences identified above between education, training, and certification/accreditation of Medical physicists in Canada and Australia, the question arises as to whether any of these differences would prevent the implementation of mutual recognition. The issue of the requirement for academic education and clinical training to take place only through accredited programs is a short term difference and the two countries will have similar requirements soon, likely by

2016. The issue of serial vs. parallel delivery of academic education and clinical training would seem to be not critically important, reflecting more a difference in the style of education/training delivery. The difference in the length of required clinical training (two years Canada versus three years Australia) is a potentially significant issue as is the use of a practical component in the Australian accreditation exam, which is not present in the Canadian certification exam. These two differences would need to be considered in detail, however neither seem to pose an insurmountable problem.

This comparison demonstrates many similarities in academic education, clinical training and certification/accreditation of individual Medical Physicists in Canada and Australia. A few interesting differences are also identified, which might present obstacles to mutual recognition of certified/accredited Medical Physicists. However we feel the differences are not overwhelming, particularly in light of the fact that Medical Physicists have for some time easily migrated between the two countries to work in their fields. The quality of both is not questioned by employers. The comparison and discussion presented in this article indicate that investigation of mutual recognition for qualifications between Australia and Canada is worth pursuing, and may be in the interests of all stakeholders involved. We hope this article stimulates further discussion on this topic.

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17. ARPANSA Code of Practice RPS14, *Radiation Protection in the Medical Applications of Ionizing Radiation* May 2008.

18. E. Podgorsak and P. Dunscombe, *News from CAMPEP*, Interactions! Official newsletter of the Canadian Organization of Medical Physics, October, 123-124, 2008.

19. Hon Nicola Roxon, MP, Minister for Health and Ageing, *Support for People Living with Cancer*, Media Release, July, 2009.

Appendix A: glossary of acronyms

AAPM – American Association of Physicists in Medicine
ABR – American Board of Radiology
ACPSEM – Australasian College of Physical Scientists and Engineers in Medicine
ANMP – Accreditation in Nuclear Medical Physics
ARECQA – Accreditation in Radiotherapy Equipment Commissioning and Quality Assurance
ARMP – Accreditation in Radiological Medical Physics
AROMP – Accreditation in Radiation Oncology Medical Physics
ARPANSA – Australian Radiation Protection and Nuclear Safety Agency
CAMPEP – Commission on Accreditation of Medical Physics Education Programs
CAP – Canadian Association of Physicists
CCPM – Canadian College of Physicists in Medicine
COMP – Canadian Organization of Medical Physics
DMBP – Division of Medical and Biological Physics (a division within CAP)
FTE – full time equivalent
IAEA – International Atomic Energy Agency
MCCPM – Member of the Canadian College of Physicists in Medicine (i.e. individual has passed CCPM membership certification exam)
NMAP – Nuclear Medicine Accreditation Panel
PSB – Professional Standards Board (within ACPSEM)
RAP – Radiology Accreditation Panel
RCA – Regional Co-operative Agreement East Asia-Pacific Region
ROAP – Radiation Oncology Accreditation Panel (within ACPSEM)
ROMP – Radiation Oncology Medical Physicist
TEAP – Training, Education, and Accreditation Program (within ACPSEM)

(Continued on page 58)

Harold Johns Travel Award Announcement
Deadline for Application: 9th April 2010

The Board of the Canadian College of Physicists in Medicine is pleased to honour the Founding President of the College by means of the Harold Johns Travel Award for Young Investigators. This award, which is in the amount of $2000, is made to a College Member under the age of 35 who became a member within the previous three years. The award is intended to assist the individual to extend his or her knowledge by travelling to another centre or institution with the intent of gaining further experience in his or her chosen field, or, alternately, to embark on a new field of endeavour in medical physics.

The H. E. Johns Travel Award is awarded annually by the Canadian College of Physicists in Medicine to outstanding CCPM Members or Fellows proposing to visit one or more medical physics centres or to attend specialized training courses such as the AAPM summer school. The applicant should not have previously taken a similar course or have spent a significant amount of time at proposed institutions. The award is for $2,000 and will be paid upon receipt of a satisfactory expense claim. The deadline for application is approximately two months prior to each CCPM annual general meeting. All applicants must have written and passed the exam for membership in the CCPM within the previous three years. They should supply a one page proposal indicating the course they wish to attend or the name(s) of the institutions they would visit and the reasons for their choice. They should also supply an estimate of the costs involved and letters from their present employer indicating that they are in agreement with the proposal. For a visit to an institution the candidate must have the institution write to the Registrar in support of the visit. The candidate should also provide their curriculum vitae and the names and phone numbers of two references whom the Awards Committee can contact. No reference letters are required. The awards Committee reserves the right to contact additional individuals or institutions.

Applicants may travel either inside Canada or elsewhere. If their proposed expenses exceed the value of the award, then they should also indicate the source for the additional funds required.

The award is intended both to assist the individual in their medical physics career and to enhance medical physics practice in Canada. Recipients are therefore expected to remain in Canada for at least one year following their travel. Applicants should be working in Canada but need not be Canadian citizens.

Successful candidates will have two years after their application deadline to complete their travel. They will be required to submit a short report to the InterACTIONS newsletter. The award recipient will be chosen by a committee consisting of the Chairman of the Examining Board, The Registrar and the President of the College. Their choice will be based upon 1) the written proposal submitted by the candidate, 2) references obtained by the committee and 3) membership exam results. The award will be announced at the Annual General Meeting of the College.

Unsuccessful candidates in any one year who are still eligible in subsequent years may have their applications considered again by writing to the Registrar and providing any necessary updated information.

Applications should be sent to:
Mr. Darcy Mason
Registrar, Canadian College of Physicists in Medicine
c/o Durham Regional Cancer Centre,
1 Hospital Court,
Oshawa, ON L1G 2B9
damason@lakeridgehealth.on.ca

Welcome to COMP!

Please welcome the following 2010 new members to COMP:

Last Name	First Name	Institute	Membership Type
McCormick	Stephen	Sunnybrook Health Sciences Centre	Associate
Persaud	Lauren	Sunnybrook Health Sciences Centre	Associate
Snelgrove	Ronald	Grand River Regional Cancer Centre	Associate
Sopher	Daniel	Juravinski Cancer Centre	Associate
Bracken	John	Princess Margaret Hospital	Full
Emde	Kimberley	Sunnybrook Health Sciences Centre	Full
Fakir	Hatim	London Regional Cancer Program	Full
Gherase	Mihai	Mount Allison University	Full
Heath	Emily	Ryerson University	Full
Karotki	Alex	Odette Cancer Centre	Full
Korol	Renée	Odette Cancer Centre	Full
Lauzon	Aimée	CHUM	Full
Mah	Dennis	Montefiore Medical Center	Full
Monajemi	Tara	Cross Cancer Institute	Full
Noseworthy	Michael	St. Joseph's Healthcare	Full
Parraga	Grace	Robarts Research Institute	Full
Vallejo	Fabiola	Juravinski Cancer Centre	Full
Wassenaar	Richard	The Ottawa Hospital	Full
Bassey	Bassey E.	University of Saskatchewan	Student
Boudreau	Mathieu	Robarts Research Institute	Student
Couch	Marcus	Robarts Research Institute	Student
Fatemi-Ardekani	Ali	McMaster University	Student
Leary	Del	Dalhousie University	Student
Linte	Cristian A.	Robarts Research Institute	Student
Tanguay	Julie	Robarts Research Institute	Student
Thind	Kundan	Robarts Research Institute	Student
Zonoozi	Amin	St. Joseph's Hospital	Student

Congratulations to the following past student members who are now full members:

Babic	Steven	London Regional Cancer Program
Ghasroddashi	Esmaeel	Tom Baker Cancer Centre
La Russa	Dan	The Ottawa Hospital Cancer Centre
Rangel	Alejandra	Tom Baker Cancer Centre
Sandhu	Gurpreet	Tom Baker Cancer Centre

Editor's Note

Idris Elbakri, PhD, MCCPM
CancerCare Manitoba, Winnipeg, MB

This issue of Inter*ACTIONS* is full of interesting and thought provoking articles.

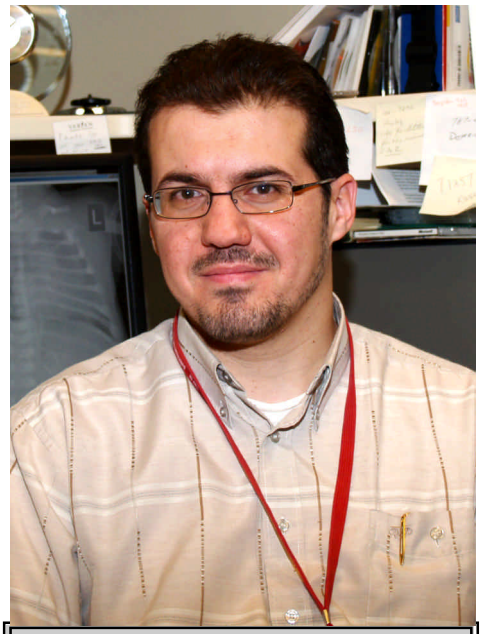
The COMP Winter School was a great success, as alluded to by the two reviews provided by Alanah Bergman and Marc MacKenzie. It seems that our colleagues who attended worked hard and skied hard. Professor Alan Wassyng kindly provided us with an article based on his presentation at the Winter School on software for medical devices.

In the previous issue, Boyd McCurdy reminisced about life in Australia during his sabbatical there. In this issue, we reprint a very interesting comparison of medical physics education and training between Canada and Australia.

As soon as I finish preparing this issue for publication, I have to attend to another deadline: the COMP ASM abstract deadline on April 2. I find Ottawa to be one of the most beautiful Canadian cities and I try to stop there whenever I can. The local arrangements committee has prepared a very interesting programs and I look forward to the interest facility tours they have lined up. I also hope to meet many of Inter*ACTIONS* contributors and thank them for their support in person!

As always, I welcome your feedback on this issue and your ideas for improving our newsletter.

Have a happy spring!



Book Review

Sherry Connors, M.Sc.
Cross Cancer Institute

Applied Physics for Radiation Oncology (2009 edition) by Robert Stanton and Donna Stinson. 391 pages, Medical Physics Publishing, Price $85 USD softcover. ISBN: 978 -1-930524-40-8

This is an updated version to the 1996 and 1992 book (An Introduction to Radiation Oncology Physics) by the same authors. The text is still useful as primer that introduces radiation oncology concepts in a simplistic manner to the student in the context of patient application. Many of the specialized textbooks for radiation oncology are written at a higher educational level, more suitable for physicists and physicians. This text has questions and answer sections at the end of every chapter, and some updated references that guide the reader to more comprehensive literature.

As the preface indicates, the majority of the book is unchanged from previous editions in the areas of basic physics and basic treatment planning principles therefore the older version suffices just as well for these topics. Although the technology of linear accelerators has changed greatly in the past 12 years, the chapter on linacs has not appreciably increased to address dynamic wedge, IMRT or IGRT imaging devices, now standard on newer linacs. The authors have missed the opportunity to review these complicated modern tools that are prevalent in North American radiation therapy centers. The section on Quality Assurance does not reference the more recent AAPM Reports (No. 106, 119 or 142). Even though the latter reports were published in fall of 2009, their advent was widely publicized. These deficiencies relegate the text as a library complement rather than a primary text for teaching. Use of more traditional texts would be needed to fill the gaps.

Nevertheless, for those that struggle with dense scientific texts and detailed diagrams, this book is an easy read for the beginner and would be useful for the intended audience.

Dates to Remember

Inter*ACTIONS* Summer Issue Deadline June 1, 2010!

COMP ASM June 16-20, 2010 Abstracts April 2, 2010 Ottawa ON

ITART 2010 June 21-22, 2010 National Harbor, Maryland

AAPM Annual Meeting July 18-22, 2010 Philadelphia, PA

AAPM Summer School July 22-25, 2010 Philadelphia, PA

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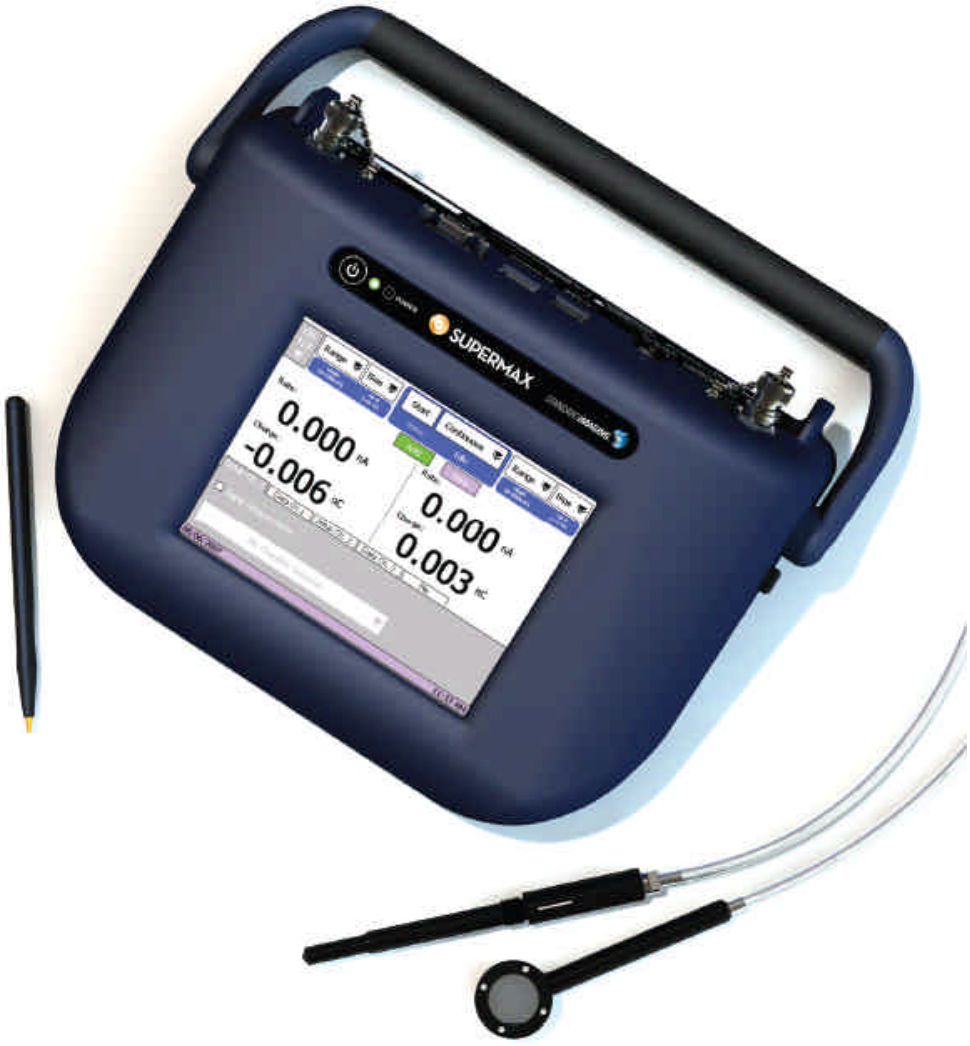

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