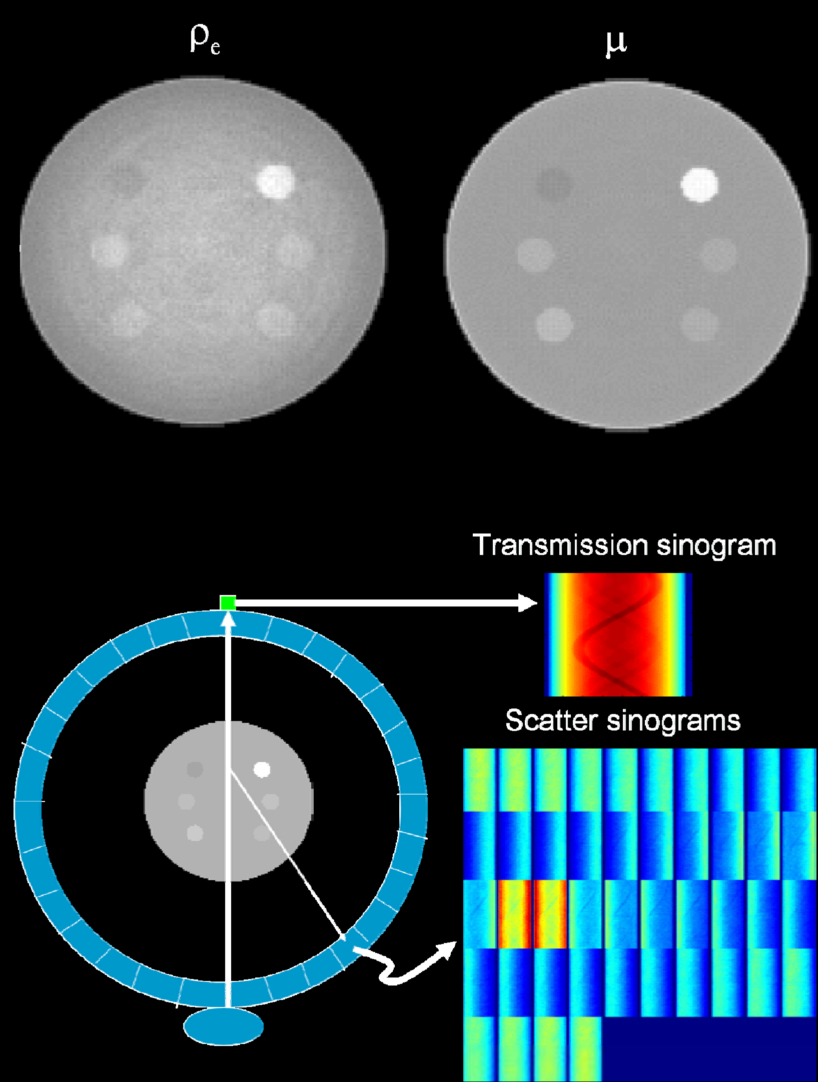
InterACTIONS

CANADIAN MEDICAL PHYSICS NEWSLETTER
Le BULLETIN CANADIEN de PHYSIQUE MÉDICALE

Reconstruction of Electron Density and Linear Attenuation Coefficient Using First Generation Incoherent Scatter Computed Tomography



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LE COLLÈGE CANADIEN DES PHYSICIENS EN MÉDECINE

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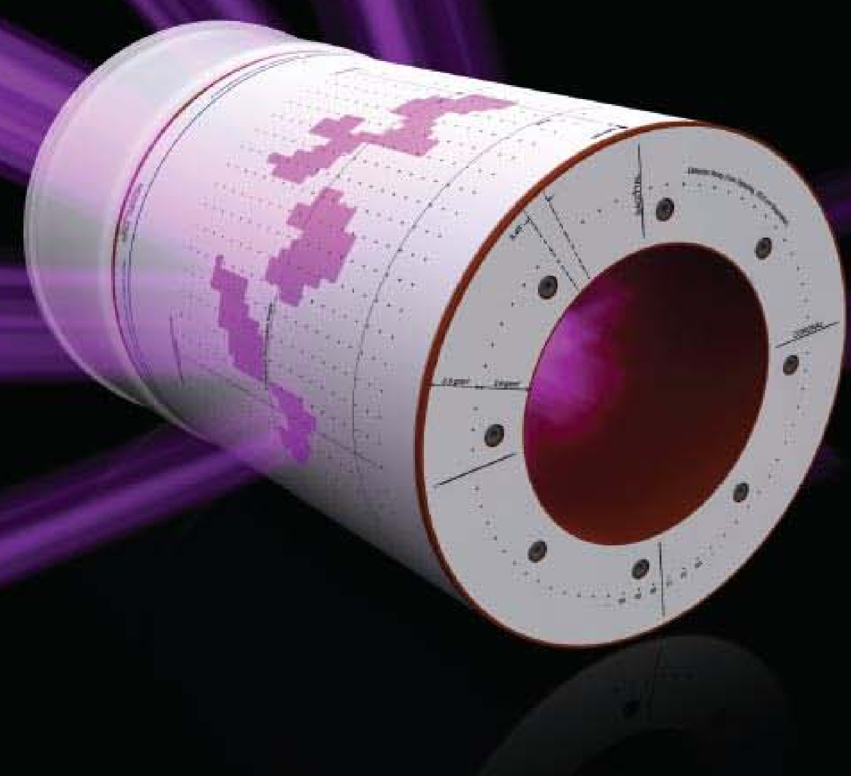

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InterACTIONS

Volume 55, Number 4– octobre/October 2009

Cover Image

Breast CT is an imaging modality that reconstructs 3D images of the characteristic linear attenuation coefficient (LAC). A major challenge of the technique is its large levels of scatter which can result in contrast reduction and image artifacts. This inherent scatter can be used to reconstruct images of electron density (ED) that can improve tissue characterization. For this reason our group is developing a bench top system that simultaneously reconstructs LAC and ED images of the breast in vivo. The system consists of an x-ray pencil beam which scans the breast using first generation CT. This system incorporates a ring of detectors that measure scattered radiation. The primary sinogram is used to reconstruct an image of the LAC using the filtered back projection algorithm. The scatter sinograms are fed to an algorithm capable of reconstructing correct ED images from single Compton scatter. In practice systems will be contaminated by multiple and Rayleigh scatter. We have used the EGSnrc code to implement a Monte Carlo (MC) simulation of the system in order to investigate the effect that all sources of scatter have on the ED reconstruction. Our results show the ability of the algorithm to reconstruct qualitatively good images of ED even without correction. The reconstructed ED values are ~2 times larger than the true ones and increase towards the centre of the breast. MC simulations show that this increase is due to the increase of the ratio between total scatter and single scatter. The ratio increase is dependent on the length of intersection between the x-ray beam and the breast irrespective of breast size. Future work will focus on developing corrections for multiple scatter as well as in-vivo image reconstructions from Rayleigh scatter.

Images provided by Jorge Alpuche Aviles from CancerCare Manitoba, Winnipeg MB. This work placed first in COMP's Young Investigator Awards at the ASM. See feature article on page 138.

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

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Members of the Editorial Board include:

Tony Popescu — Boyd McCurdy
Michelle Cottreau — Parminder Basran

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

Message from the COMP Chair

Mr. Jason Schella
COMP President

Well, another COMP Annual Scientific Meeting is over. Even though this event is a lot of work for a lot of people, I think most involved will agree that it is a most rewarding experience. The Victoria conference took place in a beautiful venue and we were provided with exceptional scientific content. I always find that the COMP ASM gives the biggest bang for the buck when it comes to showcasing current research. This year, we saw a few new "firsts": There was a breakout session aimed at non-RT physicists (though many RT physicists attended) in which the main topic of discussion was the impact of Safety Code 35 on the imaging community. This was well attended and provided excellent feedback. In addition, the first meeting of newly formed Students' Council and the first meeting for Physics Associates were held during the week. And, on the fun side, we had the inaugural COMP Fun Run with over 30 people attending.

The Victoria conference took place in a beautiful venue and we were provided with exceptional scientific content.

The awards banquet, held in the Butchart Gardens, was a fantastic time. The gardens were beautiful, the food delicious, and the crowd of almost 240 had a great evening. The awards for Best Poster and Best Oral presentations were given out and the Sylvia Fedoruk Prize in Medical Physics was given to **Dr. Karl Otto** for his paper "*Volumetric modulated are therapy: IMRT in a single gantry arc*", Med.Phys. 35 (1), January 2008. Congratulations to Dr. Otto.

Thanks to Will Ansbacher and the Local Arrangements Committee for all of their hard work. This was a conference to remember and your efforts certainly showed.

The awards banquet, held in the Butchart Gardens, was a fantastic time.

On another note, we have had one change to the COMP Executive. Welcome to **Tony Popescu**, who was voted in at the AGM to take over the role of Councillor of Communications. We look forward to working with Tony over the next 3 years. I also want to welcome **Idris Elbakri** as the new editor of InterACTIONS. This is Idris' first issue and we look forward to many more.

The inaugural Winter School is now set to take place January 24-28th, 2010 at Banff Park Lodge, Banff, AB. The topic will be **"Quality and Safety in Radiation Oncology"**.

I just wanted to add a quick note regarding the proposed creation of a new honorific that would be awarded to COMP (full) members for contributions to Canadian medical physics. In order to give the membership an opportunity to make a decision on this topic, we will be publishing a discussion on the pros and cons that have been brought forth either through email or at the AGM. My intent is to include this discussion in the next issue of InterACTIONS. I appreciate the varying opinions that have been presented, both on the necessity of the honorific and on the title of the honorific. My goal is to provide you with the information and the arguments so that we can make an informed decision prior to next year's AGM.

Here is a brief update on a few of our strategic plan items that are underway:

<u>Conduct a Feasibility Study re: Running a Winter Program</u>
The inaugural Winter School is now set to take place January 24-28th, 2010 at Banff Park Lodge, Banff, AB. The topic will be **"Quality and Safety in Radiation Oncology"**. This is a topic of the utmost importance to those practicing Medical Physics in radiation oncology and will also be of interest to Radiation Oncologists, Radiation Therapists, and management. Thanks to Marco Carlone and the Science and Education Committee for all the hard work that has gone into orchestrating this event. Please help us make this a success.

<u>Establish relations with adjacent communities</u>
COMP and the Canadian Association of Radiologists (CAR) are currently working on a plan for implementation of the CARs Bone Mineral Density Accreditation program. Through this collaboration we can ensure that this and future programs can be put in place in such a way that best utilizes the resources available while maintaining the highest level of patient and staff safety.

Finally, I would like to thank all 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 *InterACTIONS* is a great way to do it.

Message from the CCPM President

One Christmas Eve a few years ago, I was performing an annual ritual of updating monthly tabulations of dose rates for a cobalt unit for the new year (remember cobalt?). I happened to notice that the half-life for cobalt-60 decay had changed – the value of 5.26 years long engraved in Johns and Cunningham had been updated on the NIST website to 5.27 years. For some reason I was intrigued by the notion that something as well established as Co-60 half-life could be refined and updated. Apparently not everything in our field is known and cast in stone.

If something as trivial as a 0.01 y change in cobalt half-life can interest me, imagine my delight upon reading that the rate of decay can exhibit a seasonal variation. Physicists from Purdue University have re-analyzed old data from Brookhaven and PTB, and have detected a statistically significant seasonal variation in measured half-life of Ra-226 and other isotopes (1). They also observed perturbations in the decay of Mn-54 during a solar flare in Dec 2006 (2). This has led them to propose that interactions with solar neutrinos, whose flux varies with the Earth's orbital position and with solar activity, can cause a (very small) change in the rate of nuclear decay.

We learned in school that the rate of decay is absolutely constant. In the bible of nuclear physics, "The Atomic Nucleus", Robley Dunglison Evans states: "The decay constant λ is one of the most important characteristics of each radioactive nuclide; it is essentially independent of all physical and chemical conditions…" (3). Perhaps R.D. was wrong.

While this influence of solar neutrinos on radioactive decay is very weak, controversial, and not well accepted in the nuclear physics community, it is nonetheless fascinating. I am heartened by the thought that something as mundane and well-studied as radioactive decay could be infused with layers of complexity yet to be understood. Our profession extends into so many disciplines and depends upon understanding myriad physical and biological phenomena, yet in so many cases that understanding is still in its infancy. There are enough mysteries to keep medical physicists fascinated for years to come.

And fascinated we were, at the recent COMP meeting in Victoria, which was a spectacular success. Those fortunate enough to have attended will agree that the venue was beautiful, the weather spectacular, the city delightful, and the scientific content of the meeting was -- fascinating. The organizing committee should be proud after all their hard work.

As of the meeting in Victoria, there have been a few changes in the composition of the CCPM Board. Dick Drost has stepped down as President (replaced by me). The College is very grateful to Dick for the leadership he has provided over the last 3 years, and his service on the Board as Vice-President for three years before that. Coincident with retiring from the CCPM Board, Dick has also retired from his position in the nuclear medicine department at S. Joseph's Hospital in London. I wish him all the best in his retirement.

Wayne Beckham has also stepped off the Board, after 8 long years of service. As Registrar, Wayne led the development of the current process for recertification, which is a vital component of the certification of clinical competence. The College is indebted to Wayne for all his years of hard work on the Board. After a year of tutelage by Wayne, Darcy Mason has taken over as Registrar.

Michael Evans has stepped down from the Chief Examiner position, but remains a Board member. Michael has put in a tremendous amount of work administering the examination

Dr. David Wilkins
CCPM President

process, and he has organized the very successful use of the McGill Medical Simulation Centre for the membership oral exams. Michael was also responsible for achieving USNRC Authorized Medical Physicist recognition for physicists certified by CCPM from 2009 on. This is important for any CCPM certified physicist who wants to work in the United States, and required a lot of effort by Michael, for which the College is very grateful. After 3 years as Deputy Chief Examiner, Robert Corns is stepping into the Chief Examiner role.

Also joining the Board are Matt Schmid from Kelowna as Vice-President, and Boyd McCurdy from Winnipeg as Deputy Chief Examiner. Thanks to them for agreeing to volunteer their time to serve the College. I hope they will find the work of the Board as rewarding as I have.

1. Jenkins et al, Space Science Reviews **145**, July 2009.

2. Jenkins and Fischbach, Astroparticle Physics **31**(6):407-411, Apr 2009.

3. p. 472, "The Atomic Nucleus", p. 472 by Robley Dunglison Evans, McGraw-Hill, 1955.

Message from the Executive Director of COMP/CCPM

Annual Scientific Meeting

The feedback regarding the Victoria ASM was most positive and congratulations are in order for Will Ansbacher and his team. Some new elements were introduced at the Victoria meeting: an Imaging session, a meeting and social for COMP student members, a meeting of COMP Associate members, a presentation by Maria Popovic, the recipient of the Best Medical International Training Award and a 5K fun run.

Your feedback is important and your suggestions will certainly be taken into account for the 2010 Annual Scientific Meeting...

We are grateful once again to our corporate sponsors for their generous support of the meeting. A summary of the evaluations can be found in a separate article in this issue of the newsletter. Thank you to all those who provided feedback. Congratulations to Lindsay Beaton, a student member at Carleton University, who completed the evaluation and was the winner of the $50 Chapters gift certificate.

Your feedback is important and your suggestions will certainly be taken into account for the 2010 Annual Scientific Meeting in Ottawa. Preparations are already underway for this meeting so ***mark your calendars for June 16 – 20th.*** The conference will be taking place at the Crowne Plaza hotel. This premier downtown venue will enable delegates, family and friends to take advantage of all that the beautiful city of Ottawa has to offer.

COMP, in partnership with the Canadian Medical and Biological Engineering Society (CMBES), submitted a bid to host the 2015 World Congress on Medical Physics and Biomedical Engineering in Toronto. David Jaffray presented the Canadian bid in September at the World Congress in Munich. Putting the bid together was a team effort and an opportunity for us to reach out to other organizations (CAMRT, CAR, CARO, CANM and CSNM) for support.

COMP, in partnership with the Canadian Medical and Biological Engineering Society (CMBES), submitted a bid to host the 2015 World Congress on Medical Physics and Biomedical Engineering in Toronto.

Inaugural COMP Winter School

The COMP Strategic Plan included the expansion of education opportunities provided by COMP.

We are very excited to be launching the inaugural COMP Winter School which will be taking place from January 24 – 28, 2010 at the Banff Park Lodge. Marco Carlone, Sherry Connors, Luc Beaulieu, Cheryl Duzenli, Dave Rogers and Alejandra Rangel Baltazar have been working together for over a year to put together a top-notch program with the theme: **Quality and Safety in Radiation Oncology.** The Winter School provides COMP with an opportunity to raise its profile and has been promoted to AAPM, Australasian College of Physical Scientists and Engineers in Medicine, IPEM, EFOMP, ESTRO and ASTRO.

The annual mid-year meeting of the COMP Executive and CCPM Board will take place in November in Toronto. These meetings provide an excellent opportunity for our volunteer leaders to discuss how to work together to best serve the medical physics community in Canada.

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,
COMP/CCPM Executive Director

We are very excited to be launching the inaugural COMP Winter School which will be taking place from January 24 – 28, 2010 at the Banff Park Lodge.

Dates to Remember

December 1, 2009
Deadline for submission to InterACTIONS

ASTRO 2009
November 1-5, 2009
Chicago, IL

Nov 29-Dec 4, 2009
RSNA Annual Meeting
Chicago, IL

COMP Winter School
January 24-28, 2010
Banff, AB

SPIE Medical Imaging
February 13-18, 2010
San Diego, CA

COMP ASM
June 16-20, 2010
Ottawa ON

2009 COMP Annual Scientific Meeting and CCPM Symposium Delegate Survey

Submitted by the COMP Office

Thank you to the 75 participants who took time to respond to the survey. Further congratulations go to Lindsay Beaton, a student member from Carleton University whose name was drawn from the survey participants to win a $50 Chapters gift certificate.

Once again delegates came away from our Annual Scientific Meeting with a positive impression of the events. In fact, if you go down the list, for 15 of the 18 aspects of the meeting that were evaluated, the response was either “Excellent” or “Very Good”.

Most of the respondents stayed at the Empress Hotel. Although feedback was provided regarding the cost of the accommodations, respondents appreciated the central location of the conference and that fact that all events were held in one location. It is clear from the feedback that the city of Victoria was enjoyed by all.

In fact, if you go down the list, for 15 of the 18 aspects of the meeting that were evaluated, the response was either “Excellent” or “Very Good”.

	Excellent	Very Good	Good	Fair	Poor	N/A
Abstract submission process	15%	**36%**	19%	3%	0%	28%
Online registration process	31%	**43%**	17%	3%	1%	5%
Onsite registration	27%	29%	9%	0%	0%	**35%**
Conference Materials	24%	**47%**	25%	4%	0%	0%
Accommodations	25%	**32%**	23%	7%	0%	13%
Cost of Accommodations	8%	21%	24%	**27%**	9%	11%
Coffee Breaks and Lunches	33%	**47%**	16%	3%	1%	0%
Value for the registration fee	32%	**41%**	23%	3%	0%	1%
Ice Breaker Reception	16%	**47%**	19%	7%	0%	12%
Public Lecture	25%	**28%**	16%	11%	0%	20%
CCPM Symposium	20%	**36%**	21%	9%	0%	13%
Scientific Sessions	13%	**59%**	23%	5%	0%	0%
Vendor Exhibits	8%	**49%**	**27%**	11%	3%	3%
Poster Session	9%	**47%**	35%	5%	0%	4%
5K Fun Run	15%	8%	3%	0%	0%	**75%**
Travel Award Presentation	29%	**36%**	19%	3%	0%	13%
Gold Medal Awards Ceremony	15%	32%	**36%**	7%	0%	11%
Final Banquet	**52%**	35%	5%	1%	0%	7%

All 75 respondents were asked to indicate the aspects of the conference that they liked most. The top five include:

- ♦ Location (31)
- ♦ Scientific Sessions (18)
- ♦ Networking Opportunities (11)
- ♦ Young Investigator Symposium (10)
- ♦ Banquet (7) and CCPM Symposium (7)

Respondents were asked what they liked least about the conference and what would improve their conference experience. The following feedback was provided:

- ♦ Improve the space and timing for the Poster session and perhaps make it a moderated Poster session
- ♦ Increase networking opportunities and free time
- ♦ Vary the scientific content by increasing the imaging/nuclear medicine content
- ♦ The “public” lecture should be targeted to conference delegates as very little of the public actually attend
- ♦ When asked to choose whether the conference should be scheduled in June or July, most respondents chose June although there wasn’t a strong preference for either month

We would like to thank you once again for participating in the survey. We will use the information gathered as we prepare for the 2010 meeting. If you would like to see the full results of the survey, please contact Nancy Barrett at 613-599-1948 or nancy@medphys.ca.

Chief Examiner's Report

Submitted by: Michael Evans

Membership Written Examination: This year the written part of the CCPM membership examination was held on March 7, 2009 in 11 Canadian Cities. 25 candidates took this exam - 20 candidates in Radiation Oncology, one in Nuclear Medicine and two in MRI and two in Diagnostic. Of these 25 candidates, 18 passed the examination: 14 in Radiation Oncology, one in Nuclear Medicine, two in MRI and one in Diagnostic.

Membership Oral examination: 18 candidates presented for the oral part of the membership exam (all new candidates). The oral examination for the Radiation Oncology subspecialty was held in Montreal in May, using parallel sessions and 16 examiners. 12 Radiation Oncology candidates were successful in the oral exams.

The Nuclear Medicine, MRI and Diagnostic oral exams were held in Toronto using a panel format and five examiners. All 4 candidates (one Nuclear Medicine, two MRI and one Diagnostic) passed the oral examination.

The successful candidates for this year's 2009 MCCPM examination were (congratulations!):

Nicola De Zanche
Caroline Duchesne
Catalin Frujinoiu
Derek Hyde
Hans-Sonke Jans
Geneviève Jarry
Charles Kirkby
Zhengfeng Liu
Xiangyang Mei
Patrice Munger
Moira Schmuland
Kristin Stewart
Jean Théberge
Shuying Wan
Xia Wu
Heping Xu

Fellowship Exam: The FCCPM exams were held in Victoria BC in July. Six candidates took the fellowship exam this year, all in Radiation Oncology. Five candidates passed the exam.

The successful candidates for this year's 2009 FCCPM examination were (congratulations also!):

Robert Doucet,
Belal Moftah,
Karl Otto,
Stephen Sawchuk,
Jan Seuntjens.

On behalf of the CCPM I would like to congratulate all new Members and Fellows.

I would like to point out the tremendous level of support I have received from the Board and the CCPM community at large in running this exam. Whenever I have asked for help it has always been forthcoming, and the strength and success of the CCPM is a reflection of the commitment of its members. In particular I would like to thank the following people that helped out either as invigilators, with logistical support, on the exam committee, the marking committee, the appeals committee, as MCCPM oral examiners, as FCCPM oral examiners and fellow Board members (apologies if I missed anyone):

Robert Corns, Sherry Connors, Wayne Beckham, Darcy Mason, Dick Drost, John Rowlands, David Wilkins, Bill Zeigler, Peter McGhee, Konrad Leszczynski, Craig Lewis, Milton Woo, John Schreiner, Michael Hale, William Parker, Ian Cameron, Curtis Caldwell, Micheline Gosselin, Tatjana Nisic, Ervin Podgorsak, Horacio Patrocinio, Gisele Kite, Nancy Barrett, Margery Knewstubb, Katharina Sixel, Brenda Clark, Andrew Kerr, Vic Peters, Tom Farrell, Jean-Pierre Bissonnette, Judy Hale, Elizabeth Henderson, Robert Doucet, Boyd McCurdy, Cheryl Duzenli, Rasika Rajapakshe.

As this is my final report as Chief Examiner I would like to mention a few items the Board has been able to move forward with over the past three years with respect to the MCCPM and FCCPM exam. In October 2006 the Radiation Oncology question set changed from a thematic based question set to 2 ordered question banks (Part III : 83 questions and Part IV : 40 questions).

In spring of 2007 the Radiation Oncology oral exams moved to a professional examination location to permit large numbers of candidates and examiners. Since 2007, Radiation Oncology oral exams were carried out in French as requested (6 candidates from 2007 – 2009) and a number of bilingual examiners for Radiation Oncology were identified. Since 2007 the number of MCCPM oral examiners has been expanded to about 35 with an increase in all four specialties (Radiation Oncology, MRI, Diagnostic and Nuclear Medicine). Since 2007 the number of FCCPM examiners expanded to about 18 with increased expertise in Nuclear Medicine and Diagnostic.

Once again, many thanks to all the people who helped me with this process over the last four years. I know that Robert Corns as the current Chief Examiner will be able to count on this support from the CCPM community at large in order to continue this important credentialing activity for Canadian medical physics.

CNSC Feedback Forum

Proposed Protocol for Determining Access Control Measures Based on Dose Rates

Submitted by: Jeff Sandeman
CNSC, Ottawa ON

One of the issues recently encountered with respect to licensing of medical accelerator facilities is that of establishing a correlation between the degree of access control required in any given area and the corresponding dose rates in that area.

The dose rates outside a typical medical linear accelerator facility can vary from those which are indistinguishable from background, to several mSv h^{-1}, depending upon the facility workload, the intended use and occupancy of the area in question and the control measures in place to restrict access. However, the relationship between the dose rate and potential doses which might consequently be incurred in a given area, and the corresponding control measures required to limit access to that area, is not clearly identified in any of the standard facility design literature (e.g., NCRP report 151 *"Structural Shielding Design and Evaluation for Megavoltage X- and Gamma-Ray Radiotherapy Facilities"*). Terms such as controlled area, non-controlled area and exclusion area are commonly used to describe each area, but again, there is little guidance on what exactly is meant by "control" or "exclusion", or just how much "control" is required for any given circumstance.

One of the most frequently problematic areas in this regard is on the roof directly atop an accelerator vault. Many licensees indicate in their licence application that this is an "exclusion" area. NCRP report 51 "*Radiation Protection Design Guidelines for 0.1 to 100 MeV Particle Accelerator Facilities*" (the precursor to report 151), defines an exclusion area as:

> *"An area defined by the radiation protection officer to be forbidden to all personnel during operation of the accelerator."*

Designation of the roof as an exclusion zone is normally justified by the applicant based on the difficulty in accessing the roof and is usually coupled with "administrative" control measures, such as requiring authorization from the physics department prior to any access necessary for maintenance or other purposes.

From a regulatory perspective, the problem with this is that designation as an exclusion zone implies zero occupancy. Since the dose to an exposed person is given by the product of the dose rate and the exposure duration, this in turn implies that an infinite dose rate should be acceptable in an exclusion area, because the exposure duration is zero. However, the physical difficulty in accessing the roof can invariably be circumvented if someone desires access and administrative restrictions are easily forgotten or ignored. Consequently, the dose a person could potentially receive in the event of unauthorized access must be considered. The questions then are, what exposure duration is appropriate for modeling such an event, how much dose is too much, and what limiting dose rate does this imply?

It is interesting to note that the more recent NCRP151 does not refer to "exclusion" areas, only to "controlled" and "non-controlled" areas. This makes sense when one considers that unless the area is completely enclosed and interlocked to prevent access during irradiation, there is no way to truly guarantee zero occupancy. Even in this case, one could simply consider the area as "controlled", with the interlock system just being the most stringent control measure possible to prevent access.

However, if every area is at best a "controlled" area, then a further question must be asked; how do we determine the appropriate control measures required for any given area?

The Class II Division is finalizing a position paper on this subject and is considering the approach outlined in the table on the adjacent page. In essence, the approach is to correlate the control measures required for a given area to the time it would take, in the event of an unauthorized access, for the dose incurred to reach the corresponding dose limit. Areas in which the dose limit could be reached even for very short occupancy durations (e.g., < 1 day) would require very stringent controls, including interlocks. Areas in which the general public dose limit could not be reached, even under conditions of full occupancy for the entire year, would not require any physical access restrictions. Between these extremes, a graduated system of control measures would be applied.

The goal of this system is to ensure reasonable measures are taken to ensure that doses to workers and the public do not exceed the applicable limits in the event of unexpected changes to occupancy or unauthorized access to restricted areas. The Class II Division invites your feedback on this issue. Please send any comments to:

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P.O. Box 1046, Station B
280 Slater Street
Ottawa, ON
K1P 5S9

E-mail: jeff.sandeman@cnsc-ccsn.gc.ca

RECOMMENDED ACCESS CONTROL SCHEME			EXAMPLES OF POTENTIAL DOSES BASED ON TYPICAL MEASURED DOSE RATES						
Effective dose rate range for recom-mended control measures	**Control measures**		**Maximum dose rate in area outside primary barrier[b] (mSv/h)**	**Effective dose if access control fails or is bypassed, assuming various occupancy periods** Assuming medical accelerator is operating 100 hours of beam on per year, U=1/4 for all primaries (0°, 90°, 180°, 270°)					**Comments**
	Area is not under direct observation from control console[a]	***Area is under direct observation from control console[a]***		**One Year** (T=1) **(mSv)**	**One month** (T≈1/10) **(mSv)**	**One week** (T≈1/50) **(mSv)**	**One day** (T≈1/250) **(mSv)**	**One hour** (T≈1/2000) **(mSv)**	
≤2 µSv/h	none	none	0.002	0.05	0.005	0.001	0.000	0.000	Unrestricted access, full occupancy by general public
> 2 µSv/h but ≤ 50 µSv/h	annual check to verify purpose/occupancy of area	none	0.02	0.5	0.05	0.01	0.002	0.000	Unrestricted access, partial occupancy by general public
			0.025	0.625	0.063	0.013	0.003	0.000	
			0.04	1	0.1	0.02	0.004	0.001	
> 50 µSv/h but ≤ 1 mSv/h	Physical barrier (fence, elevated roof, locked door) with access control procedures for access by staff for maintenance etc.	Access control procedures such as requiring that operators move unauthorized personnel away from area if/ when observed	0.1	2.5	0.250	0.05	0.01	0.001	Highest dose rate typically seen in restricted access areas inside the facility, including inside adjacent treatment vaults
			0.4	10	1	0.2	0.04	0.005	Typical range of dose rates on normally unoccupied roof, access required only for periodic maintenance of roof, air handling units etc.
			0.5	12.5	1.25	0.25	0.05	0.006	
			0.8	20	2	0.4	0.08	0.01	
> 1 mSv/h but < 10 mSv/h	Physical barrier (fence or wall, not fully enclosed) with normal access route via locked door interlocked to accelerator, with key controlled access	Physical barrier (fence, elevated roof, locked door) with access control procedures - operating procedures require cease operation, notification of RSO and removal of unauthorized personnel if/when observed, prior to restart	2	50	5	1	0.2	0.025	Higher dose rate roofs, general public dose limit reached or exceeded for occupancy from 1 day to 1 week, access control must prevent unsupervised access.
			4	100	10	2	0.4	0.05	
			8	200	20	4	0.8	0.1	
≥ 10 mSv/h but ≤ 100 mSv/h	Physical barrier must fully enclose space, with locked door interlocked to accelerator, key controlled access		10	250	25	5	1	0.125	Range of highest dose rates measured above existing roofs and or crawlspaces under vaults, general public dose limit reached or exceeded in 1 hour to 1 day
			40	1000	100	20	4	0.5	
			80	2000	200	40	8	1	
>100 mSv/h (inside vaults)	Full set of safety systems including LPO, door interlocks, emergency stops, warning lights etc. is required		200	5000	500	100	20	2.5	Dose rate inside vault, occupational dose limit exceeded in <1 day
			4800	120000	12000	2400	480	60	Dose rate is equivalent to head leakage dose rate at 1.25 m from accelerator head
			96000	2400000	240000	48000	9600	1200	Dose rate is equivalent to primary beam dose rate through patient at 1.25 m from accelerator head

Effective dose rate ≥ 25 µSv/h and consequently requires posting of a radiation warning sign (*Radiation Protection Regulations* 21(b)).

Effective dose < 1 mSv, which is the annual limit for a person who is not a Nuclear Energy Worker (NEW) (*Radiation Protection Regulations* 13(1)).

Effective dose ≥ 1 mSv but < 20 mSv, which is the average annual dose which would be required to reach the NEW dose limit of 100 mSv limit over a five-year dosimetry period (*Radiation Protection Regulations* 13(1)).

Effective dose ≥ 20 mSv

[a] Direct observation implies either line of sight or use of a camera-monitor viewing system (e.g. applicable to treatment room entrances, control console area, or roof with camera connected to monitor at the control console).
[b] Dose rate under worst case operating conditions (i.e. the medical accelerator is being operated in the manner that produces the maximum dose rate in area).

Margaret E. J. Young's 2009 COMP Gold Medal Acceptance Speech

COMP President Mr. Jason Schella presenting the 2009 COMP Gold Medal to Margaret E. J. Young

Firstly, let me say that I feel very honored and it makes me feel very proud to be awarded this medal. I regret that my health does not allow me to be here to receive it in person.

It is now just over 50 years since the first edition of my textbook on Radiological Physics was published in London, England and since it eventually reached a third edition. I would like to think that some radiologists, radiographers and even some physicists may have found it useful. The publisher told me he was taking a risk printing a book on physics by a woman and recommended using my initials only and not my full name.

I would like to reminisce for a few minutes and ask you to imagine trying to produce isodose curves for a new therapy machine when the only equipment is an ionization chamber (calibrated by the NRC in Ottawa) and a water bath. The chamber was moved from point to point in the X-ray field using the motor from a sewing machine and it took several evenings to obtain data for a single machine. It was a wonderful improvement when UBC obtained an ALWAC 3E computer and we were able to raise enough money to pay for a few hours on this primitive computer.

Of course we had to write our own computer program, which involved telling the computer where to look for the data in needed and arranging the place for storage to keep the computer time as low as possible. It is a different world now but I believe that physicists can really contribute to medicine and I wish you all the best success in this.

Photos from COMP 2009. Left: Isabelle Gagne (Victoria) and Laura Drever (Kingston). Right: Jack and Sheila Cunningham with Peter McGhee at Butchart Gardens.

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Feature Article

Monte Carlo Simulation of a First Generation Scatter Enhanced CT System for in vivo Breast Imaging

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Editor's note: This article is the recipient of the 1st place in the J.R. Cunningham Young Investigators Award. A list of all award recipients is on page 149.

Introduction

X-ray mammography is the imaging technique most commonly used for the detection of breast cancer. Its ability to provide images with high resolution and relatively large contrast for low dose and cost has made it the current gold standard. Despite the techniques high resolution, its sensitivity and specificity range from 83% to 95% and from 93% to 99% [1] which can result in missed cancers and false diagnosis. This limitation has motivated the search for alternative imaging modalities that can potentially replace or complement mammographic studies.

Breast CT is an emerging imaging modality that provides the ability to reconstruct 3D images of the breast using a dose comparable to that of a two view mammography study [2]. Current breast CT systems designs have the woman lying prone on a table which has an opening for the pendant breast, so that an end-fired x-ray tube and flat-panel detector can rotate around the breast under the table. Unlike conventional mammography this configuration does not require breast compression, thereby reducing patient discomfort and allowing for better visualization of the breast. A further benefit is the ability to reconstruct images of the characteristic linear attenuation coefficient (μ) which can potentially result in quantitative information. Breast CT however is not free of limitations and studies have shown that the scatter to primary ratio can be as large as 0.5 for the average breast which, if not corrected for, can lead to image artifacts and contrast reduction[3]. In addition, the acquisition of the μ is not sufficient to completely characterize the material which can potentially limit the techniques specificity.

The number of scattered photons is dependent on the electron density (ρ_e) of the material, which can be exploited to reconstruct images of ρ_e. Recent studies have shown that the ρ_e can be used to differentiate between different types of breast tissues [4]. Scatter enhanced CT (SECT) is a term which we use to refer to the simultaneous measurement of scattered and transmitted photons in order to reconstruct CT images of ρ_e and μ. The inherent large levels of scattered radiation and potential for breast tissue classification make breast CT a perfect candidate for the incorporation of SECT. Although electron densities have been measured using breast tissue samples, there has been no attempt to make ρ_e images of the breast in vivo. It is for this reason that we have conceptually designed a scatter enhanced breast CT (SEBCT) prototype system. The prototype system will allow us to evaluate the potential of reconstructing images of ρ_e using clinically feasible doses (and corresponding incident fluxes). This system uses first generation CT acquisition and an algorithm capable of reconstructing correct images of ρ_e using single Compton scattered photons [5]. The experimental measurements however will be contaminated by the presence of Rayleigh scatter (RS) and multiple scatter (MS). The purpose of this study was to use Monte Carlo (MC) simulation of the prototype system to evaluate the ability of the algorithm to reconstruct images of ρ_e when all sources of scatter radiation are present

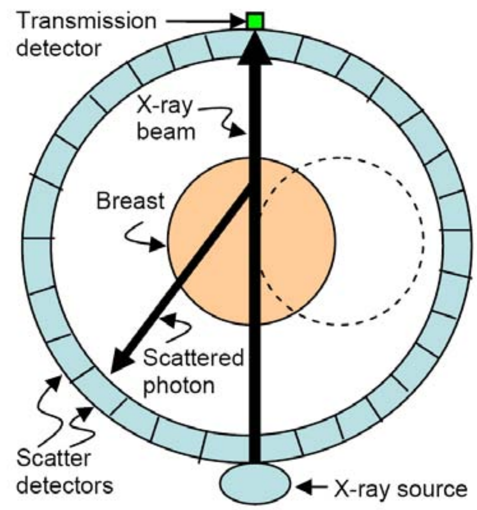

Figure 1. The geometry of the SEBCT system.

Methods

Figure 1 illustrates the concept of the 1st generation SEBCT system. It consists of an x-ray pencil beam and two types of detectors: a single transmission detector and a set of scatter detectors in a ring configuration. Breast translation, as shown by the dashed circle, is needed in order to acquire a complete projection. Once a projection is completed the breast can be rotated and the translation repeated in order to fill the sinogram space.

(Continued on page 143)

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Note that this acquisition can also be achieved by moving the system appropriately as opposed to the breast.

The EGSnrc MC code was used to run simulations using DOSRZnrc and DOSXYZnrc [6]. DOSRZnrc was used to simulate a beam large enough to cover cylinders of homogeneous breast with a 4 mm layer of skin. This incident beam mimics a complete 3D acquisition of the breast using our prototype system. Cylindrical phantoms simulated breasts with diameters of 10, 14 and 18 cm and lengths equal to 1.5*r*, where *r* is the radius of the breast. This setup was used to calculate the breast mean glandular dose (MGD) as a function of energy. We simulated the geometry of figure 1 using DOSXYZnrc with an incident beam produced by a 90 kVp Tungsten target filtered by 1 mm of Tungsten. This filtration results in a beam with mean energy of 65.3 keV which lies close to the energy at which the MGD is at a minimum (see figure 2). The dimensions of the incident beam consist of a 1 mm x 1 mm cross section while each scatter detector was simulated as a square of 5 cm x 5 cm. Each scattered photon was tracked until it reached the geometrical location where the hypothetical detectors would be located. The number of histories was set to deliver a MGD of 4 mGy for a CT scan with 288 projections. The breast was simulated as a cylinder of 14 cm diameter (average breast size) and 10.5 cm length (1.5*r* as above). We simulated two types of breast compositions: a completely homogeneous breast and a breast with contrast inserts as presented by Shikaliev [7]. This phantom was adopted in order to investigate the effect of heterogeneities in the breast. We analytically calculated the distribution of first order Compton scattered photons in order to verify that the MC simulation is correct. The number of single scattered photons (N_s) can be analytically calculated using equation (1):

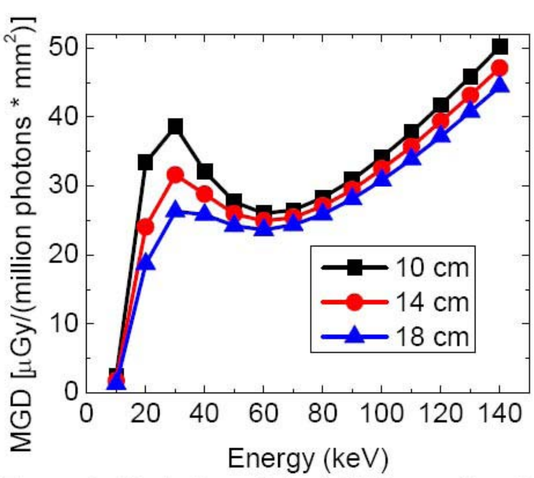

Figure 2. Variation of the MGD as a function of energy for different breast sizes.

$$N_s = N_0 T_p \rho_e L(d_e\sigma/d\Omega)\Delta\Omega T_s \quad , (1)$$

where N_0 is the number of photons incident in a voxel with length L and ρ_e electrons/cm^3, $d_e s/d$W is the differential cross section per electron and ΔW is the solid angle subtended by the detector. T_p and T_s are the transmission factors from the source to the voxel and from the voxel to the scatter detector respectively. We validated the MC simulation by comparing the distribution of single Compton scattered photons from a heterogeneous plastic phantom for a complete projection. The validated MC simulation was used to simulate all types of scatter produced in the breast for a complete CT scan of a single slice.

We reconstructed images of the µ using the transmission measurements and filtered back projection (FBP). Reconstructions of ρ_e from scatter measurements must first be

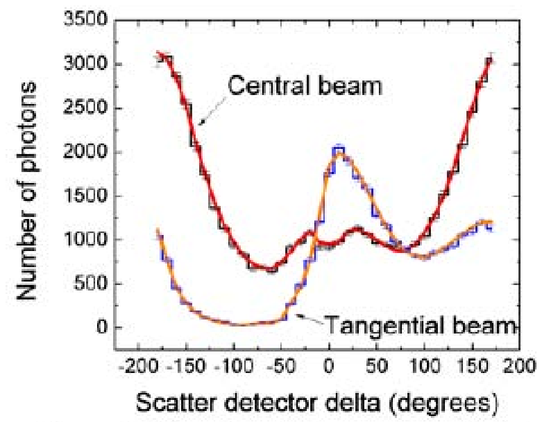

Figure 3. Variation of the number of single Compton scattered photons along the ring calculated analytically (solid lines) and with MC (stairs).

corrected for attenuation and this was done using an iterative reconstruction algorithm [5]. The reconstruction algorithm consists of an attenuation correction followed by FBP at each step of the iteration until a difference between successive reconstructions of less than 0.1% is obtained. We applied a post reconstruction correction for the presence of MS and RS since the reconstruction algorithm assumes that only single Compton scattered photons reach the detector. The correction consists of taking the ratio of the reconstructed image with the reconstruction of a homogeneous breast of the same size. This approach results in an image of ρ_e relative to that of a homogeneous breast tissue. The a-priori reconstructions for homogeneous breasts have to be calculated once only and can be done in advance using MC simulations.

Results and Discussion

Figure 2 shows the variation of the MGD as a function of energy for different breast sizes. All breast sizes show a fast increase in dose that peaks at about 30 keV followed by a drop in dose. The MGD reaches a minimum at 60 keV beyond which the dose increases with energy.

Figure 3 shows the number of the single Compton scattered photons calculated analytically and with MC as a

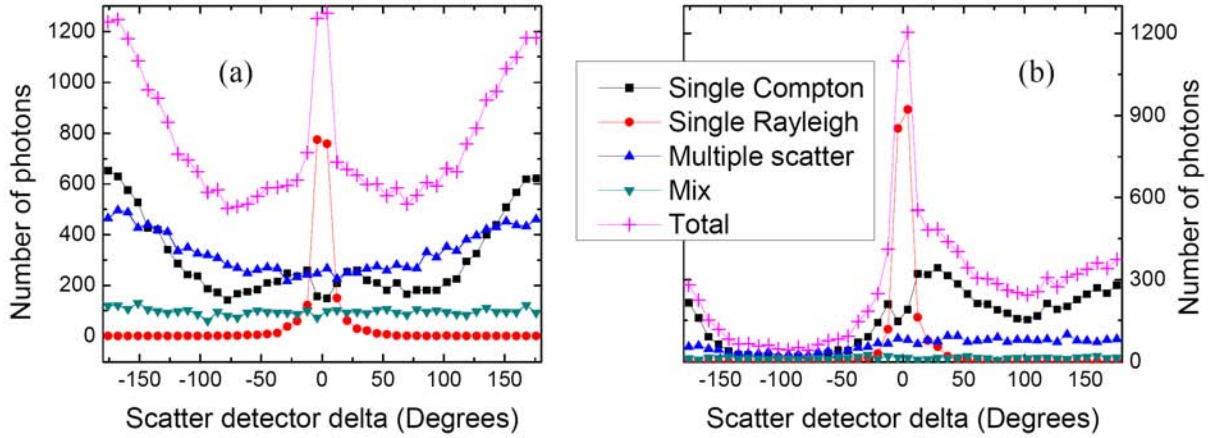

Figure 4. Variation of the number of scattered photons measured along the ring for the central (a) and tangential beams (b) going through the breast.

func-
tion of detector central angle (called delta). Negative angles correspond to the right part of the ring and the 0º scatter detector coincides with the incident beam. The measurements shown are for the central and tangential beams (which correspond to the location of the solid and dashed circles of figure 1). The analytical calculation of the central beam had a mean error of 1.3% with respect to the MC distribution whose mean uncertainty was of 2.9%. The corresponding mean errors and uncertainties for the tangential beam were of 1.2% and 5.8% respectively. The simulation of the complete projection had a mean error of 1.1% with a mean MC uncertainty of 3.2%. These results validate the use of a MC simulation to investigate the practical measurements of a breast scan.

Figure 4 shows the number of photons along the ring of detectors for the central and tangential beams when scat-

terd photons are classified as single Compton, single Rayleigh, multiple scatter and mix (which covers any combination of Compton and Rayleigh scattering). The total signal is compromised of the sum of all categories and this

is the
one that will be measured in practice. The contribution of MS to the total scatter signal ranges from 4% to 77% with a mean value of 43% and standard deviation of 8%. This MS contribution is not constant across the detectors, e. g. the MS of the central beam is reduced by a factor of 2 from the back to forward direction of scatter. Rayleigh scatter makes up as much as 81% of the total signal for scattering angles less than 8º. This percentage drops quickly as a function of scattering angle reducing to 21% for angles between 8º and 16º and to less than 11% for larger scattering angles. The contribution of the mix to the total signal is of 11% ± 5% and remains approximately constant across the detectors.

Figure 5 shows the ρ_e and μ reconstructions derived from scatter and transmission measurements respectively. The ρ_e image shows an increase in the reconstructed values towards the centre of the breast due to the increase of the

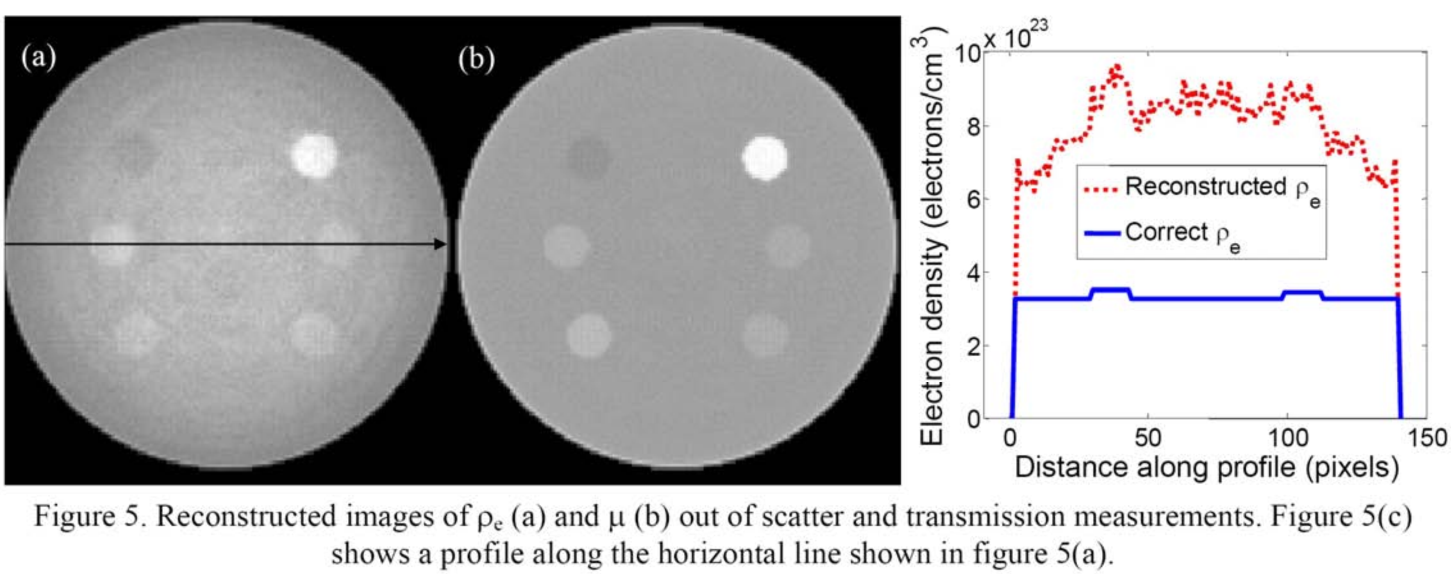

Figure 5. Reconstructed images of ρ_e (a) and μ (b) out of scatter and transmission measurements. Figure 5(c) shows a profile along the horizontal line shown in figure 5(a).

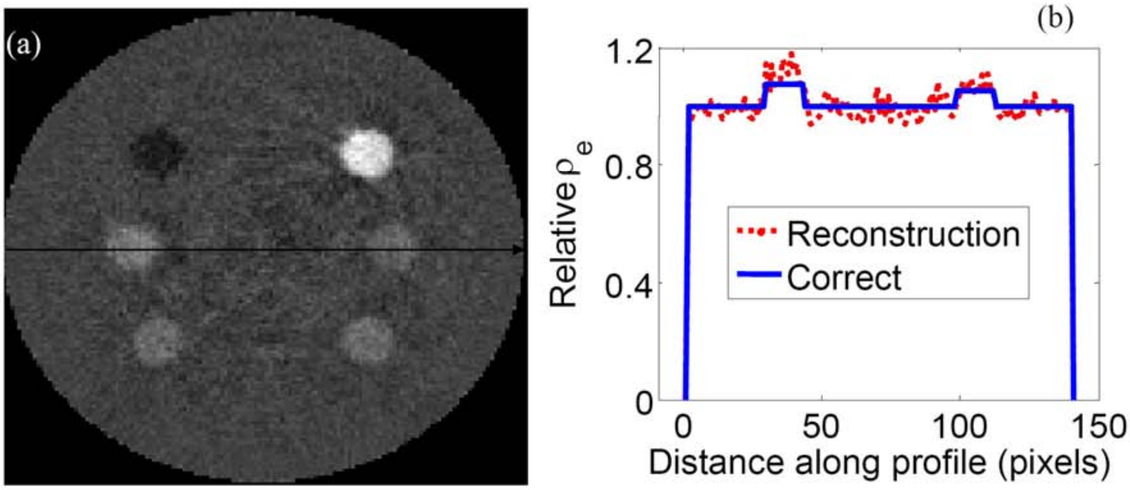

Figure 6. Relative image of ρ_e (a) and a profile (b) along the horizontal line of (a). The correct profile is also shown for comparison.

relative contribution of MS to the total signal. While the fraction of MS of the total signal varies with beam translation, it is always at its maximum when the beam goes through the centre of the breast. The profile through the reconstruction also shows that the reconstructed ρ_e has increased on average by 2.5 with respect to the correct ones. This effect is caused by an overall increase of 2.3 ± 0.7 in the number of photons with respect to the expected number of single Compton. Figure 6 shows the image of ρ_e relative to that of the breast after the post-reconstruction correction for all sources of scatter. The final relative electron densities have errors of ±3% with the exception of the insert that has the largest density whose error is of 8%. This error is caused by an insert with an electron density 23% larger than that of the breast. A profile through the image shows the reduction of the "inverse" cupping artifact where the variation from the centre to the edge is less than 3%.

Conclusions

We have implemented and validated a MC simulation of a first generation SEBCT system. RS dominates the scatter signal for scattering angle less than 8° but it rapidly decreases to less than 11% for scattering angles larger than 16°. MS is about the same magnitude as single Compton and does not remain constant across the detector channels.Its contribution causes an increase of the reconstructed ρ_e values towards the centre of the breast. The overall contribution from all sources of scatter offset the reconstructed ρ_e by a factor larger than 2.

A post reconstruction correction scheme based on the reconstruction of a homogeneous breast yields relative ρ_e with errors of ±3% for most tissues in the breast. Our results indicate the feasibility of the technique when all types of scatter are present and allow us to pursue the acquisition of breast images with natural structural noise. Our results show that it is possible to reconstruct *in vivo* images of ρ_e using the same incident flux as the one used in cone beam breast CT.

Acknowledgements

The authors would like to thank Idris Elbakri, Harry Ingleby, Daniel Rickey, Eric Recsiedler and Tamar Chighvinadze for their input. This project was funded by the Manitoba Health Research Council and CancerCare Manitoba Foundation.

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The Profession of Medical Physics in Alberta

Submitted by: Colin Field, Alana Hudson, Alasdair Syme and Heather Warkentin

What is a Profession? While there is no agreed upon definition of a profession, the Australian Council of Professions defines a profession as:
'A disciplined group of individuals who adhere to high ethical standards and uphold themselves to, and are accepted by, the public as possessing special knowledge and skills in a widely recognised, organised body of learning derived from education and training at a high level, and who are prepared to exercise this knowledge and these skills in the interest of others.

Inherent in this definition is the concept that the responsibility for the welfare, health and safety of the community shall take precedence over other considerations.'

Significant characteristics of a Profession are self regulation and autonomy. These characteristics have been, and are actively being, developed by COMP through the Professional Affairs Committee, and the COMP Code of Conduct. The main milestones which mark an occupation being identified as a profession are[1]:

1. It became a full-time occupation;
2. The first training school was established;
3. The first university school was established;
4. The first local association was established;
5. The first national association was established;
6. The codes of professional ethics were introduced;
7. State licensing laws were established.

Medical Physics is currently operating as a profession, but is not officially recognized as one because milestones 4 and 7 are missing. We want to change this.

Regulated Professions: In Canada, the provinces have jurisdiction over regulated health care professions. In Alberta, The Alberta Health Professions Act governs and defines all regulated health professions. Table 1 provides a list of currently registered health professions in Alberta.

It is clear to us that Medical Physics belongs in the ranks of regulated health professions. The relatively small numbers in our ranks should not be an obstacle in our path since some of the existing regulated professions have only 30-35 members. The full text of the Alberta Health Professions Act is available at http://www.qp.alberta.ca/574.cfm?page=H07.cfm&leg_type=Acts&isbncln= 9780779740772. It outlines the responsibilities of the profession with respect to things like registration, continuing competence, professional conduct, standards of practice, code of ethics and discipline. It also makes provision for title protection so that only an individual recognized by the appropriate body can work professionally as a Medical Physicist. Along with that, it identifies Restricted Activities which become solely the domain of the Medical Physicist. This could include, for example, the dosimetric calibration of a linear accelerator.

Looking south of the border, we see that there are currently 4 states that license Medical Physicists, http://www.aapm.org/government_affairs/licensure/default.asp#TX.

It is our hope that requirements for competency, recertification, code of ethics, and disciplinary committees can be shared between COMP, CCPM and other provincial associations, e.g. B.C. Association of Medical Physicists (BCAMP), Association des Physiciens et Ingénieurs Biomédicaux du Québec (APIBQ), l'Association Québécoise des Physiciens Médicaux Cliniques (AQPMC).

Table 1
Acupuncturists
Chiropractors
Combined Laboratory and Xray Technicians
Dental Assistants
Dental Hygienists
Dental Technologists
Dentists
Denturists
Hearing Aid Practitioners
Licensed Practical Nurses
Medical Laboratory Technologists
Medical Diagnostic and Therapeutic Technologists
Midwives
Naturopaths
Occupational Therapy
Opticians
Optometrists
Paramedics
Pharmacists
Physical Therapists
Physicians, Surgeons, Osteopaths and Podiatrists
Psychologists
Registered Dietitians and Registered Nutritionists
Registered Nurses
Registered Psychiatric and Mental Deficiency Nurses
Respiratory Therapists
Social Workers
Speech-Language Pathologists and Audiologists

Liability Insurance: The litigation landscape for Medical Physicists is changing, as recent law suits both within Canada and internationally have demonstrated. This has prompted numerous Medical Physicists to inquire about the potential benefits of having individual liability insurance. The details pertaining to premiums and the amount and types of coverage required have not determined, however, we believe that access to independent legal counsel should be an important component of any package. In Alberta, individual liability insurance is a requirement of becoming a regulated profession.

For the purpose of comparison, it is interesting to look at insurance rates for our colleagues in other professions. The internet provides the insurance costs for Radiation Oncologists who are required to purchase liability insurance along with other Physicians through the Canadian Medical Protective Association (CMPA). The annual and monthly fees for Radiation Oncologists are summarized in table 2. The complete fee schedule is available at http://www.cmpa-acpm.ca/cmpapd04/docs/membership/fees/2009cal-e.pdf.

Radiation Therapy Technologists in Alberta purchase their insurance in conjunction with membership in the Alberta College of Medical Diagnostic and Therapeutic Technologists (ACMDTT) and the Canadian Association of Medical Radiation Technologists (CAMRT). Their 2009 annual dues were $605 which includes the ACMDTT and CAMRT fees as well as liability insurance.

Table 2

	Yearly Cost
Quebec	$2,563.68
Ontario	$2,856.00
Rest of Canada	$1,260.00

Activities in Alberta: The Association of Medical Physicists in Alberta (AMPA) was incorporated with Alberta Corporate Registry on April 22, 2009. Very broad goals of AMPA are to protect the Alberta public by identifying competent persons who are responsible for applications of the physical sciences in the medical field (medical physicists), and to represent the interests of medical physicists practising within Alberta. Please visit our web site: http://abmedphys.ca, where a copy of our objectives, bylaws, and a 2009 membership application form are available. The inaugural meeting of AMPA directors was held May 7, 2009. A list of the directors appointed is provided in table 3.

Table 3

Position	Name	Contact Information
President	Colin Field, MSc, FCCPM	cfield@cancerboard.ab.ca
Vice-President	Alasdair Syme, PhD, MCCPM	alasdair@cancerboard.ab.ca
Registrar	Heather Warkentin, MSc, MCCPM	heathert@cancerboard.ab.ca
Treasurer	Alana Hudson, MSc, MCCPM	alanahud@cancerboard.ab.ca
Secretary	vacant	

As of August 18, AMPA has 25 Full members, 2 retired members and 2 associate members. The membership categories, rights, and 2009 membership dues (without insurance costs) are shown in table 4.

Table 4

Membership Category	Membership Dues (2009)	Voting Rights	May be a Director	Insurance Required
Full (MCCPM, or equivalent)	$40	Yes	Yes	Yes (when available)
Associate	$40	Yes	No	Yes (when available)
Student	$10	No	No	Optional
Retired	$10	No	No	Optional

AMPA is investigating a number of insurance providers and hopefully a policy with reasonable costs will be included in the 2010 Membership fee for Full and Associate members. We think that this insurance may best be provided at the national level and are actively collaborating with the COMP Professional Affairs Committee. Following the provision of insurance for Full and Associate members in AMPA, we will apply for Medical Physicists to become a regulated profession in the province of Alberta.

A big thank you to:

- The BC Association of Medical Physicists (BCAMP) for providing their constitution and bylaws, which significantly helped in our application process
- The COMP executive and Chairman Jason Schella for providing a letter consenting to the use of the name Association of Medical Physicists in Alberta
- Ernie Mah for his artistic creation of the AMPA logo and the web site Praful Shrestha for his assistance in setting up the domain name and URL forwarding

What can you do to help?
If you are a Medical Physicist practicing in Alberta, please join AMPA and participate in the discussions.

If you are a Medical Physicist practicing outside Alberta, feel free to join AMPA. If Medical Physics is to become a regulated profession across the country, your assistance with the formation of provincial associations and dialogue between these provincial associations will be required.

Please contact any of the Directors with questions or comments you may have.

1. Perks, R.W.(1993): *Accounting and Society*. Chapman & Hall (London); ISBN 0412473305

Advertisement

Endowed Chair in Medical Imaging – Wright State University, Dayton, OH

Wright State University, in partnership with a consortium of Ohio universities, has received a major award from the State of Ohio to establish a research cluster in medical imaging. This cluster will perform research and development in medical imaging and invest aggressively in senior and junior research talent, capital facilities and equipment. As part of this program, Wright State University is recruiting a distinguished senior researcher for the WSU Ohio Research Scholar endowed chair in the field of medical imaging.

We are looking for a person with experience in the design and building of medical imaging equipment. Areas of interest include, but are not limited to, imaging with ionizing radiation or other novel imaging modalities; quantitative imaging based on single or multiple imaging techniques; imaging of small animals with application of the technology to clinical imaging.

The position will be at the associate professor level or higher as dictated by experience and qualifications. The successful candidate will have substantial resources available, including a considerable amount of start-up funds, and will interact with our engineering, science and medical faculty members. This includes collaboration with existing research groups of the BioMedical Imaging Laboratory at WSU as well as the Innovation Center of the Kettering Health Network and the Air Force Research Laboratories. Joint appointments in collaborative departments are possible. The successful candidate is expected to build and lead a cohesive research team, including some junior faculty members to be hired as part of this effort, raise funds for the group and eventually create technology for commercialization. Business start-ups are encouraged.

Wright State University, an institution of 17,000 students, is located in a growing high-tech suburban community and is surrounded by commercial and government research and development facilities. The university is proactively committed to industrial and government partnerships for research and development ventures. WSU maintains relevant PhD programs in engineering and the biomedical sciences, a medical school, as well as Master's and undergraduate programs in numerous related disciplines.

This endowed chair is part of the Ohio Research Scholar Program's goal of recruiting research talent to the state of Ohio and, under the terms of this program, all candidates must be recruited from outside Ohio.

Review of applications will begin on 15 October 2009 and will continue until the position is filled. Candidates should submit a letter of application, curriculum vitae, brief statements of research plans and teaching philosophy, and include contact information for at least three references. Questions about this position should be directed to Prof. Thomas Hangartner at thomas.hangartner@wright.edu. To apply, please go to https://jobs.wright.edu/applicants/Central?quickFind=50962

Wright State University is an equal-opportunity, affirmative-action employer.

COMP 2009 J.R. Cunningham Young Investigators Award

1st Place
Jorge Edmundo Alpuche Aviles
CancerCare Manitoba, Winnipeg, MB

2nd Place
Miranda Kirby
University of Western Ontario, London, ON

3rd Place
Lindsay Mathew
Robarts Research Institute, London, ON

Poster Award

1st Place
Jeff Grant
Queen's University, Kingston Regional Cancer Centre

2nd Place
Michel G. Arsenault
UPEI

Oral Presentation Award

1st Place
Matthew Wronski
University of Toronto, Sunnybrook-Odette Cancer Centre

2nd Place
Jihyun Yun
University of Alberta, Cross Cancer Institute

McMaster University
Medical Physics & Applied Radiation Sciences

Imaging Physics or Image-Guided Therapies

The Department of Medical Physics and Applied Radiation Sciences at McMaster University is hiring a tenure stream faculty member in imaging physics or image-guided therapies. This appointment is advertised at the assistant professor level. We are looking for an energetic and enthusiastic individual who can establish an independent research program with collaborative links to other members of the department. Candidates must hold a PhD in a relevant discipline and have demonstrated a strong track record of independent research.

The Department has existing researchers and groups working with optical, radioisotope and magnetic resonance modalities. Ideally, the successful candidate will complement these interests, while establishing novel and focused research in the broadly-defined field of imaging. As a department, we are responsible for an undergraduate Honours Medical and Health Physics program, a Master's program in Health and Radiation Physics, and a graduate program in Radiation Sciences with fields of Medical Physics and Radiation Biology. In addition, we offer a diploma/degree programme in Medical Radiation Sciences with Mohawk College – with ultrasonography, radiography and radiation therapy as the major areas of specialization. We expect new faculty members to teach in one of the undergraduate programs, to supervise graduate students and to offer graduate courses to students in the Department.

The Department has been undergoing a period of exciting change and growth, with an increasing faculty complement and growing graduate program. We have close links with the McMaster Institute of Applied Radiation Sciences, Hamilton Health Sciences, the Juravinski Cancer Centre and St. Joseph's Hospital in Hamilton. Major research infrastructure includes the McMaster Nuclear Reactor, the McMaster Accelerator Laboratory, a unique fully licensed facility for handling high levels of unsealed radioactive sources, a small animal imaging facility with SPECT/CT and microPET machines and a range of irradiation facilities including the Taylor Radiobiology source, a 60Co hot cell and a newly expanded x-ray laboratory.

Further information can be found at www.science.mcmaster.ca/medphys or obtained by emailing medphys@mcmaster.ca

Interested applicants should send a letter of application with their curriculum vitae, statements of teaching and research interests and three reference letters to:

Department of Medical Physics and Applied Radiation Sciences
McMaster University
1280 Main Street West, GSB-116
Hamilton, ON L8S 4K1, Canada

All qualified applicants are encouraged to apply; however, Canadian Citizens and permanent residents will be given priority. McMaster University is strongly committed to employment equity within the community, and to recruiting a diverse faculty and staff. The University welcomes applications from all qualified applicants, including women, members of visible minorities, Aboriginal persons, members of sexual minorities, and persons with disabilities.

The COMP Gold Medal

The COMP Gold Medal will be awarded to a member of COMP (or retired ex-member) who has made an outstanding contribution to the field of medical physics in Canada. An outstanding contribution is defined as one or more of the following:

1. A body of work which has added to the knowledge base of medical physics in such a way as to fundamentally alter the practice of medical physics.

2. Leadership positions in medical physics organizations which have led to improvements in the status and public image of medical physicists in Canada.

3. Significant influence on the professional development of the careers of medical physicists in Canada through educational activities or mentorship

The Gold Medal is the highest award given by the Canadian Organization of Medical Physicists and will be given to currently active or retired individuals to recognize an outstanding career as a medical physicist who
has worked mainly in Canada. It will be awarded as appropriate candidates are selected but it will not generally be given more than once per year.

Nominations for the 2010 medal are hereby solicited. Nominations are due by Dec 15 each year and must be made by a member of COMP. Nominations must include:

1. the nominator's letter summarizing the contributions of the candidate in one or more of the areas listed above;
2. the candidate's CV;
3. the candidate's publication list (excluding abstracts) which highlights the candidates most significant 10 papers;
4. additional 1 to 2 page letters supporting the nomination from three or more members of COMP.

The applications will be made electronically to Nancy Barrett at the COMP office (preferably in pdf format, nancy@medphys.ca) and authorship of the submission e-mail will be verified by the COMP Office.

A committee of COMP members appointed by the COMP executive will consider nominations and recommend award winners to the COMP executive by Feb 15. The COMP executive makes the final decision and the awardee will be notified by March 15 to give time to arrange to be at the COMP annual meeting in Ottawa.

Candidates selected for the medal will be invited to attend the annual COMP meeting where the award will be presented by the COMP chair. Travel expenses will be paid for the medal winner. The medal winner may be asked to give a 30 min scientific presentation at the COMP meeting in addition to a short acceptance speech when the medal is presented.

COMP 2009 Treasurer's Report

Bill Ziegler, Regina, SK

The financial report was presented at COMP's annual general meeting in Victoria. Nephin & Winter Chartered Accountants audited the financial statements for the year of 2008. It was moved and passed that Nephin &Winter be retained to audit the 2009 statements. Due to the $44,128 surplus from 2008 (see Comparative Income Statement), the total equity at the end of 2008 was $193,363 (see Balance Sheet). The share of the profit from the 2007 COMP-CARO meeting was paid in 2008 ($38,000). The 2008 ASM turned a profit of $38,600. The situation isn't as rosy for this fiscal year. Even after modifying the 2009 budget, we are still predicting a deficit of ~$10,000. So by the end of the year we will only have ~$180,000 in equity while our yearly operating budget will be over $320,000. Since COMP has more committees and more activities, our expenses have also increased. It was moved and passed that the membership fees for full members will be increased by $50 starting 2010. This fee increase allows our 2010 budget to be close to break even. It was noted that if expenses continue to rise, further increases to membership fees might be necessary. If there are any questions about any of the numbers, do not hesitate to send me a message (bill.ziegler@saskcancer.ca).

(Financial report continued on page 153)

Canadian Organization of Medical Physicists Balance Sheet As at 12/31/2008

ASSETS	
Total Cash	73,571.20
Investments	132,276.08
Total Receivable	6,172.43
Prepaid Expenses	3,892.13
TOTAL ASSETS	215,911.84
LIABILITIES	
TOTAL LIABILITIES	22,548.73
EQUITY	
Retained Earnings - Previous Year	149,234.71
Current Earnings	44,128.40
TOTAL EQUITY	**193,363.11**
LIABILITIES AND EQUITY	215,911.84

Meeting of Canadian Physics Technicians, Assistants and Associates at COMP 2009, Victoria, British Columbia

Lisa Gamble, Physics Associate, Juravinski Cancer Centre, Hamilton, Ontario

I would first like to thank COMP for providing this group the opportunity to meet and discuss issues of interest to Canadian Physics Technicians, Assistants and Associates (hereinafter referred to as Physics Associates or PAs).

The meeting was attended by representatives from Victoria (our beautiful host city), Hamilton, London, Ottawa and Toronto. The COMP President (Jason Schella) and the COMP Councillor for Professional Affairs (Joe Hayward) took time to introduce themselves and ensure the group that COMP is supportive of our efforts to initiate discussion regarding the possible formation of a national organization and the creation of a certification process.

A lot of information was discussed during the meeting including the diversity of the job responsibilities across Canada. The first order of business was to define the role of a Physics Associate. It was decided that:

The role of a Physics Associate is to ensure the safe treatment of patients in a radiation oncology environment through radiation measurement and analysis. The role is complimentary to that of a medical physicist and as such Physics Associates should be considered specialists in the field of medical physics.

(continued on page 154)

Canadian Organization of Medical Physicists

Comparative Income Statement Fiscal Year 2010 Budget

	Budget 2010	Modified Budget 2009	Actual 2008	Actual 2007
REVENUE				
Total Advertising	35,000.00	35,000.00	31,086.65	37,944.47
ASM 2007 (COMP/CARO) Received in 2008			38,074.36	
ASM - Registrations	77,000.00	53,500.00	60,310.00	0.00
ASM - Exhibitors	30,000.00	31,500.00	25,338.10	0.00
ASM - Sponsorships	28,000.00	26,500.00	23,600.00	0.00
Total Winter School	40,000.00			
Harold E. Johns Donations	0.00	0.00	1,291.00	1,495.88
Interest Income	4,000.00	4,000.00	4,433.71	4,866.28
Membership Dues	107,000.00	85,000.00	84,689.17	85,273.98
Subscriptions	0.00	0.00	7,140.00	8,836.30
Award Sponsorship Revenue	4,000.00	4,000.00	4,000.00	0.00
TOTAL REVENUE	**325,000.00**	**239,500.00**	**279,962.99**	**138,416.91**
EXPENSES				
Total - Committees & Executive/Board	17,500.00	16,440.00	14,135.18	2,820.56
Travel to represent COMP/CCPM	5,000.00	2,000.00	1,031.73	0.00
Total - Annual Scientific Meeting	125,300.00	100,300.00	70,644.51	910.55
Total - Winter School	41,300.00			
Directory	7,000.00	7,000.00	6,955.00	7,126.88
Newsletter	22,000.00	22,000.00	21,629.88	20,203.27
Website	2,000.00	2,000.00	10,490.48	15,420.40
Professional Survey	3,500.00	3,200.00	3,512.50	0.00
Total - Office & Administration	91,030.00	82,730.00	83,288.60	79,585.49
Total - Awards & Support	15,000.00	14,500.00	24,146.71	18,076.59
TOTAL EXPENSES	**329,630.00**	**250,170.00**	**235,834.59**	**144,143.74**
SURPLUS (DEFICIT)	**-4,630.00**	**-10,670.00**	**44,128.40**	**-5,726.83**

Editor's Note

Idris Elbakri, CancerCare Manitoba, Winnipeg, MB

It is said that the key to a happy life lies in two human qualities: patience and gratitude. As I finish my first experience with my new role as InterACTIONS editor, I have a better appreciation for those two qualities.

Getting this issue ready has definitely been a lesson in patience. Trying to learn Microsoft publisher (using a 60-day trial version for now), making a list of all the regular contributors and their contact info, making sure I did not miss anyone or anything...Let's just say I was on a steeper learning curve than usual.

But it was also a lesson in gratitude. I am thankful to Parminder Basran, the previous editor, for making my job a lot easier. He provided me with many helpful hints and tricks of the trade, put in me touch with the right people and provided me with a wealth of resources and materials. Gisele and Nancy at the COMP office were also very helpful in managing the advertisement and provided several pieces for publication. All of the regular contributors who sent their articles by the deadline (or just after) ensured that I did not have to spend my labour day weekend working on the issue. I was also fortunate that several unsolicited submissions arrived in my inbox and ensured that I had enough material to work with. My only hope is that I have, even if partially, lived up to everyone's expectations.

I don't know if layout and design is my cup of tea, but editing is a sort of secret hobby of mine. I remember helping friends and colleagues with scholarship essays, PhD dissertations, press releases and community newsletters I am excited about this opportunity to serve as the InterACTIONS editor and to meet so many people, in writing.

As I start my term as editor, I hope to continue in the tradition of quality and consistency that my predecessors have established. I also welcome your ideas and thoughts on how we can make the newsletter better and more enjoyable: medical physics crosswords any one? Feel free to drop me a line with your suggestions and ideas, and remember, December 1st in the deadline for the next issue. My email is Idris.Elbakri@Cancercare.mb.ca.

Best wishes for a productive Fall!

Meeting of Canadian Physics Technicians, Assistants and Associates

(continued from page 152)

Many issues resulted from this meeting and the group has set a goal of June 2010 to accomplish certain strategic goals. It was also decided that the group should have an appropriate name.

Proposed names included *Physics Support Group (PSG)* or *Radiation Measurement and Analysis Group (RMAG)*.

Our 2010 Targets are the following:

1.Define a nation-wide position title which includes three levels
2.Define appropriate job descriptions and qualifications for each level
3.Suggest a salary structure for each level which may include resources for COMP membership fees and registration fees for conferences in the form of a professional allowance
4.Develop rationale for securing time and resources for training and continuing education

To attain these goals, support will be required from fellow PAs, COMP and Heads of Physics across Canada. As a group, medical physicists, and hospital human resource personnel nation-wide must be persuaded to support the standardization of the profession of Physics Associates.

Homeira Mosalaei (PA from London) will soon establish a website to provide a forum for communication amongst Physics Associates, on topics such as new equipment, recommendations, opinions regarding the profession, etc.

Finally, I would like to thank all those that have already shown support for this endeavour and those individuals who attended the PA meeting in Victoria (some of whom came at their own expense). I welcome any questions or comments and I can be contacted at lisa.gamble@jcc.hhsc.ca. I would also like to encourage those who have yet to join COMP as an Associate Member to do so and show your support for this endeavour.

I hope to see more PAs at the COMP 2010 conference in Ottawa!

Did you know…

InterACTIONS is published four times a year: January , April, July, October

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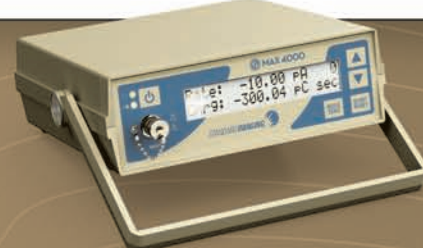

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