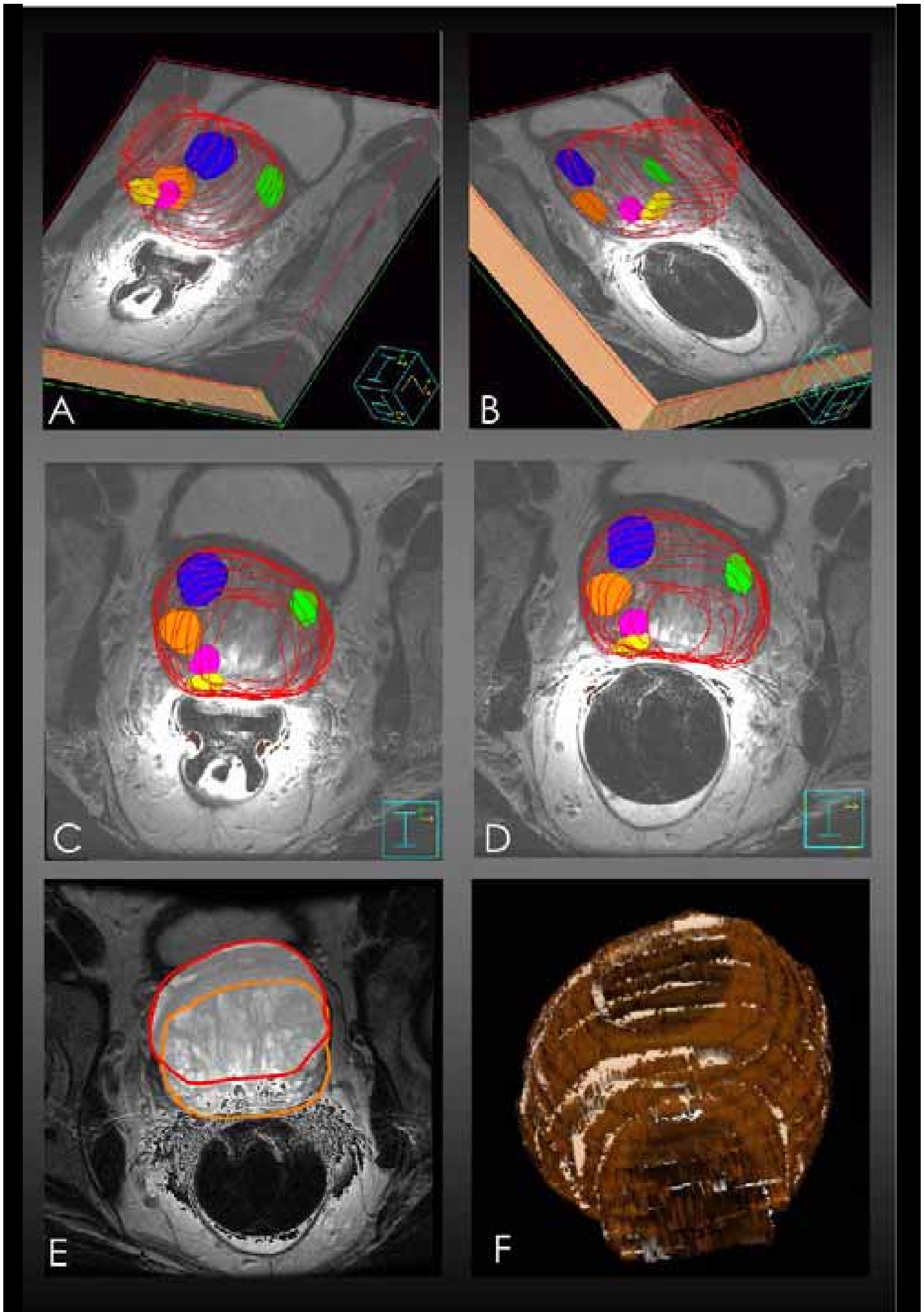
InterACTIONS

CANADIAN MEDICAL PHYSICS NEWSLETTER
Le BULLETIN CANADIEN de PHYSIQUE MÉDICALE



Non-linear prostate deformation

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

51 (4) octobre/October 2005

About our Cover

At CancerCare Manitoba, research is being carried out to investigate the use of magnetic resonance spectroscopic imaging (MRSI) in the diagnosis and radiation treatment planning of prostate cancer. MRSI provides in vivo information related to the underlying metabolic activity of tissues, and can be related to the presence of cancer. However, the inflated endorectal coil required during MRS imaging poses a potential problem by deforming the prostate when it is filled with ~100 cm^3 of air during image acquisition. This pushes the prostate superiorly/anteriorly, deforming the prostate and consequently the spectroscopic imaging data, in a nonlinear manner. In this work, the coil-deformed MRS images are warped back to a non-deformed state, using a single data set. A nonlinear warping algorithm is used to achieve this. Results indicate that the algorithm attains an accuracy of 97% (4 cm^3 difference) when reproducing the total prostate volume compared to a Radiation Oncologist defined prostate volume. Additionally, intraprostatic nodules were used to assess the accuracy of the warping algorithm in regions inside the prostate. In figure's A-E, we present T2 weighted MR anatomical images of the prostate (highlighted in red). In A and B we present a cut-away view of the prostate with external gross tumour and intraprostatic nodules visualized. Figure A and C demonstrate the rectum in the deflated state, while B and D show the rectum in the inflated state. Figure E, shows the 2D mid-prostate image of the warped image data, which is highlighted in orange. On this image we have overlaid the original contour from the un-warped inflated image data set to illustrate the displacement corrected by the warping algorithm. Lastly, figure F is a rendering of the full warped data mapped directly on to the deflated image data set. The white regions are remaining small volumes of discrepancy.

Images provided by Niranjan Venugopal[1,2], Boyd McCurdy[1,2,3] and Lawrence Ryner[1,3,4] of the [1]Department of Physics and Astronomy, University of Manitoba, Winnipeg, MB, [2]Department of Medical Physics, CancerCare Manitoba, Winnipeg, MB, [3]Department of Radiology, University of Manitoba, Winnipeg, MB, and [4]The Institute for Biodiagnostics, National Research Council, Winnipeg, MB

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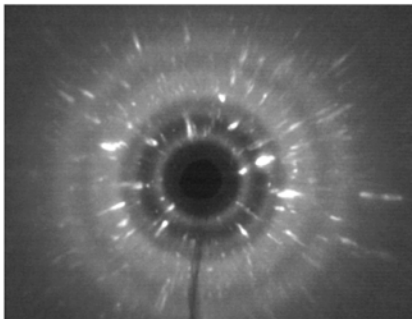
Please submit stories in Publisher 98, Word 6.0, Word 97, or ASCII text format. Hardcopy submissions will be scanned to generate an electronic document for inclusion in the Newsletter. Images in Tiff format at 300 dpi resolution are preferred.

InterACTIONS 51 (4) octobre/October 2005



Inside this issue:

Message from the COMP Chair:

As with any work of this sort the volunteer inevitably reaps rewards for his or her work which are far more valuable than the effort expended.

COMP 2005 is now "in the books" and thanks go out to **Joe Hayward** and the Hamilton Local Organizing Committee for an excellent meeting. The scientific presentations were, as usual, of high quality and the social events showcased local venues and offered ample opportunity for interaction with colleagues from across the country. The evening at the faculty club, with excellent wines to loosen the tongue was a very comfortable way to meet colleagues at the ice-breaker and later in the week it was a treat to take the time to "smell the flowers" at one of Hamilton's treasures, the Royal Botanical Gardens. The university venue offered everything from Shakespeare-in-the-park to the old campus pub! We were fortunate to have 2 of the icons of Canadian medical physics, **Dr. Jack Cunningham** and **Dr. Doug Cormack** present in Hamilton. Doug put the rest of us to shame by traveling to the sessions from Dundas on foot! Thanks to **Mike Patterson** for organizing the CCPM symposium which offered a fascinating tour of the science and medical applications of light. **Jean-Pierre Bissonnette** once again had the difficult task of leading the group which selected the best poster presentation and also the Young Investigator prizes. Congratulations to the winners - YIS - Melanie Davidson, UWO (1^{st} place), Jonathan Dysart, McMaster (2nd place), Kristen Stewart, McGill (3^{rd} place); Posters - S. Pradad, LRCC, and K. Bush, BCCA.

The presentation of the Sylvia Fedoruk award for the best medical physics paper published by Canadians in 2004 was made at the banquet by **Pat Cadman**, representing the Saskatchewan Cancer Agency. Congratulations to the winners, **Paul Johns** and **Matthew Wismayer** for their paper "Measurement of coherent x-ray scatter form factors for amorphous materials using diffractometers" Phys. Med. Biol. 49, 5233 - 5250 (2004).

The meeting had 214 delegates and 45 personnel representing 27 commercial exhibitors. One measure of the success of the meeting is the number of those attendees who stayed to the end – in this case a beautiful summer Saturday afternoon. In Hamilton a very respectable 125 remained to hear the last of the talks and the closing remarks. For a pictorial tour of COMP 2005 visit the COMP website (www.medphys.ca) and go to the COMP 2005 link. Planning will now begin in earnest for COMP 2006 to be held in beautiful Saskatoon.

Notification is given in this issue of the relocation of the COMP office to Ottawa. All administrative activity for the organization will now be integrated at the offices of our executive director, **Nancy Barrett**. Unfortunately with this relocation we will be losing the services of our administrative secretary **Barb Callaghan**. Barb has been efficiently dealing with the affairs of our organizations from the Edmonton office for the past 5 years, working independently for some periods and also with 3 different executive directors. The work that Barb did is not obvious to most of the membership, but that work is vital to our organization and Barb deserves our collective thanks for a job well done. We wish Barb success and happiness in her new endeavours.

Mr. Peter O'Brien, COMP Chair

Your executive is committed to continuing to improve the organization, to better serve the membership and to make it the recognized voice for medical physicists in Canada and internationally. In this issue is a call for nominations for 2 very important executive positions in COMP. The first is the Councillor for Communications. This position (now held by **Darcy Mason**) chairs the communications committee which is responsible for the website and the newsletter, two of our most important news and service

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Message from the CCPM President:

At our Annual General Meeting in July, we welcomed 3 new Fellows, **Clément Arsenault, Ian Cameron, Patrick Rapley**, and 13 new Members, **François DeBlois, Larry Gates, Judy Hale, Adnan Ismail, Nina Kalach, Vitali Moiseenko, DeeAnn Radford, Jeffery Richer, Russel Ruo, Greg Salomons, Robert Stodilka, Monique Van Prooijen** and **Jian Wang.** Congratulations to all of you. As most of you know from personal experience, subjecting yourself to the examinations for either Membership or Fellowship of the College requires dedication and hard work and is generally not considered to be much fun! The College thrives on the growth provided by new members and I encourage all of you (the new members and those of you who are *not-so-new*) to consider taking an active part in the business of the college. There are many ways to do this and an easy starting place is to consider making some suggestions for the membership question bank, read on for more information on this.

Dr. Brenda Clark, CCPM President

I would also like to recognise the considerable effort on the part of our Chief Examiner **Katharina Sixel**, our Registrar **Wayne Beckham**, members of the credential review and examining committees and the invigilators, all of whom also give up personal time for this effort and many of whom are anonymous. Thanks to all of you.

Other business at the AGM included the approval of several changes to the College By-laws. The first adds a Deputy Chief Examiner to the list of officers, in recognition of the increased workload incurred by the oral membership examination and also to help smooth the transition between Chief Examiners. **Michael Evans** was promptly inaugurated as our first Deputy. Congratulations Michael!

Other Bylaw changes approved will allow greater flexibility with setting the written membership examination, although these changes will most likely not take place until next year. The membership bank for radiation oncology physics will be reconstructed to contain a much larger number of smaller questions to increase the potential scope of each examination. As a side benefit, it should then be easier to edit and revise each question, although a priority in the scaling down process is to ensure the depth and rigour is preserved. At present, the other specialty questions will retain the larger question format although the potential to revise these sections will be assessed individually. As advertised, the detailed examination instructions for the coming year will be posted on the web site before 1 October.

Other Bylaw changes approved will allow greater flexibility with setting the written membership examination, although these changes will most likely not take place until next year.

Other news from the Hamilton meeting: there were two winners this year of the **Harold E. Johns Travel Award**, as described elsewhere in this publication. This double award is not going to be repeated unless and until contributions to this fund increase dramatically! The reasons for giving two awards this year are that recently there were three years when no award was given (no applications were received!) and also that this year we received two very worthy applications. I encourage all of you to consider making a generous donation to this fund and also to encourage those of your colleagues eligible for this award to develop some appropriate travel plans and make an application for next year. If you are in doubt of the value of this fund, the previous awardees are listed on the web site and could be contacted for a testimonial.

This is the beginning of my last year as President of the College and also as a board member. While I acknowledge that most of the activities can be classified as "work", it's also a lot of fun to work behind the scenes on the examinations and of course the people you work with are great! So I encourage those of you who may be interested in participating to consider volunteering for a position on the board. There is a posi-

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Message from the Executive Director of COMP/CCPM:

...COMP relies heavily on its volunteers to give it the in-sight, the direc-tion, and the support it needs to be relevant to its members.

It has been a tremendous experience learning about the important work that our members do and understanding more about the contribution of the medical physics community. I was especially appreciative of the opportunity to meet many of you in person at the Annual Scientific Meeting in Hamilton. For those who attended the meeting, I am sure you agree it was a great success and the results of the post-meeting survey (published in this issue of InterACTIONS) confirm this. Congratulations to the Local Arrangements Committee for a job well done!

I have now had a chance to interact with a cross-section of COMP members – those who are students and just beginning their careers, those who are highly engaged as volunteers, those who are prospective volunteers and those members who have paved the way for others and are considered pioneers in the field of medical physics. I have been struck by the mutual respect and sense of community within the group and by the number of members who volunteer, either in a leadership capacity or behind the scenes. Like many other professional organizations, COMP relies heavily on its volunteers to give it the insight, the direction, and the support it needs to be relevant to its members. The volunteers that serve both COMP and CCPM through their active participation on the Executive and Board, committees and other ancillary organizations make it possible for COMP to deliver services to the membership and promote the medical physics profession in North America and abroad.

I have counted approximately 70 volunteers, which relative to the number of COMP members, indicates that there is a high level of engagement within the organization. But there is always room for more! Volunteering provides significant benefits not only to COMP but to the volunteer as well. For younger professionals, volunteerism provides valuable networking opportunities that can build professional relationships and establish long lasting friendships. Volunteerism provides individuals with a chance to grow personally and professionally while making a positive contribution to their profession. If you thought about volunteering in the past but haven't acted on it, please feel free to contact us to learn more about opportunities available.

One way of supporting COMP would be to attend the public lecture that the World Year of Physics 2005 Committee is sponsoring across Canada in the fall of 2005. COMP is one of the sponsors of the lecture which is entitled *"Was Einstein Right?"* and will be given by Dr. Clifford Will, Washington University. Dr. Will, who was born in Hamilton, Ontario, started the tour by giving the Herzberg Memorial Public Lecture at the 2005 CAP Congress in Vancouver this past June. Details are available at www.cap.ca/wyp/tour-list.asp and will also be shared with

Ms. Nancy Barrett,
COMP/CCPM Executive Director

you via email as they become available. Consider attending so that we can ensure that the medical physics community is well represented.

As you are aware, the COMP office is now located in Ottawa. We thank you for your patience during this time of transition and are confident that a centralized administration will ensure continuity from one year to the next and enable volunteers who serve COMP to focus on issues that are strategic in nature.

We are in the process of gathering information that is spread out across the country (in the offices, basements etc. of past volunteers perhaps?) and creating a COMP/CCPM Archives. If you have materials that would be of interest, please contact us.

COMP is a successful organization because

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Dr. John (Jack) Cunningham appointed to the Order of Canada!

Submitted by Crystal Plume Angers
TS Engineering, Ion Technologies, MDS Nordion, Ottawa, ON

Dr. John Cunningham (Jack) has been appointed to the Order of Canada!! (http://www.gg.ca/media/doc.asp?lang=e&DocID=4523). [See also www.medphys.ca for link.]

Dr. Cunningham is considered a pioneer in the field of Medical Physics. He is a founding member and fellow of the Canadian College of Physicists in Medicine (CCPM), an emeritus member of the Canadian Organization of Medical Physicists (COMP), a fellow of the American Association of Physicists in Medicine (AAPM), an honorary member of the Scientific Association of Swiss Radiation Oncology (SASRO) and a life member of the Association of Medical Physicists of India.

Jack's awards are numerous but of greatest significance are the AAPM Coolidge award (1988) and the CAP-COMP Peter Kirkby Memorial Medal (2002). The AAPM Coolidge award is the highest honour given by the American Association of Physicists in medicine and recognizes those members who have had an eminent career in medical physics. Awardees are recognized for having made a significant impact upon the scientific practice of medical physics, for having a significant influence on the professional development of the careers of other medical physicists, and for demonstrating leadership in national and/or international organizations, with specific emphasis on AAPM activities. The CAP-COMP Peter Kirkby Memorial Medal recognizes outstanding service to Canadian physics. It is intended to recognize service to the physics community by strengthening the Canadian physics community, by enhancing the profession of physical scientists, by effectively communicating physics to the non-scientific community, or by making physics more attractive as a career.

Dr. Cunningham's involvement in Medical Physics and Radiation Oncology is far reaching. He played a significant role in the introduction of computers for radiotherapy treatment planning and was instrumental in the development of Theraplan a commercial treatment planning system developed and marketed by Theratronics Ltd. (formerly AECL, Medical Division) of Ottawa. Many of the algorithms he developed are still in use in commercial systems today. Jack was also involved in the introduction of Cobalt-60 teletherapy and the building of one of the first Cobalt treatment units. Working with the late Dr. Harold Johns (Officer of the Order of Canada), Dr Cunningham co-authored "The Physics of Radiology" which is considered to be the primary work in Medical Physics. This classic text is used throughout the world to instruct basic radiation physics concepts to physicists and non-physicists alike.

Dr. Cunningham has been a part of Medical Physics since 1948. Jack received his B.Eng. and M.Sc. degrees from University of Saskatchewan and his Ph.D. degree from the University of Toronto. He spent the majority of his academic career in Toronto at the Ontario Cancer Institute (incorporating the Princess Margaret Hospital), where he served as Chief Physicist. He is now retired and living in Camrose, Alberta.

On a more personal note, Jack has a captivating personality. His open friendliness, his humility and his gift for making people feel at ease are all important contributors to his success. Jack is the kind of teacher that leaves a lasting memory and he willingly shared his love of the medical physics profession. You will find evidence to this in the recent text "The Modern Technology of Radiation Oncology", edited by Jacob Van Dyk. The dedication reads, "In my professional life: To Jack Cunningham who by example demonstrated that medical physics is much more than just a career".

Report on COMP AGM 2005

July 6 to July 9, 2005

Submitted by Pat Cadman
Saskatoon Cancer Centre,
Saskatoon, SK

The annual COMP/CCPM Conference was hosted by the good folks at the Juravinski Cancer Centre in Hamilton and held at the McMaster University campus. I had not been to that part of Ontario before, being leery of that escarpment thing that might encumber a poor prairie-boy's view and his ability to travel by foot, so I headed down a day early to attend the Pinnacle User's Meeting and check the place out. I ventured off and found trails that wind through the forest in the university area (I came face-to-face with a deer and saw some baby swans (signets?) in the Cootes Paradise area). By the time the conference began on Wednesday evening, I had cemented my morning routine of rollerblading along the waterfront and hiking along the forest paths that lead to McMaster. Although the industrial smokestacks might be seen looming in the distance, the campus and surrounding area are truly beautiful and provided a wonderful backdrop for the 51st annual meeting.

Oh yeah, the conference. The topic of the CCMP Symposium this year was Optical Diagnostics and Therapeutics. As a radiation therapy physicist, I feel that we sometimes get too wrapped up in the mainstream treatment modalities; this year's symposium provided a chance to learn of the fundamental science and research and development in optical techniques. Enlightening presentations from invited international scientists focused on optical coherence tomography, diffuse optical imaging of the neuro-metabolic-vascular relationships during brain activation and imaging of breast tumor tissue using diffuse light. Brain Wilson of the University of Toronto gave an excellent lecture on the physics and biophysics of photodynamic therapy, describing the underlying optical technologies for generation, delivery and dosimetry and the associated challenges and future prospects.

This year there was a pretty even split between oral presentations in the scientific sessions and poster presentations and discussions. A highlight of the conference each year is the J. R. Cunningham Young Investigators Symposium. We were fortunate to have Jack Cunningham and his charming wife attend the conference again this year, providing inspiration to the younger and not-so-younger medical physicists. Congratulations to the following YIS winners:

1st place: Melanie. Davidson, UWO, Tomographic composition analysis of intact urinary calculi by x-ray coherent scatter, M. Davidson, UWO, D Batchelar, S. Velupillai, J. Denstedt, I. Cunningham

2nd place: Jonathan Dysart, McMaster, Calculation of singlet oxygen dose from photosensitizer photobleaching during THPC or Photofrin photodynamic therapy in vitro, J. Dysart, G. Singh, M. Patterson

3rd place: Kristen Stewart, McGill, Design and testing of a new sealed water calorimeter for electron beams, K. Stewart, N. Klassen, C. Ross, J. Seuntjens

Thirty-five posters were on display this year. This year's top prize is shared by:

S. Prasad, LRCC, Conversion of kV-CT Numbers to electron density of human tissues in vivo: Validation using megavoltage CT scanning on a tomotherapy machine, S. Prasad, T. Kron, J. Kempe, J. Battista

K. Bush, BCCA, Commissioning of virtual wedges for Monte Carlo simulations by optimizing photon source characteristics, K. Bush, T. Popescu

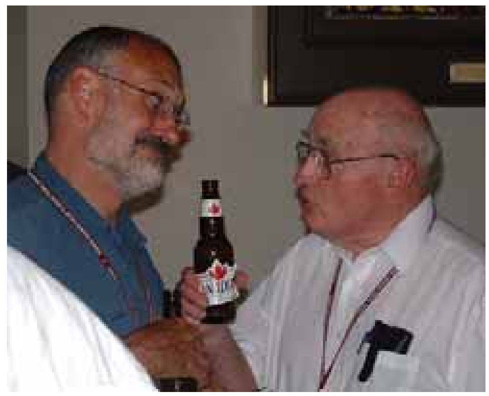
The banquet was held on Friday evening at the Royal Botanical Gardens. With the extreme chitchat that happens during medical physics social events, it was hard to notice the surrounding flora and fauna, but I am sure it was out there somewhere. It was even difficult to discern a musical trio (Scantily Plaid) comprised of 2 lads in kilts playing an assortment of instruments and a harp strumming maiden over the din of old fiends and new acquaintances. After the official announcements and presentations, and a scrumptious buffet meal, we were again entertained by the trio, but this time we were all in the mood for listening. The musical selections ranged from traditional east coast (including Stompin' Tom) to blues. The front man of the band fortunately broke a few guitar strings along the way, which allowed him to dazzle us with an impressive harmonica solo during each string change – quite a showman.

The 2006 COMP/CCPM conference will be held in Saskatoon. The venue will be the Delta Bessborough hotel (see http://www.deltahotels.com/hotels/hotels.php?hotelId=8), one of the great Canadian railroad hotels that was built in the 30's on the banks of the South Saskatchewan River. Just think, you will be able to roll out of bed just 15 minutes or so before the sessions and arrive on time to not miss a thing. We plan to include a tour of the Canadian Light Source, Canada's national synchrotron facility (see http://www.lightsource.ca/), and the CCPM symposium will host a number of experts on synchrotron science. Please note that June is NOT a winter month in Saskatoon and the mosquitoes should not have arrived from Winnipeg yet. There is even talk of a talent show at the banquet next year so shine up those guitar strings and dust off your Mountie jackets and lyrics to Monty Python's LumberJack song. Hope to see you all there.

Pictures from COMP AGM 2005

"Why is he taking so long to pour?"

Some male models from la belle province! [Very difficult to find in the realm of physics!]



Ahhhhh, yes, I too enjoy this particular beverage. Physics always makes more sense this way!

Please, no pictures taken with me in the vicinity of this guy!

Some of the most important physics discussions take place late at night, on patios, with a nacho and beer catalyst!

Our new Executive Director Nancy Barrett meeting and greeting COMP AGM attendees at the Icebreaker.

Scientific content aside, the font looks pretty good, but I prefer 'Arial' to 'Verdana'.

London Regional Cancer Program reunion.

COMP Chair Peter O'Brien presenting a commemorative plaque to the first ever COMP Public Lecturer, Michael Bronskill.

More Pictures from COMP AGM 2005

Attendees filing into the banquet held at the beautiful Royal Botanical Gardens.

Attendees were greeted by a live band as they arrived at the banquet.

Joe Hayward and Nancy Barrett announce the prize draw.

“I put my tickets in for WHAT?”

Sherry Connors is one of the lucky prize winners!

Jean-Pierre Bissonette congratulates the top two scientific poster prize winners, S. Prasad (most left, London Regional Cancer Program) and Karl Bush (most right, Vancouver Island Cancer Centre).

Jean-Pierre Bissonette congratulating Kristen Stewart (McGill University/ Montreal General Hospital) on her third place finish in the Jack Cunningham Young Investigators competition.

Jean-Pierre Bissonette congratulating Jonathon Dysart (McMaster University/Juravinski Cancer Centre) on his second place finish in the Jack Cunningham Young Investigators competition.

Jean-Pierre Bissonette congratulating Melanie Davidson (University of Western Ontario/ Robarts Research Institute) on her first place finish in the Jack Cunningham Young Investigators competition.

The COMP Gold Medal

The COMP Gold Medal will be awarded to a member of COMP (or retired ex-member) who has made a significant contribution to the field of medical physics in Canada. A significant contribution will be 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 2006 medal are hereby solicited. Nominations are due by Dec 15 each year and must be made by a member of COMP. Nominations must include:

- the nominators letter summarizing the contributions of the candidate in one or more of the areas listed above;
- the candidate's CV;
- the candidate's publication list (excluding abstracts) which highlights the candidates most significant 10 papers;
- 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 Saskatchewan.

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.

A Proposal to Issue Consolidated Radiotherapy Treatment Facility Operating Licences

Submitted by Robert Corns[1] and Jeff Sandeman[2]
[1]Fraser Valley Cancer Centre, British Columbia Cancer Agency, Surrey, BC
[2]Canadian Nuclear Safety Commission, Ottawa, ON

Introduction
A proposal to consolidate CNSC operating licences was presented at both the CRPA and COMP conferences this year by Jeff Sandeman. He would appreciate feedback from the medical physics community to see if there is sufficient interest to justify the work required to instigate these changes to the licensing structure. This article examines the motivation for and the key components of the proposal.

Class II facilities include most radiation oncology facilities, irradiator facilities with activities exceeding 10^{15} Bq, and irradiator facilities capable of producing dose rates in excess of one cGy per minute at a distance of one meter from the source. Approximately 75% of all Class II licences are from cancer centers with an average of five licences per center. The types of licences one might find in a cancer center include Class II Nuclear Facilities construction, operating, decommissioning and service licences; and Nuclear Substance and Radiation Device licences for manual brachytherapy sources or calibration. Separate licences are required for each use type within a facility. Fortunately, some streamlining of licences is possible through consolidation of licences for a common use type. For example, all high energy linear accelerators (≥ 10 MV) may be under one operating licence, but separate licences are still required for cobalt units and for brachytherapy sources.

Maintaining licences requires quite a lot of paperwork on the part of the licensee. Most licences must be renewed every five years, with the exception being linear accelerator operating licences, which are every twenty-five years. Renewals are usually done individually because their due dates are staggered. Annual compliance reports are required for each licence. Every licence ties into the institution's radiation safety program by incorporating the program into an Appendix A. Any changes to the safety program must be amended into each licence and updating this information in one licence does not automatically apply that update to all licences.

Obviously there is a redundancy of information, because a facility with multiple licences holds them under the same radiation safety program. Moreover, staff-related documentation is often duplicated for each licence because staff members typically rotate between use types. Licence renewals require resubmission of all information and since the renewal dates are staggered, they cannot be prepared as a batch.

This affects not only the licensee, but also the CNSC, which has to process all of the various applications, renewals and reports. If an inspection or audit finds a systemic problem in the radiation safety program, the cancer center may have to be cited for violations on each licence. Furthermore, the duplication of information submitted makes it difficult to track licence specific information.

A single radiotherapy treatment facility licence draft proposal

The proposal is to issue a consolidated radiotherapy treatment facility licence to each clinic. This licence would be renewable once every five years and require a single annual compliance report. NSRD licences will likely remain separate, at least for the initial stages of the project, but eventually the CNSC would like to incorporate manual brachytherapy as well.

Application process

Construction licences would continue to be issued on a facility by facility basis. However, only new institutions with no existing Class II licence would need to supply their radiation safety program information. An existing licensee who wished to construct new facilities would need only confirm the facility will follow their existing radiation safety program and submit shielding design and safety devices for evaluation.

Commissioning licences would also continue to be issued on a facility by facility basis. Only the commissioning plans would be required for evaluation.

Once commissioned, the new facilities would then either be annexed into the existing consolidated operating licence, or if it is the first facility for the cancer center, issued a new routine operating licence. All Class II radiotherapy treatment facilities at a cancer center would be under single consolidated operating licence. This presumes that all facilities are operating under the same radiation safety program. In-house Class II servicing activities would be covered under the same consolidated licence. Operationally the process flow for applications will be similar to the current process.

Draft licence format

The proposed licence format would move information relating to the types of prescribed equipment and nuclear substances and their locations to an appendix. The conditions stated on the opening pages of the licence would be similar to existing conditions but some work will need to be done to customize them as to which facilities, devices or sources they are applicable to.

Draft licence appendices

The licence appendices will contain the cancer center's list of class II prescribed equipment and sources and their permitted locations for use and storage. Each source or piece of equipment would be indexed for cross referencing.

Currently Appendix A contains the supporting documentation for each licence. This would be expanded to include the

(Continued on page 121)

Consolidated Licencing Proposal… (Continued from page 120)
information pertaining to each use type. The information required would remain the same as it is today; only the organization of this information would be changed. Eventually there is expected to be a consolidation of the documentation relating to four basic program elements:

- radiation safety policies and procedures;
- the QA program (not to be confused with quality control of equipment);
- those operating procedures with radiation safety implications (e.g emergency response); and
- servicing procedures.

Once this consolidation is achieved, facility specific documents in the appendix would be restricted to construction details, commissioning plans and commissioning results.

The existing Appendix B, which details the format of the annual compliance report, would be extensively modified to cover all facilities and use types in one report. Makes and models of equipment and their location would automatically be entered onto the report form whenever a new licence was issued. The total information in the single report will be the same as the collective information currently required in the annual compliance report written for each existing licence. The difference would be the removal of information which is currently redundant between reports for different use types because only one annual compliance report would be written.

Conclusion

The CNSC proposes that each cancer center hold a single, consolidated radiotherapy treatment facility operating licence. The motivation is to reduce the redundancy of information required in the current licensing structure, because it costs significant resources to prepare this information on the part of the licencees and significant resources to process this information on the part of the CNSC.

The benefits of a single licence to the licencees would be
- an approach consistent with the structure of a radiation safety program;
- a single operating licence to maintain per clinic;
- amendments to the radiation safety program are automatically applied to all use types under the operating licence;
- one annual compliance report to write, albeit somewhat more complex;
- one renewal application to submit every five years; and
- the elimination of the need to submit redundant information

The benefits to CNSC would be
- a 75% reduction in the number of cancer clinic licences to administer;
- a decrease in the number of annual compliance reports, renewals and amendments to the process;
- a decrease in the number of inspection reports to prepare and track;
- tracking of duplicate radiation safety program information is eliminated;
- it would be consistent with new licence security requirements (PE, NS and locations moved to attachment); and
- it would be consistent with existing document tracking database.

Jeff Sandeman is spearheading this project at the CNSC and is looking for feedback from his clients. This project might not proceed if there is insufficient interest. You may write to him with your comments at:

Jeff Sandeman
Project Officer
Class II Facilities and Dosimetry Services Licensing Division
Canadian Nuclear Safety Commission
P.O. Box 1046, Station B
280 Slater Street
Ottawa, Ontario, Canada
K1P 5S9

Update on the Development of the CAPCA Standards for Quality Control at Canadian Radiation Treatment Centres

Submitted by Peter Dunscombe[1] on behalf of the Task Group
[1]Tom Baker Cancer Centre, Calgary, AB

Four of the draft standards posted on medphys.ca have recently been approved by the Canadian Organization of Medical Physicists. These are the standards for Electronic Portal Imaging Devices, Medical Linear Accelerators, Conventional Simulators and Kilovoltage X-ray Radiotherapy Units. These four standards went through a consultative process by being posted on the website for comments for close to a year. Comments were received on each document. These were reviewed by the Task Group and the documents modified accordingly before being submitted to COMP for final approval. The Task Group is currently in the final review process for the standards on Cobalt 60 Therapy Units and Multileaf Collimators so, hopefully, these will receive full approval fairly soon. The next documents for revision will be those on Major Dosimetry Equipment and Brachytherapy Remote Afterloaders. At this time we would solicit your comments on these two documents with the intention of undertaking the revisions and obtaining final approvals by the end of this year. Any help you can give us would be appreciated.

CRPA-ACRP/CRSO 2005 Conference

June 20-23, 2005

Submitted by Robert Corns
Fraser Valley Cancer Centre,
British Columbia Cancer Agency, Surrey, BC

The first CRPA-CRSO joint annual conference held in Winnipeg from June 20-23 provided participants with an excellent opportunity to learn about radiation-safety involving both ionizing and non-ionizing sources, including some topics not often addressed in a radiation oncology department. Topics included non-ionizing radiation, radiation safety, radiation biology, lasers, radon, medical radiation and regulatory and security issues. THE CRPA presented a post-conference course on laser. They also held their first accreditation exams.

The conference took place at The Forks. This location is a designated national historic site because of its strategic location at the junction of the Red and Assiniboine rivers that were part of a vast continental network of water routes. The site's significance derives from its continuous use over time for transportation, trade and settlement. A traditional aboriginal stopping place, The Forks was the site of Fort Rouge, Fort Gibraltar and the two Forts Garry. Unlike most other national historic sites, The Forks does not commemorate one specific period in history. Instead, its importance lies in its role as witness to so many of the events that shaped the Canadian West as we know it. The first people here camped at the confluence of the two great rivers and over the centuries their presence drew others. Today The Forks is Winnipeg's "Meeting Place," where festivals, special events and a tranquil landscape draw thousands to the historic site.

William Bailey, keynote speaker for the first session, provided a general overview of the effects of 50/60 Hz of non-ionizing radiation and the research supporting guidelines to be released later this year. Brian Philips (BC Centre for Disease Control) discussed the Federal-Provincial-Territorial Radiation Protection Committee –Canada's (FPTRPC) position statement on health effects of 60 Hz fields. For more information, check out the FPTRPC website at http://www.bccdc.org/content.php?item=196.

The University of Toronto (U of T) implemented a laser-safety program in 2004. U of T's Sandu Sonoc provided highlights from the first year. The laser safety program includes petawatt laser systems, which can split nuclei and which can produce high intensity radiation beams (protons, electrons, X-rays). Sandu noted that radiation-safety legislation is not keeping up with the pace of new developments in lasers. Celia Hacker, also from the U of T, spoke of an international training program in radiation safety and of the educational and organizational challenges that program presented.

Nowhere was the difference between public response towards radiation and the responses of medical physicists and radiation-safety specialists more clearly highlighted than in Jim Herrold's (University of Wyoming, Laramie, WY) presentation entitled

Satellite photograph of 'The Forks' in Winnipeg.

Hiroshima Nagasaki Russian Roulette. He observed that 715 songs in nine categories and 13 genres reference radiation.

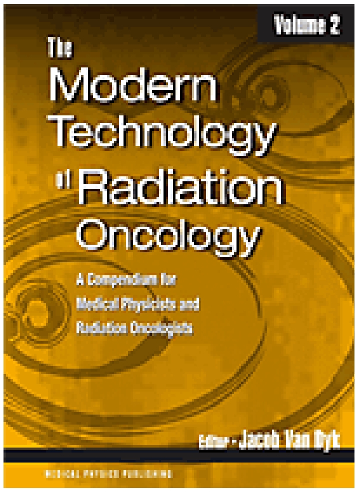
Day two's keynote speaker in the morning was McMaster's Doug Boreham, who discussed radiation biology and the environmental factors that impact on radiosensitivity, including hyperthermia, diet and low radiation doses prior to a large dose. Low dose radiation therapy is used to treat non-Hodgkin's lymphoma and as a preventive measure for radiation sickness induced in the GI tract.

Health Canada's Gary Kramer critiqued paradoxes and flaws in the ICRP's newest work that was released at the Madrid 2004 IRPA congress. The ICRP report presents the concept of excluding certain classes of radiation sources with a 10 μSv limit as the foundation for the exclusion.

The afternoon was devoted to medical applications, leading off with keynote speaker Dr. Michael West's (CancerCare Manitoba) presentation on the Gamma Knife. Other topics included Gamma Knife QA, reloading a Co-60 TBI irradiator, PET/CT and an interesting proposal by Jeff Sandeman to consolidate CNSC Radiotherapy Facility operating licenses. This proposal will be presented in a separate article.

Nikolay Stoev of Valkom Laser Consulting gave the keynote address, on laser safety, on Wednesday. He also led the post-conference laser course. The conference rounded out its program with topics in radon, security, CT dosimetry, radiation dosimetry and RSO miscellaneous topics.

Book Review: The Modern Technology of Radiation Oncology, Volume 2



Jacob Van Dyk, Editor. 514 pages. Medical Physics Publishing.
Price: 100.00 USD (Hardcover, $120).
ISBN 1-930524-25-0 (Hardcover)
ISBN 1-930524-26-9 (Softcover)

Submitted by Marco Carlone
Cross Cancer Institute, Edmonton, AB

The second volume of the popular book *The Modern Technology of Radiation Oncology* is a comprehensive review of much of the new technology and clinical practice of radiotherapy since the publication of the first volume in 1999. Editor Van Dyk introduces the need for these technology advances in the opening chapter by discussing some key issues surrounding prostate cancer: identification of the target, tracking the target through image guidance, and radiobiological considerations. In many ways, the example of the prostate illustrates the most modern of challenges in radiotherapy. The book concludes by addressing current issues in radiotherapy from a brachytherapy perspective by discussing advances in the important area of prostate brachytherapy. In between, the book addresses many of the modern aspects of radiotherapy: imaging, Monte Carlo dose calculation, inverse planning, intensity modulation, image guidance and breathing control. Also included is an excellent chapter on radiobiological modelling; this chapter will certainly be very useful to many readers as it brings together into one chapter many concepts and results that are typically only available through a large literature review. Finally, a pleasant surprise in this book is a thorough chapter on dosimetry protocols. At first, the chapter seems atypical of the book since dosimetry protocols are not what one considers when thinking of modern radiotherapy, however several new protocols have appeared since volume 1 of *The Modern Technology of Radiation Oncology*, (including TG51) and so this chapter is timely and will be useful for anyone that is implementing a new dosimetry protocol since it contains several worked examples designed to assist the reader in implementing these protocols.

Absent from this book, however, is an up-to-date view of the clinical practice of tomotherapy. The technology of tomotherapy was covered in great detail in the first volume; since then the clinical practice and implementation of tomotherapy has evolved considerably. Admittedly, much clinical experience in tomotherapy is so recent that it would be difficult to provide an accurate perspective of this new technology, and to collect the material in a timely manner such that it could be published in this book. However, this book would have been the ideal forum for a chapter devoted to these advances. As well, the technology of ultrasound based image guidance, where an ultrasound device is registered to a CT simulator and linac, is only covered briefly. This technology can potentially solve the difficult problem of prostate mobility and day-to-day localisation; this book would also be ideally suited for an overview of this very new technology.

The goal of this book was to focus on the improvements in technology that have occurred since volume 1, and the book is very successful at achieving this goal. Consequently, much of the material in this book is advanced, and is less likely to be useful to someone new to radiotherapy. It will be very useful to professionals already in the field, people who want to get up to date on new developments, or people who are interested in implementing the technologies discussed in the book. It was very interesting to read, and I highly recommend it as a reference text for all practising medical physicists in radiotherapy.

In Memoriam – Dr. Nelson Videla

Dr. Nelson Videla, a medical physicist at the Toronto Sunnybrook Regional Cancer Centre (TSRCC) for the past 15 years passed away on August 4, 2005 after a brief illness. Nelson was a native of Chile who did graduate work in theoretical nuclear physics in Moscow and in Winnipeg. After working at accelerator laboratories in Winnipeg and Saskatoon, and a brief stint with industry, Nelson joined the TSRCC as a medical physics resident in 1990. Nelson worked in all aspects of clinical radiation therapy physics at TSRCC and most recently was the leader of our quality assurance program. With his quiet, friendly manner and helpful nature Nelson made many friends at TSRCC and he will be missed. Nelson leaves his wife Elsa and 3 children.

Peter O'Brien
Toronto Sunnybrook Regional Cancer Centre

COMP OCPM

CANADIAN ORGANIZATION OF MEDICAL PHYSICISTS

CALL FOR NOMINATIONS

Chair

(2-year Term as Chair-Elect from 2006 to 2008;
2-year Term as Chair from 2008 to 2010;
2-year Term as Past-Chair from 2010 to 2012)

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

Please send nominations to:

ORGANISATION CANADIENNE DES PHYSICIENS MÉDICAUX

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terme de 2 ans comme président(e) 2008 à 2010;
terme de 2 ans comme président(e) sortant(e) 2010 à 2012)

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

Envoyez vos mises en candidature à:

Clément Arsenault, Ph.D., FCCPM
COMP Past-Chair
Centre d'oncologie Dr Léon-Richard
Moncton, NB E1C 8X3
Tel: (506) 862-4151
Fax: (506) 862-4222
E-mail: carsenault@health.nb.ca

DEADLINE : FEBRUARY 28, 2006

The results will be reported at the Annual General Meeting in Saskatoon in June 2006.
(See Articles IV.B(6&7) of COMP Bylaws)

DATE LIMITE : 28 FÉVRIER 2006

Les résultats seront rapportés à la réunion générale annuelle à Saskatoon en juin 2006.
(Voir articles IV.B(6 et 7) des règlements de l'OCPM)

Nominee :

Accepted by nominee :

Sponsors: 1)

2)

Candidat(e) :

Acceptée par le(la) candidat(e):

Parrains: 1)

2)

COMP OCPM

CANADIAN ORGANIZATION OF MEDICAL PHYSICISTS

ORGANISATION CANADIENNE DES PHYSICIENS MÉDICAUX

CALL FOR NOMINATIONS

APPEL POUR MISES EN CANDIDATURE

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(3-year Term from AGM in 2006 to AGM in 2009)

Conseiller des communications

(Terme de 3 ans de la RGA en 2006 à la RGA de 2009)

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

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

Please send nominations to:

Envoyez vos mises en candidature à:

Clément Arsenault, Ph.D., FCCPM
COMP Past-Chair
Centre d'oncologie Dr Léon-Richard
Moncton, NB E1C 8X3
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Nominee :

Accepted by nominee :

Sponsors: 1)

2)

Candidat(e) :

Acceptée par le(la) candidat(e):

Parrains: 1)

2)

Sylvia Fedoruk Award—2004

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

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

Winner:

"Measurement of coherent x-ray scatter form factors for amorphous materials using diffractometers"
Phys. Med. Biol. 49, 5233 - 5250 (2004)
Paul Johns and Matthew Wismayer

Honorable Mentions:

"Development of high quantum efficiency, flat panel, thick detectors for mega-voltage x-ray imaging: A novel direct-conversion design and its feasibility"
Med. Phys. 31, 3004 (2004)
G. Pang and J. A. Rowlands

"The influence of antiscatter grids on soft-tissue detectability in cone-beam computed tomography with flat-panel detectors"
Med. Phys. 31, 3506 (2004)\
J. H. Siewerdsen, D. J. Moseley, B. Bakhtiar, S. Richard, and D. A. Jaffray

A note about the selection process:

Papers are grouped into six categories: radiation therapy, dosimetry and Monte Carlo, MRI, CT, ultrasound, and various subjects. Each category is evaluated by an expert and the best paper in each category is identified. The six winners (one from each category) are sent back to all committee members who rank the whole group to the best of their ability.

!!!! CONGRATULATIONS !!!!

Canadian College of Physicists in Medicine

Examination Schedule 2006

Membership Examination:
Applications due: 6 January 2006
Examination date: Written 11 March 2006
Oral 13 May 2006
Fee: $450.00
Decisions announced on or before February 24
(Note: Non-Radiation Oncology specialty orals to be held at the same time as Fellowship orals)

Fellowship Examination:
Applications due: 6 January 2006
Examination date: 1-2 days prior to COMP Meeting in Saskatoon
Fee: $300.00 (Exam in Saskatoon)
Decisions announced on or before February 24
(later for those who do the membership exam in the same year)

Note:

- The application forms, exam study guide, and sample exams are available on the COMP website under the heading "CCPM Certification". Application forms must be the ones currently posted on the COMP website.
- Membership & Fellowship examination application deadlines are set to the same date. This allows the Credentials Committee to review all applications in one time period.
- **It is critical for the success of your application that you respect the deadlines**.

For further information contact the Registrar:

Dr. Wayne Beckham. Registrar, CCPM
BC Cancer Agency, Vancouver Island Centre
2410 Lee Ave.
Victoria, British Columbia, V8R 6V5
Phone: (250) 519-5620 Fax: (250) 519-2024
wbeckham@bccancer.bc.ca

WESCAN 2006 ANNOUNCEMENT

Mark Your Calendars Now!

WESCAN 2006 will be held in Regina, SK
March 22 – March 25, 2006

Delta Regina
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WESCAN 2006 is a meeting for
Radiation Therapy Professionals in Western Canada.

For more information email: wescan2006@scf.sk.ca

Kidney stone analysis by x-ray coherent scatter: new insights for therapy?

By Melanie T. M. Davidson[1], Deidre L. Batchelar[2], Ian A. Cunningham[1]
[1]Robarts Research Institute and The University of Western Ontario, London, ON
[2]Department of Clinical Physics and Engineering, London Regional Cancer Program, London, ON

1. BACKGROUND: KIDNEY STONE ANALYSIS

Kidney stones are an increasingly common urological disorder [1], with a reported incidence of 13% in North America [2]. If left untreated, they can lead to infection due to stasis of the urine and eventually engender renal damage or failure. The chance of recurrence without treatment, after an initial stone episode, is approximately 50% within 5 to 7 years [3] and 70% within 20 years [4].

The success of medical therapies may depend on the type of stone. Knowledge of stone composition often dictates the course of treatment followed by the urologist [5,8]. It can shed some light on the nature of stone formation and identify metabolic abnormalities and underlying medical conditions [9]. Stone composition may thus provide the critical insights needed to devise targeted preventative measures. Laboratory techniques routinely used for a composition analysis of urinary calculi include x-ray diffraction (XRD) and infrared spectroscopy (IRS). Unfortunately, these techniques are destructive in nature and can consequently only report the chemical structure of small powdered stone fragments. As such, an accurate overall assessment of composition may only be achieved if several zones of the stone are sampled [10] since most stones vary in structure and composition from core to surface [11]. Detailed information of the structure of components within a stone may provide better indications of the causes of formation and subsequent growth.

Various radiographic imaging modalities have been explored for such a comprehensive analysis. However, these techniques lack the ability to fully characterize composition based solely on radiographic contrast. Clinical utility of a non-destructive technique for stone analysis requires the ability to provide structural information and to discriminate common stone components. Coherent scatter (CS) analysis, a novel technique based on the principles of XRD, satisfies these requirements. The use of a diagnostic x-ray source overcomes the need for powdered samples, essential in conventional XRD. This allows for a laboratory analysis of intact stones and is a potential candidate for *in situ* imaging. Unlike other radiographic imaging techniques, in which contrast is generated by x rays transmitted through the specimen, CS provides contrast based on the coherent scatter of x-rays, governed by interactions with the specimen at the atomic level. CS is formally described as the interaction between the electromagnetic wave of the x ray and that of bound electrons in the atom. The process, initiated when an x ray travels in the proximity of an atom, involves the uptake and re-radiation of the x ray's energy with no change in frequency. At diagnostic energies, the low-angle x-ray scatter (0-10°) is largely coherent and gives rise to material-specific diffraction patterns. Although CS generally accounts for less than 10% of the total interaction processes in diagnostic radiology, it comprises the bulk of forward-directed low-angle scatter. This information is extracted in the form of the CS cross-section, a measure of the probability of scatter at any particular angle. The differential CS cross-section under monoenergetic conditions is given by the product of the Thomson cross-section $[(r_e^2/2)\ (1+\cos^2\theta)]$, where r_e is the classical electron radius, and the square of the atomic form factor $F(x,Z)$:

$$\frac{d\sigma_{coh}}{d\Omega} = \frac{r_e^{\,2}}{2}\left(1+\cos^2\theta\right)F(x,Z) \qquad (1)$$

The form factor, $F(x,Z)$, describing interference between scatter from different electrons in the material [12], is dependent on both the atomic number Z and the momentum transfer argument $x = (1/\lambda)\sin(\theta/2)$, expressed in terms of the x ray wavelength λ, and the scattering angle θ. $F(x,Z)$ is therefore dependent on the x-ray energy. It is related to the Fourier transform of the electron charge distribution of the scatterer, characteristic of each material. CS cross-sections are thus representative of the molecular structure of each compound.

The primary goal of this work is to develop a viable laboratory technique, based on the coherent scatter of x rays, with the ability to examine urinary stone structure and composition simultaneously. To achieve this goal, three challenges needed to be overcome:

1. Angular broadening of scatter patterns due to our use of a polyenergetic diagnostic source
2. Non circularly-symmetric form factor of intact calculi due to a small number of oriented crystallites
3. Presence of multiple components within stones

This report describes the methods devised to address these challenges, to support the development of CS analysis as a means for identifying stone composition characteristics in clinical laboratory investigations.

2. CHARACTERIZING STONE COMPONENTS USING POLYENERGETIC X-RAYS

Since scatter patterns are dependent upon atomic structure as well as x-ray energy, monoenergetic beams, such as those produced by a copper (Cu) source in conventional diffractometry, are preferred. While common crystalline

(Continued on page 129)

Kidney Stone Analysis... (Continued from page 128)

components of urinary calculi are readily identifiable through their unique sharp-peaked scatter patterns in diffractometry, the low x-ray energy utilized (8 keV) provides insufficient penetration depth for most intact stones, restricting measurements to small powdered samples. Monoenergetic beams can also be produced by synchrotron beamlines at diagnostic energies, but such facilities are expensive and not likely accessible for routine stone analyses.

We offer a more practical alternative to allow the measurement of XRD from extended samples by making use of a diagnostic x-ray source. However, these sources are polyenergetic and the associated spectrum of energies incident on a sample will result in scattering within a finite scatter angular range. Thus, stone component scatter patterns acquired under polyenergetic conditions will be broadened with respect to those acquired under monoenergetic conditions. Practical stone analysis based on CS signals is first and foremost provisional on our ability to resolve its components' atomic structures with a polyenergetic x-ray source. The feasibility of doing so is explored in this section through a comparison of polyenergetic measurements with monoenergetic results obtained from diffractometry.

2.1 Monoenergetic and polyenergetic measurements

Monoenergetic XRD measurements were acquired on a diffractometer using a Cu-K_α x-ray source (8 keV). The stone component samples were placed in 0.5-mm diameter capillary tubes for scanning. The diffraction patterns were captured with an area detector and logged with the assistance of Linux-driven software.

A purpose-built diagnostic x-ray image intensifier (XRII)-based scanner, developed by our group [13, 14], is used to acquire polyenergetic CS images. The x rays from a diagnostic x-ray tube (Tungsten anode) are filtered by a 0.30-g/cm^2 gadolinium filter to reduce the spectral width of the beam, thus improving the angular resolution of the measured CS cross-sections. Following this filtration, the x rays are collimated to a 1-mm^2 pencil beam using a triple-aperture parallel-plate collimator. Low-angle scatter from the sample is monitored with a CsI XRII and a charge-coupled device (CCD) video camera. Detection of the transmitted primary beam is achieved using a Si-photodiode optically coupled through Pb glass to a Gd_2O_2S screen. This diode is placed directly on a 5-mm lead beamstop in front of the XRII, to subsequently absorb the transmitted beam and effectively prevent veiling glare. The signal from the CCD is digitized with a PC using a PCI frame grabber. The samples for this study were scanned for 5 seconds at 70-kVp and 200-mA with the CS scanner to acquire high-quality scatter patterns.

The monoenergetic XRD and polyenergetic CS patterns for the seven most common urinary stone components are displayed in Fig. 1. A broadening of diffraction rings is seen in CS patterns, as a result of the polyenergetic x-ray source used to make the measurements. The associated scatter cross-sections from XRD and CS analysis for these stone components are shown on the same scale for comparison in Fig. 2. The cross-sections under both monoenergetic and polyenergetic conditions exhibit characteristic peaks, making each a unique identifier of stone components. Although these polyenergetic cross-sections do not reveal as much structural detail as does XRD, the alignment of diffraction peaks indicates that similar atomic structure is probed and characterized with both techniques. Differences in characterizations at small angles (θ <~ 1.6°) are expected. The lead beamstop used in the CS experimental setup will absorb scatter at these angles due to its dimensions. Although cross-section features will be missed at small angles as a consequence [as seen in Fig. 2(b) and Fig. 2(c)], scatter occurring in this range is virtually indistinguishable from the primary transmitted beam and would be difficult to characterize.

2.2 Relating monoenergetic and polyenergetic measurements

The polyenergetic CS cross-section can be estimated as a linear superposition of the monoenergetic XRD cross-section measurement with a function derived from the polyenergetic x-ray spectrum [13]. Therefore, if both the monoenergetic XRD result and x-ray spectral shape are known, the linear superposition of these two functions allows the prediction of the measured scatter intensity (*dI*) per solid angle (*dΩ*) for a polyenergetic beam:

$$\frac{dI}{d\Omega}(\theta) = \int_{-\infty}^{\infty} g_1(\theta')g_2(\theta,\theta')d\theta' \qquad (2)$$

(Continued on page 130)

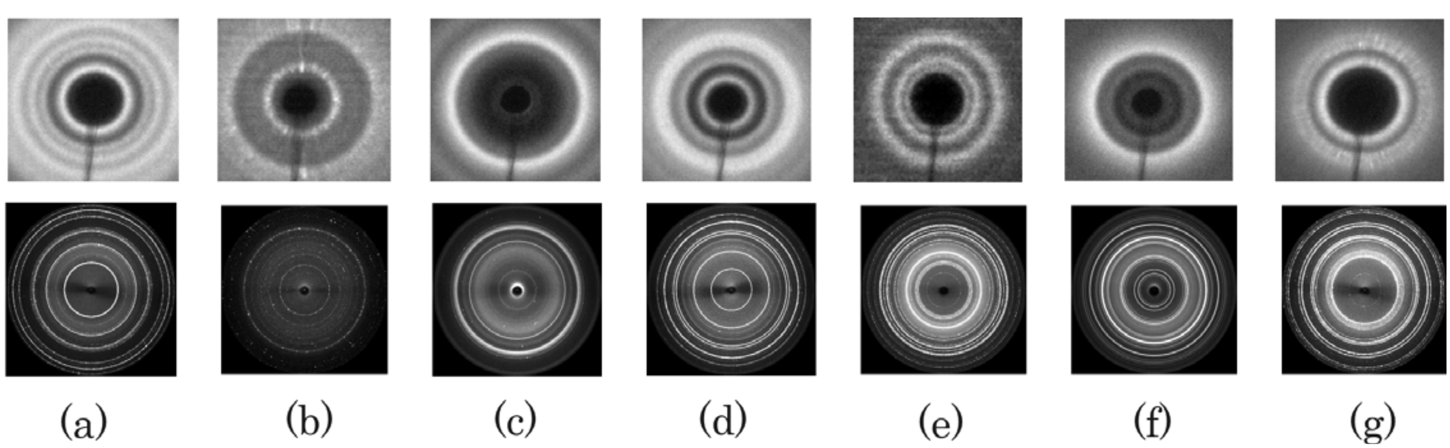

Figure 1: Scatter patterns from CS (top row) and XRD (bottom row) for the seven most common stone components (a) COM, (b) COD, (c) CP , (d) CPD, (e) MAP , (f) UA, (g) CYS.

Kidney Stone Analysis... (Continued from page 129)

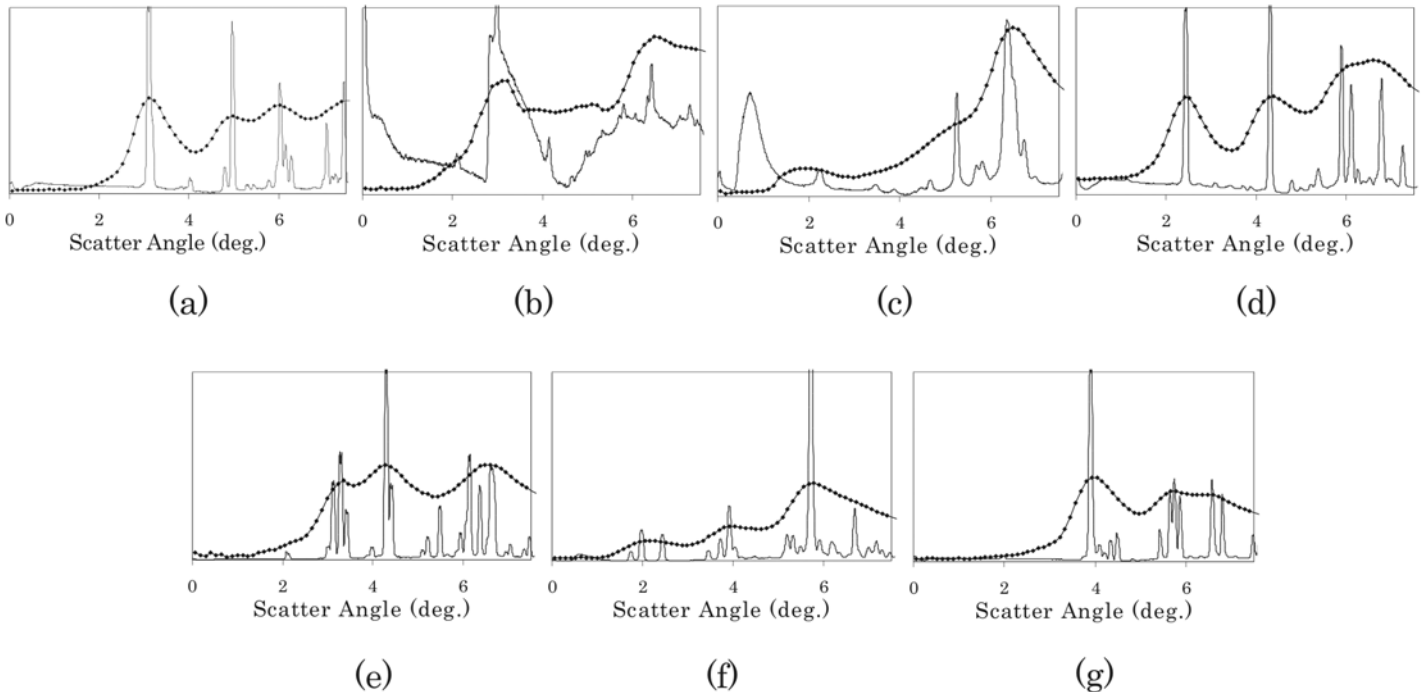

Figure 2: Measured scatter cross-sections from XRD shown in the solid line and CS shown in the line intercepted by dots, for the seven most common stone components (a) COM, (b) COD, (c) CP , (d) CPD, (e) MAP , (f) UA, (g) CYS.

where $g_1(\theta')$ is the monoenergetic differential CS cross-section ($d\sigma_{coh}(\theta)/d\Omega$)) given in Eq. 1, weighted by a trigonometric factor $T(\theta)$, arising from the geometrical considerations of CS interactions [13]. The function $g_2(\theta,\theta')$ is derived from the normalized polyenergetic x-ray spectrum interacting in the detector ($dN_I(E)/dE$) as a function of scatter angle θ inversely weighted by $T(\theta)$. This interacting angular spectrum, shown in Fig. 3, is derived from the x-ray energy spectrum interacting in the detector, calculated using the method of Tucker *et al.* [15].

The calculation of the linear superposition given in Eq. 2, performed using MATLAB, yields a prediction of the polyenergetic scatter distributions per unit solid angle. These results are shown on the same axes as the associated CS measurement in Fig. 4. The agreement between the theoretical and experimental polyenergetic results indicate that the diagnostic x-ray source is the primary contributor to angular broadening of CS cross-sections. Although key scatter features exhibit striking similarities, residual angular uncertainty remains in predicted polyenergetic cross-sections. A number of factors including object size, x-ray beam width, geometric XRII distortions, and width of annular rings used to generate the CS cross-section (in which scatter signal is integrated) contribute to these discrepancies. These effects are discussed in length by Westmore *et al.* [13] and are shown to be small in comparison to the x-ray source spectral width; they are thus not discussed here.

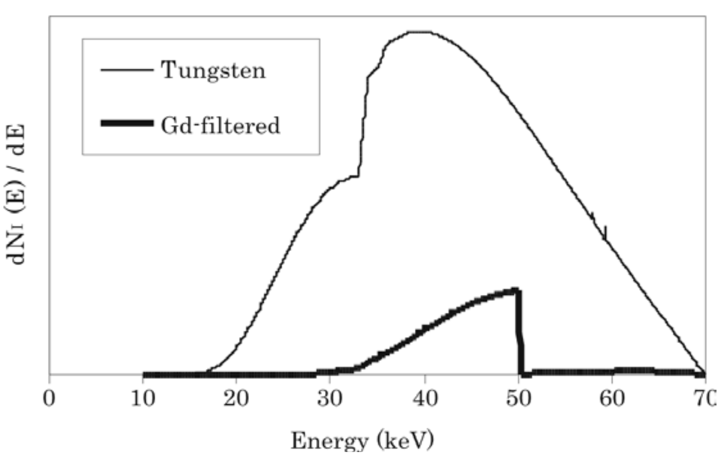

Figure 3: Tungsten x-ray spectrum and Gd-filtered tungsten spectrum, interacting in the detector. The Gd-filtered interacting x-ray spectrum used experimentally for CS measurements is used to calculate $g_2(\theta)$, introduced in Eq. 2.

The current section offers theoretical and experimental evidence demonstrating that stone component CS characteristics depend upon atomic structure, through comparisons with XRD analysis. Correspondence with XRD analysis proves that CS from polyenergetic x rays can also be used to depict urinary stone composition.

3. CS IMAGING OF INTACT CALCULI WITH CRYSTALLITES

Having established the ability of CS analysis to characterize stone components, we optimistically mounted an intact stone in the beam for analysis. Much to our dismay, we noticed the appearance of bright spots in CS patterns from intact stones, indicative of some preferentially-oriented crystallites. While randomly-oriented crystallites in powder samples produce azimuthally symmetric scatter patterns due to their isotropic

(Continued on page 131)

Kidney Stone Analysis... (Continued from page 130)

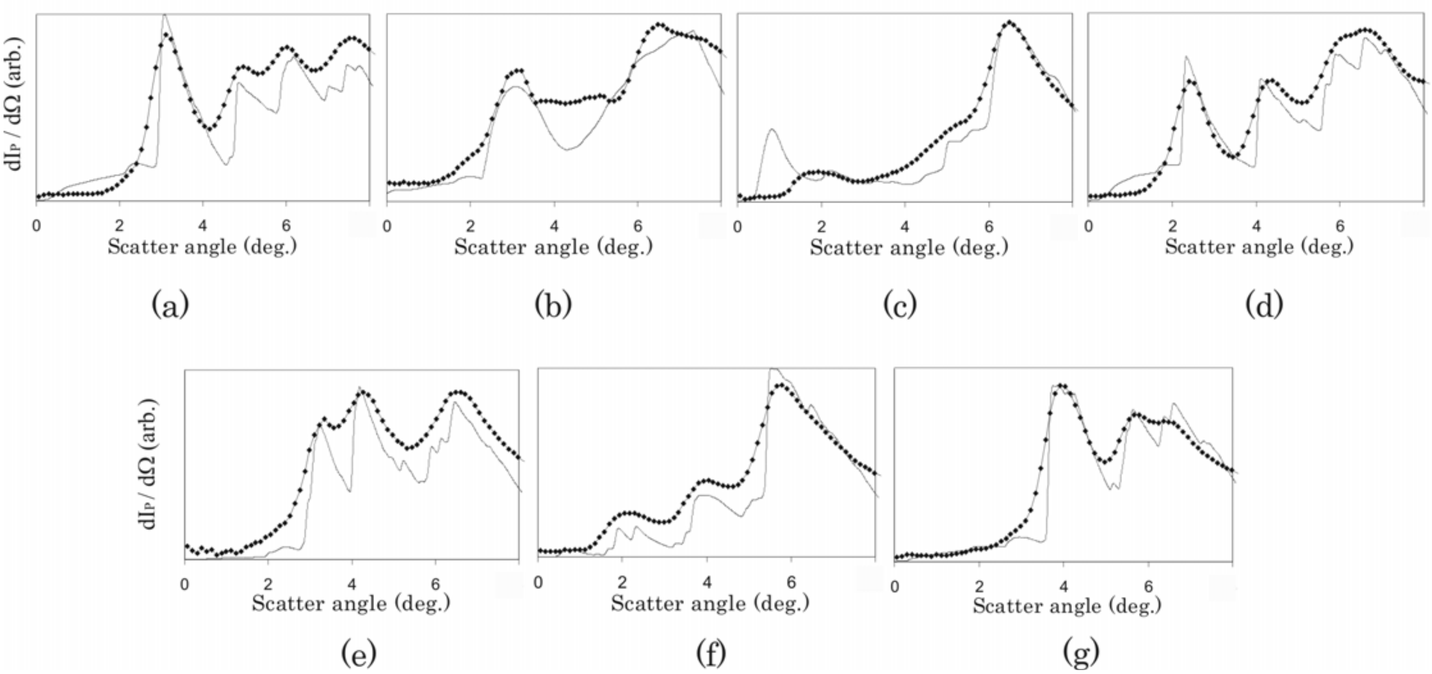

Figure 4: Measured (dotted line) and predicted (solid line) polyenergetic scatter cross-sections ($dI/d\theta$) for the seven most common stone components (a) COM, (b) COD, (c) CP , (d) CPD, (e) MAP , (f) UA, (g) CYS.

form factors, single crystals scatter x rays preferentially in particular directions depending on the crystal structure and angle of incidence of the x-ray beam. Biologically mineralized tissues like kidney stones are well recognized for their unusual crystal morphologies and hierarchically organized composite structures. Polycrystalline aggregates readily form randomly-oriented well-ordered crystals within a matrix of macromolecules [17]. These oriented crystallites act much like single crystals and scatter x-rays in particular directions due to a non-spherically-symmetric electron charge distribution. The added dependence on azimuthal angle in the form factor results in the appearance of bright spots in the CS pattern. As a consequence, CS patterns from corresponding components in pure powdered form and within urinary calculi may not be identical. The presence or extinction of bright diffraction spots will, in most instances, enhance or de-emphasize the prominence of diffraction peaks in the CS cross-section. Thus, a composition analysis based on comparing CS measurements from urinary calculi to a library of CS signatures from powdered chemicals may lead to some uncertainties or errors.

The presence of oriented crystallites in intact stones renders the identification of such materials more difficult than amorphous types and presented us with our second challenge to stone analysis. In this section, we explore CS from oriented crystallites and demonstrate how we can exploit its features to eliminate the problem it poses to a materials-analysis of intact stones [18].

3.1 Features of CS from oriented crystallites

The first step to tackling this problem is to understand how CS from such oriented crystallites behaves. As in the case of single crystals, the appearance and position of bright spots depends on the relative direction of crystallites with respect to the interrogating x-ray beam. The random orientation of these crystallites within stones make it such that if the sample is exposed through a series of projection angles, the diffraction spots will appear to rotate around the central beam axis (azimuthally) as a function of projection angle. Therefore, not only does the projection angle at which the specimen is exposed directly affect the location of bright diffraction spots, it does so in a predictable way [19].

This feature suggests that a technique in which the sample is exposed through multiple projection angles, such as a tomographic acquisition, may allow a thorough sampling of crystallite orientations, and thus allow for their characterization.

3.2 Tomographic measurements of the CS cross-section

The theory behind this method has been described previously [14,20] for amorphous materials, and is based on a method described by Harding *et al.* [21]. The method uses first-generation computed tomography (CT) geometry in which a CS pattern is acquired for each projection ray. CT reconstruction using filtered backprojection allows the reconstruction of one CS pattern per pixel. However, the suitability of this method has not been explored for non-isotropic CS patterns, such as those seen in calculi. The added dependence of CS characteristics on the azimuthal angle (dictating the location of bright spots) required further investigation.

Conventionally (in transmission-based x-ray measurements), CT reconstruction using filtered backprojection produces a reconstructed image $f(x,y)$, a summation of filtered projections $g(x\cos\phi + y\sin\phi)$ from all projection angles, ϕ, passing through

(Continued on page 132)

Kidney Stone Analysis... (Continued from page 131)

each point *(x,y)* [22]:

$$f(x,y)=\int_0^{\pi} g(x\cos\phi+y\sin\phi)d\phi \qquad (3)$$

This feature allows one to map the average linear attenuation coefficient within each pixel in the CT slice.

Unlike conventional CT, where a single image is produced from each projection set, coherent-scatter CT (CSCT) results in a series of images, indicated by the index *i*, over the range of scatter angles θ found in the CS cross-section (i.e. each projection ray will contribute θ_i values for reconstruction, dependent on CS interactions):

$$f(x,y,\theta_i)=\int_0^{\pi} g(x\cos\phi+y\sin\phi,\theta_i)d\phi \qquad (4)$$

The reconstructed image for each CS cross-section angular value θ_i represents the summation of all the filtered projections for this value in each image pixel (Eq. 4). Consequently, apparent contributions from preferred-orientation crystal scatter that might otherwise skew the CS cross-section peak intensities will be averaged over projection angles, and equivalently, azimuthal angles. The resulting CS cross-section is thus equal to the powder cross-section if this average represents a true average over all possible crystallite orientations in the sample. The uniformity of the diffraction patterns post-reconstruction hinges on the assumption that a sufficient number of crystal orientations was interrogated by the incident x-ray beam. If this sampling is inadequate, differences to the powder cross-section will result.

3.3 Crystallite CS cross-sections reconstruction

The theoretical description of the averaging of bright spot contributions through filtered backprojection CT in section *3.2* is validated using an aluminium (Al) rod phantom. Much like kidney stones, the CS pattern from a solid polycrystalline Al rod will exhibit bright diffraction spots, which are absent in the symmetric, ring-like Al powder CS pattern (Fig. 5). In contrast to the intact stone specimen [Fig. 5(c)], however, the Al rod pattern is dominated by bright spots and does not exhibit azimuthally-symmetric rings [Fig. 5(b)], demonstrating a higher degree of preferred crystallite orientation. The Al rod was chosen for this reason, to demonstrate an extreme case of the impact of CT reconstruction on oriented crystallite CS cross-sections.

The proof-of-concept phantom consists of a 0.5-cm diameter Al rod placed in the center of a 2-cm diameter water-filled polymethyl methacrylate (PMMA) cylinder. CS measurements of this phantom were acquired for a full CT data set consisting of 80 scatter patterns acquired at 70-kVp and 200-mA during a 2.7 second exposure (6.7- mAs per frame) for each of the 90 angular views over 180°. Prior to reconstruction, the scatter patterns for each projection were segmented in ~100 concentric annuli (each indexed by the subscript *i*) with corresponding scatter angle values.

A demonstration of the variability of the CS cross-section with CT projection angle ϕ is shown in Fig. 6 for CS measurements of the Al rod scanned in air. Although a general trend can be seen in the CS cross-section for three different representative projection angles, some differences exist in peak locations and intensities. The observed differences are a direct consequence of the variability of preferred-orientation crystal contributions to the diffraction signatures as a function of projection angle. As such diffraction spots are not present in the powdered Al reference diffraction pattern, this may lead to mis-identification of the Al component in CS material-specific analysis, especially in the presence of other materials.

The averaging effects of reconstruction are examined through a comparison of the reconstructed CS cross-section angular values (θ_i) in an image pixel containing Al with the effective average of all projection cross-sections (over 90 angular views) from the Al rod scanned in air under similar x-ray settings. The powdered Al cross-section is also acquired at 70-kVp and 200-mA during a 4 second exposure for comparison. These results are summarized in Fig. 7. The reconstructed CS cross-section of an Al-containing pixel in the phantom closely resembles the average CS cross-section and exhibits similar features to the powder cross-section. Differences remaining between the reconstructed Al rod and powder cross-sections can be attributed to the abundance of ordered crystallites in the rod. While the few crystallites within urinary stones are deposited in random

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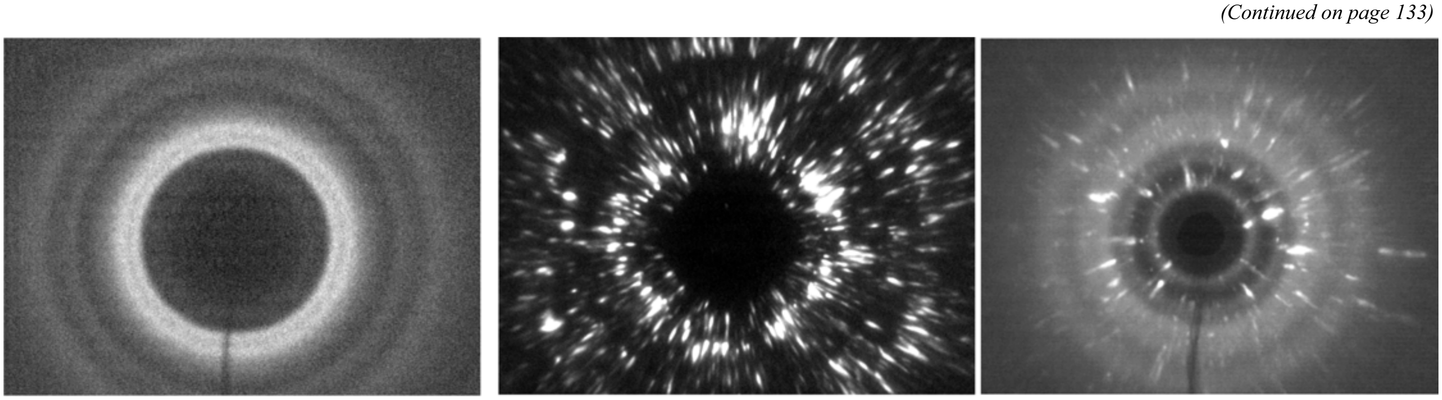

(a) (b) (c)

Figure 5: CS patterns for (a) Al powder and (b) Al rod (c) kidney stone. The rod has a crystalline CS pattern that is averaged over all angles in the powdered sample. The stone CS pattern shows both amorphous (circularly symmetric) and crystalline diffraction characteristics. The transmitted primary beam at the centre of the scatter pattern is intercepted by a beamstop in each pattern.

Kidney Stone Analysis... (Continued from page 132)

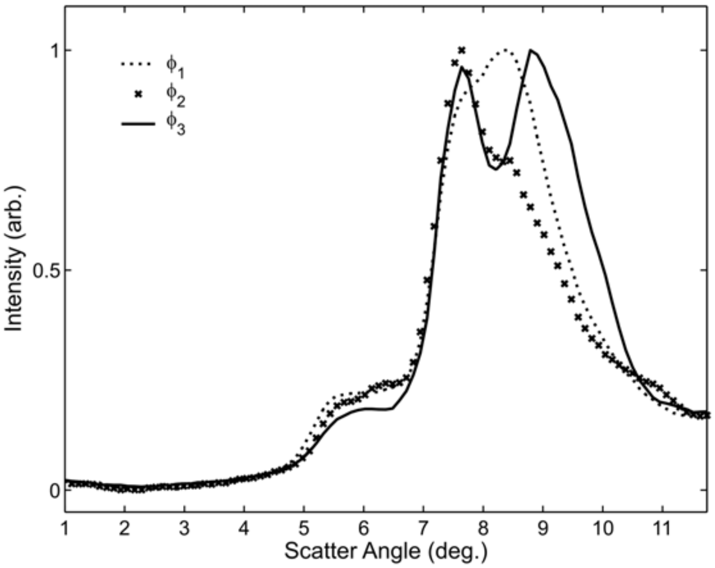

Figure 6: CS cross-sections for three different CT projection angular views of an Al rod.

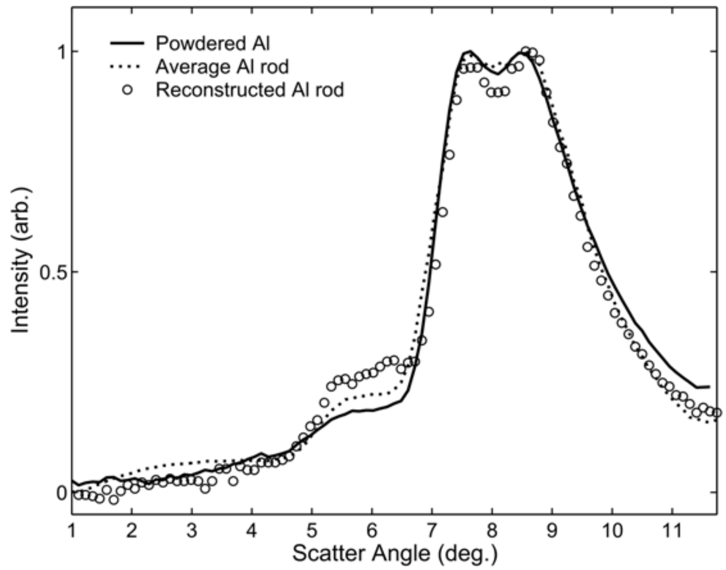

Figure 7: Reconstructed CS cross-section of Al-containing pixel in phantom image and average CS cross-section of Al rod in air (over multiple projection angular views). The Al chemical powder CS cross-section is shown for comparison on the same axes.

orientations, the many crystallites within the Al rod will exhibit considerably more structured orientation. Despite this feature, CT reconstruction eliminated most of the preferred-orientation crystal contributions in its cross-section for a modest number of angular views. Due to the large number of oriented crystallites in the Al rod, a larger number of angular views during CSCT acquisition would likely enhance agreement with the Al powder cross-section by ensuring a more adequate sampling of all crystallite orientations.

3.4 Composition analysis of crystalline materials using CSCT

The material-specific maps for the Al phantom are displayed in Fig. 8. Each phantom component exhibits the expected spatial distribution. The Al rod is found in the center portion of the phantom surrounded by water, and encapsulated within the PMMA cylinder. The reconstructed CS cross-sections of the Al-containing pixels within the phantom allowed for a direct comparison with a powdered Al basis function. This is reflected in the well-defined Al-specific image [Fig. 8(d)].

Although measurements of the CS cross-section can be made in both radiographic and tomographic modes, the preferred-orientation polycrystalline nature of kidney stones promotes the tomographic acquisition of CS measurements. The feasibility of the CSCT method for these types of materials has been validated using an Al rod phantom. A computed tomographic reconstruction of CS measurements effectively eliminated the majority of preferred-orientation crystal contributions to the Al diffraction patterns. Thus, exposing the sample through a series of projection angles smears the diffraction spots azimuthally and generates much more uniform diffraction rings. By averaging CS patterns in this way, CT reconstruction using filtered backprojection allows for both the extraction of composition information as well as the examination of the spatial arrangement of each component, whether or not it exhibits some level of preferred orientation.

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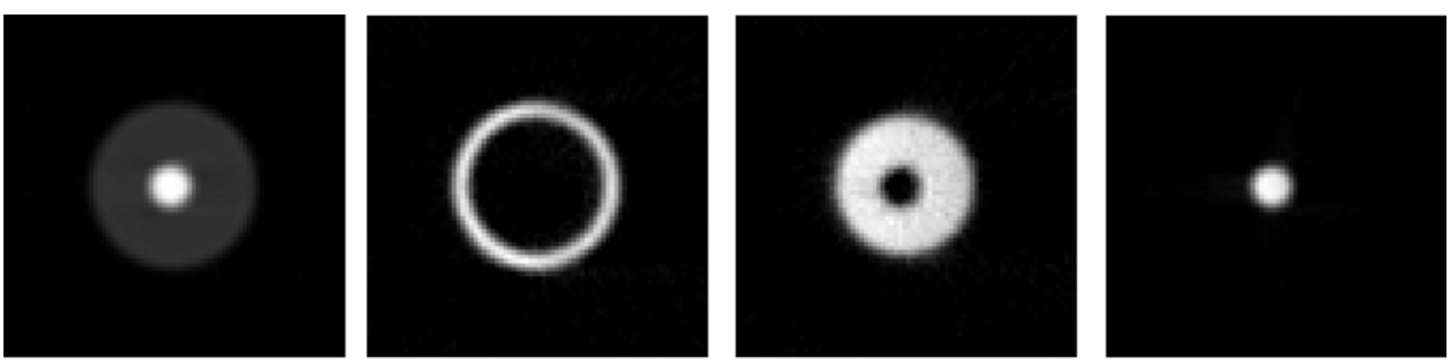
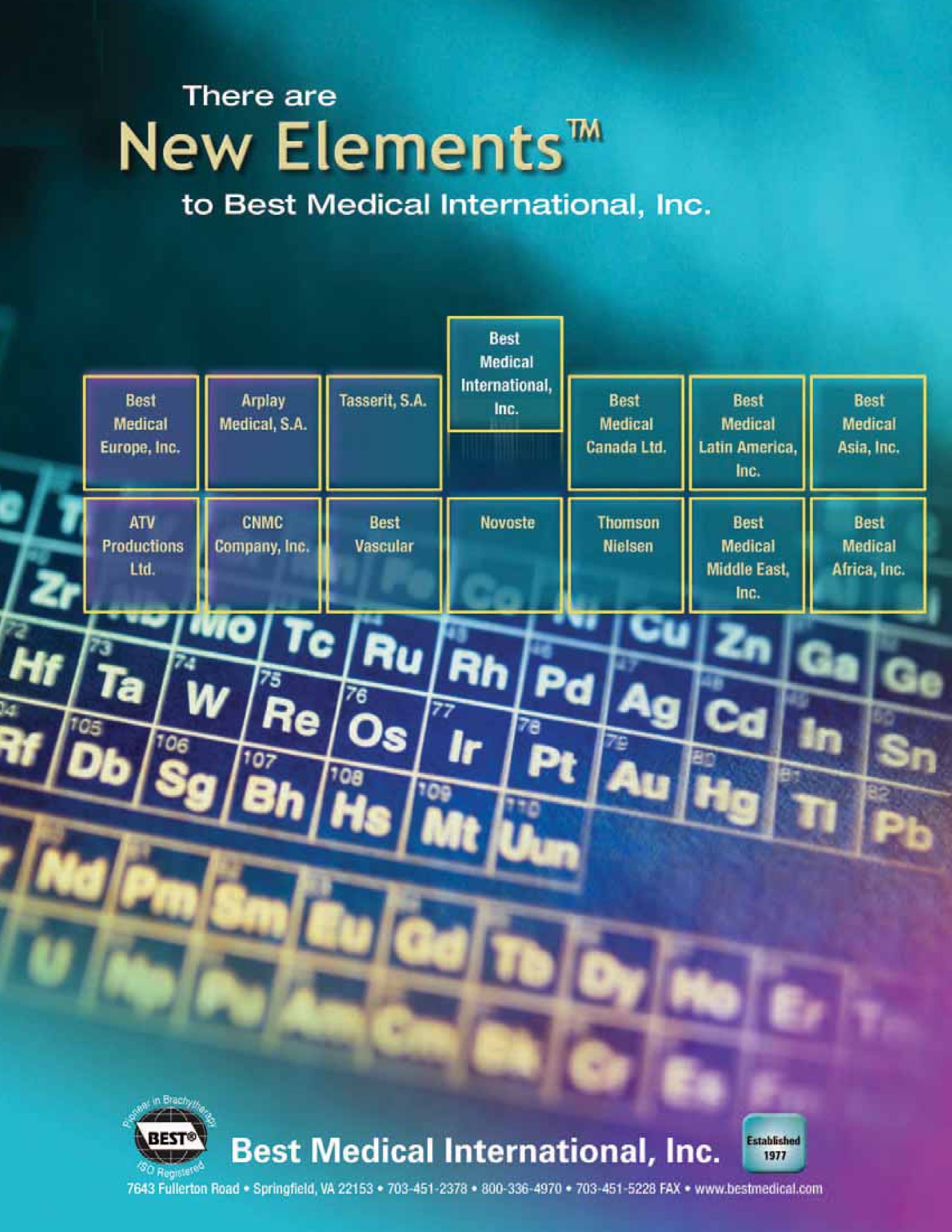


(a) (b) (c) (d)

Figure 8: CSCT material-specific maps of Al rod suspended in a water-filled PMMA cylinder phantom: (a) attenuation map (Hounsfield units), (b) PMMA, (c) water, (d) Al rod.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Kidney Stone Analysis… (Continued from page 133)

4. IMAGING STONES OF MIXED COMPOSITION USING CS

With the theory in place to characterize stone components in both powdered and intact samples, our next objective was to investigate the possibility of mapping them tomographically. Although some urinary calculi contain only one component, most are of "mixed" composition, showing variations in chemical makeup from the core to the surface. A non-destructive stone analysis technique must accordingly have the ability to resolve distributions of key stone components simultaneously.

Fortunately, x rays scattered from different tissues do not interfere with each other, making composite CS cross-sections linear combinations its component cross-sections. This feature allows us to use the CS cross-sections of chemically pure stone materials as a basis set to extract composition from the unknown. To do so, basis functions are fit to reconstructed CS cross-sections in stone images using a non-negative least-squares (NNLS) regression [23]. On a pixel-by-pixel basis, NNLS yields the proportions of each constituent material.

The reference patterns were acquired for the seven most common urinary stone components: calcium oxalate monohydrate (COM), calcium oxalate dihydrate (COD), calcium phosphate (CP), calcium phosphate dihydrate (CPD), magnesium ammonium phosphate (MAP), uric acid (UA), and cystine (CYS). Pure chemical samples were used for all components except calcium oxalate dihydrate (COD), which is unstable and not readily available in pure chemical form. The COD sample used in CS analysis came from a stone identified as pure COD (by IRS analysis). A fragment from this stone was powdered, well-mixed, and multiple samples from this powder further validated to only contain COD by IRS analysis. The powder was then scanned by CS to provide the basis function for the COD component in the materials-analysis [24].

In this section, we show that common stone components and their relative distributions can be characterized non-destructively using CS analysis in a phantom study. Intact stones are also characterized by CS and composition maps verified by IRS from powdered regions-of-interest within the stones.

4.1 Potential of CSCT to identify stone component distributions

Tomographic images of the CS properties of a stone-mimicking phantom, containing known distributions of common stone components, are used to demonstrate the potential of CS analysis [15]. Eight 0.5-cm cylindrical voids were created in a 2.5-cm solid polymethyl methacrylate (PMMA) cylinder. Seven of the voids were filled with the powdered pure chemical stone components (COM, COD, CP, CPD, MAP, UA, CYS) and the other with a mixture of COM and CP, to qualitatively demonstrate identification of areas of mixed composition. The phantom was continuously translated during a 2.4s exposure (70 kVp, 200 mA). Diffraction patterns were acquired at 70 positions in each of the 90 angular views. CSCT images were reconstructed using filtered backprojection and component-specific images generated with the use of our chemical reference library through NNLS.

The material-specific maps of the stone-mimicking phantom in Fig. 9, generated from CS signals, demonstrate the spatial

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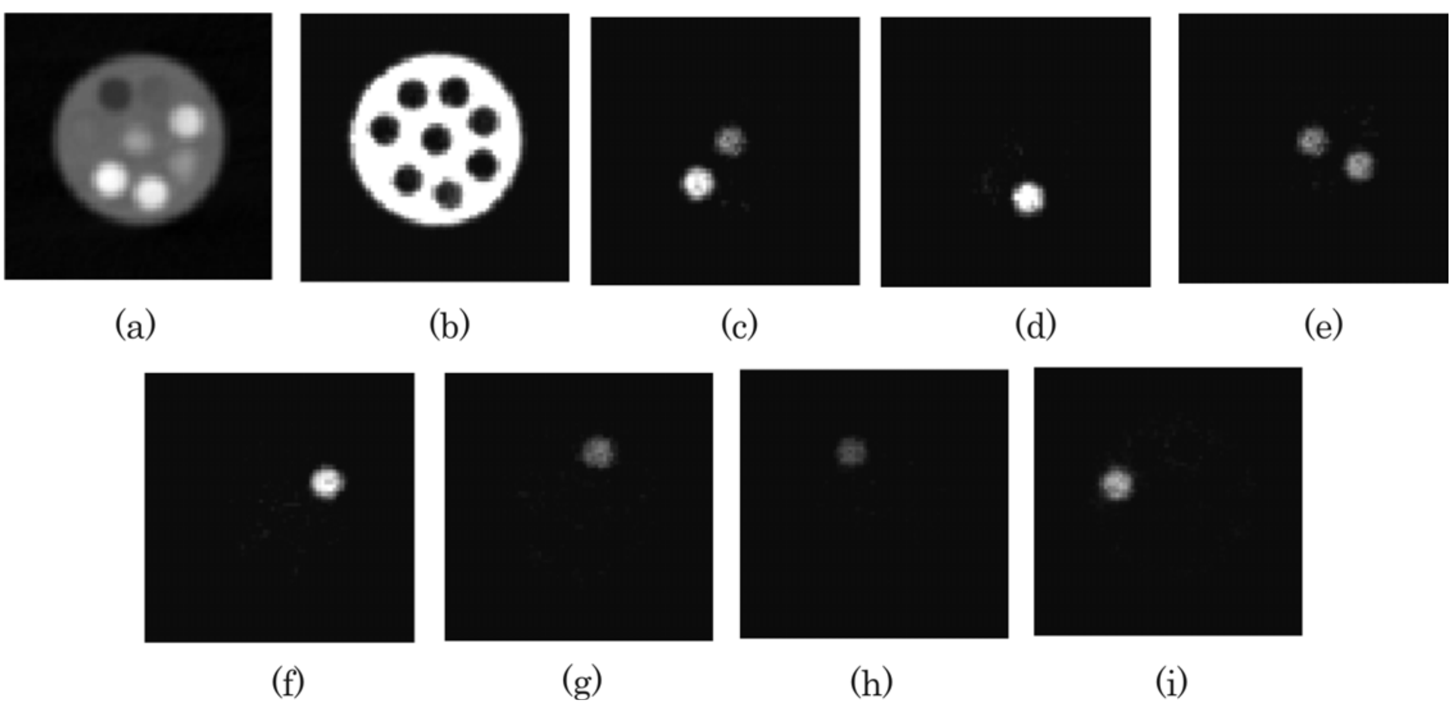

Figure 9: CSCT composition maps of stone-mimicking phantom, showing the ability of CS imaging to identify common stone components in pure form, and in mixtures non-destructively. (a) attenuation map (Hounsfield units), (b) PMMA, (c) COM, (d) COD, (e) CP , (f) CPD, (g) MAP , (h) UA, (i) CYS.

Kidney Stone Analysis… (Continued from page 137)

arrangement of its constituents. This demonstrates that each component can be accurately separated in the presence of others. Identification of mixtures is also possible. The mixture of COM / CP in the center portion of the phantom was recognized by CSCT composition analysis and shown qualitatively in Fig. 9(c) and Fig. 9(e).

4.2 Imaging intact urinary calculi

CS signals were acquired tomographically from intact urinary calculi. A subset of five calculi of mixed composition were chosen for demonstration purposes, as all seven primary stone components were identified within these specimens [25]. For each two-dimensional slice, 80 scatter patterns were acquired as the intact stone was translated through the x-ray beam during a 2.7-s exposure at 70-kVp and 200-mA for each of the 90 angular views. CSCT images were reconstructed, and composition maps produced using the chemical reference library. For each stone, two zones were sampled (powdered) for IRS analysis characterizations. IRS composition results were then compared to CS results in these regions-of-interest. A sample representing bulk stone composition was chosen by the IRS technician (as routinely done in clinical calculus analyses) and scanned independently by IRS.

Fig. 10 shows the composition maps derived from CS patterns for five stones of mixed composition. Although each stone was tested for the seven common stone components, only those identified to be present are displayed. Each set of composition maps illustrates the structural arrangement of components through a cross-sectional view of all five stones (I-V). Although a single tomographic slice for each stone sample is shown here, CS images can be acquired in three dimensions. The two regions of each stone that were subsequently powdered for characterization with IRS analysis are indicated in the stone photographs. These were chosen to represent areas of differing composition within the sample, as identified by CS analysis.

Components identified in these regions via CS analysis were also reported by IRS. Each of the seven common stone components was successfully identified via CS analysis. It is not surprising that the component percentages do not exactly match, as IRS measurements were done on a small subset of the prepared powdered samples from each region. The independent identification of similar compounds in each stone region by IRS validates the CS composition maps and provides evidentiary support that CS can be used as a basis for characterizing stone component distributions. Results from the analysis of bulk composition by IRS, as used clinically, are also included on the bar graphs for each stone sample. While these measurements generally identified the primary stone components, some secondary components were missed. As such, although IRS can identify stone components, composition assessment hinges on the choice of sample and its preparation. This is of concern when treatment pathways are currently chosen based on such compositional analyses.

In this section, the non-destructive potential of CS from diagnostic x rays to characterize multiple stone components in intact specimens was demonstrated. The examination of a phantom and intact calculi by CS analysis revealed the presence of minerals and their spatial arrangement in composition image maps. IRS analysis of selected regions of interest within stones confirmed the presence of minerals and thus the accuracy of CS analysis. These CS composition maps also demonstrate that misrepresentations or oversights can occur due to inadequate sampling in IRS characterizations. The tomographic analysis of CS signals provides direct information about the composition of intact samples, while also contributing structural information.

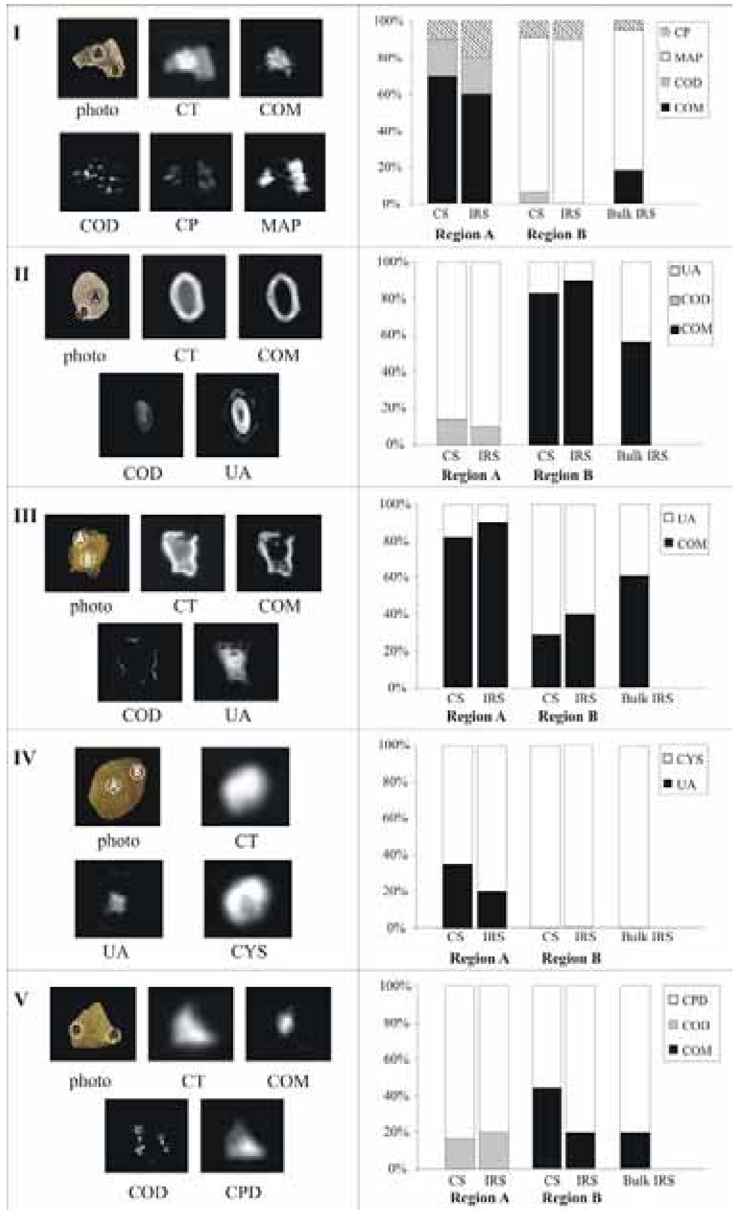

Figure 10: CS composition maps and associated composition analyses by IRS for five urinary calculi (I-V). Two samples were taken from each stone from regions indicated in the photographs by A and B, powdered and characterized by IRS. Bar graphs indicate the composition analysis results from both CS and IRS for these two regions. An assessment of bulk composition by IRS, as routinely done clinically, is also shown on the same graph for comparison.

(Continued on page 139)

Kidney Stone Analysis… (Continued from page 138)

5. CONCLUSIONS

A method of obtaining composition maps within intact urinary stones from x-ray coherent scatter was described in this report. In particular, CT reconstruction of CS signals is shown to allow for an accurate characterization of the preferentially-oriented polycrystalline constituents found in urinary calculi. CS can separate primary stone components in chemical samples and in tomographic slices to show structure and composition. This can provide substantially more clinically-relevant information than currently available from laboratory techniques such as IRS. Current x-ray transmission techniques are unable to provide adequate information on composition (especially for stones of mixed composition) due to a lack of differentiation in radiographic characteristics. CS-based characterizations are unaffected by the presence of more than one component thus allowing the analysis of both pure and mixed composition stones. Consequently, CSCT may provide more diagnostically-relevant information to the urologist than existing techniques. The material-specific results presented here support the development of CS analysis as a means for identifying stone composition both at the laboratory level (for post-operative analyses and explorations of therapy responses) and possibly for *in situ* composition assessments. Such characterizations may have the potential to elicit changes in the course of treatment or the preventative measures against recurrence for urinary stones.

Acknowledgements

This article contains results presented in the Ph.D. thesis of M. T.M. Davidson [26] and published in Phys. Med. Biol. [16,18] . The authors would like to thank Sujeevan Velupillai for his valued technical assistance with this work. The clinical expertise provided by Drs. Ben Chew and John Denstedt, from the Division of Urology at the University of Western Ontario is also gratefully acknowledged.

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Across Canada

Allan Blair Cancer Centre
Regina, SK
Submitted by Craig Beckett

The Allan Blair Cancer Centre is one of two cancer care facilities operated by the Saskatchewan Cancer Agency, a provincial government organization mandated to "deliver effective and sustainable research, education, prevention, early detection, treatment and supportive care programs for the control of cancer in Saskatchewan." The Allan Blair Cancer Centre is located within the Pasqua Hospital in Regina, Saskatchewan. A Medical Physics group provides clinical support to the Allan Blair's radiotherapy operation. The group consists of 4 physicists, 1 physics assistant, 1 programmer/analyst, 2 electronic technicians, 2 mould room technicians, and 1 instrument maker.

The radiotherapy department sees about 1200 radiotherapy new patient referrals annually. We operate a conventional simulator, a CT scanner, a cobalt unit, 3 linear accelerators, an orthovoltage unit, and a HDR brachytherapy afterloader. We have a fully equipped machine shop including a CNC mill for compensators and general millwork. Treatment planning is performed with Pinnacle and Plato systems. Recently we have benefited from the Agency wide implementation of Varis. The Saskatchewan Cancer Agency is working diligently towards the goal of an electronic medical record for cancer patients.

As may be the case across Canada, capital and operational funding at the Allan Blair has not kept pace with developments in the field of radiotherapy. Nevertheless, recent capital funding has been significant. Recent acquisitions include a Siemens CT scanner (2000), a Siemens Primus accelerator (2000), a Varian 21EX accelerator (2004), an onboard Imager (OBI) upgrade (2005), and the first Gulmay orthovoltage unit installed in Western Canada(2005).

The Allan Blair employs CT planning for sites such as head and neck, lung and prostate. We plan to extend CT planning to the breast site in the coming year. Regarding program development, our main focus at this time is provision of intensity modulated radiotherapy (IMRT) for head and neck sites which is planned for late 2005. Other programs include HDR brachytherapy for sites such as cervix, endometrium, esophagus, lung, and prostate.

The Medical Physics group primarily provides a clinical service; however, the academic and research interests of the physicists are occasionally indulged. Each physicist has an appointment with the College of Medicine, University of Saskatchewan. Over the years, we have collaborated with colleagues in the departments of physics and computer science at the University of Regina. We have supervised two M.Sc. graduates. We are funded to hire summer students and this has allowed us to pursue some research and development projects.

With major equipment installations and the implementation of IMRT for head and neck, the coming year promises to be a very busy one at the Allan Blair Cancer Centre. In addition, we will host WESCAN2006 at the Delta Regina, March 22-26, 2006. Plan to attend this excellent meeting. You may also wish to consider attending COMP2006, hosted by our sister clinic, the Saskatoon Cancer Centre.

Physicists at the Allan Blair Cancer Centre (left to right) – Bill Ziegler, Matthew Schmid, Craig Beckett, Peter Dickof

(Continued on page 141)

ACROSS CANADA… (Continued from page 140)

Regional Cancer Program of the Hôpital régional de Sudbury Regional Hospital Sudbury, ON
Submitted by Konrad Leszczynski

The Regional Cancer Program of the HRSRH, formerly the Northeastern Ontario Regional Cancer Centre (NEORCC), will celebrate its 15-th anniversary this November. It is therefore appropriate to have a brief look at the history of our department.

Prehistory

In prehistoric times, the site of the radiotherapy facility in Sudbury was uninhabited; in fact a large part of it was solid rock, so typical of this locale. Various species of mammals could be seen roaming around, including *Alces alces* (moose), *Ursus americanus* (black bear), and towards the end of the prehistoric era, some *Homo sapiens politicus* (local politicians) who were trying to establish the site as a new cancer centre.

From ancient to modern times

With the plans for building the NEORCC radiation therapy facility approaching completion, the first *Physicus medicus* was noted to take permanent habitat in Sudbury. It was the well-known Peter Dunscombe, who after leading the great eastern migration from Winnipeg, began the establishment of a medical physics department. Peter, with his undeniable charisma, was able to attract (some may say also to corrupt) young and promising physicists from near and far. By September of 1991, Sudbury had a complement of five *Physici medici*: Peter Dunscombe, Terry Chu, Peter McGhee, Tai Yeung and your present chronicler. At that time, the major radiation therapy equipment included three linear accelerators, a Cobalt unit, an orthovoltage X-ray machine and a simulator. A few years later a high dose rate (HDR) brachytherapy unit was added to the lineup. The second half of the first decade of our department saw some significant personnel changes: Peter McGhee took over the post of the *Physicus medicus principalis* in Northwestern Ontario (Thunder Bay) and Terry Chu migrated south of the 49-th parallel to seek his fame and fortune. To at least partially compensate for these losses, Xiaofang Wang, a McGill alumnus, was recruited from Newfoundland. By the end of the 90's, plans for a major capital expansion and total equipment replacement were under way. Unbeknownst to us, realization of these plans was going to be only part of some major changes in the first years of the new century.

Beginning of the 21-st century

The new century started on a good note with the acquisition of Daniel Provost – the first and the only, so far, Canadian-born (or Quebecois-born, for those who want to make the distinction) *Physicus medicus* in Sudbury. Unfortunately, soon after, in September 2001, we lost our original *Physicus medicus principalis*, who set off on western migration to Calgary where he can be found today. After Peter's departure, our staffing trials confirmed what administration was telling us - that he was simply irreplaceable. It was only a few weeks ago that we finally welcomed Shuying Wan who arrived from Kingston to become our fifth *Physicus medicus*. Meanwhile, the planned capital expansion and equipment replacement occurred at a frantic pace. First, in 2001 two new Primus accelerators were installed in two newly constructed radiotherapy vaults. Over the following three years the three original linacs were replaced with Primuses to increase the current complement to five. Another major piece of new equipment – a CT scanner/simulator was installed and commissioned for clinical use last Fall. Currently we are introducing a new treatment planning system (Pinnacle) clinically to replace the venerable TMS-Helax. In the very near future we will be replacing our HDR system and the orthovoltage X-ray unit. Plans are also in place for implementation of a permanent implant prostate brachytherapy program.

During these very busy times of new equipment and technique commissioning, we have been trying to also keep focused on research and academic activities. We continue our involvement in graduate teaching and thesis supervision through the affiliation with Laurentian University. Active areas of medical physics research in Sudbury include image-guided and intensity modulated radiation therapy, clinical applications of Monte Carlo dose calculations, technical and organizational aspects of quality management and clinical radiobiology.

Historia magistra vitae… Perhaps the most valuable thing that archaeological study of the rock has taught me is the importance of people – my colleagues and coworkers. With their experience, competence and strong pioneering spirit of cooperation, a department can successfully weather many difficult periods. The fossilized record will show that neither black flies, cold, nor integration of services will impede progress of *Physica Medica.*

(Continued on page 142)

ACROSS CANADA… (Continued from page 141)

CancerCare MANITOBA

CancerCare Manitoba, Winnipeg, MB
Submitted by Stephen Pistorius, Boyd McCurdy, Dan Rickey and Ingvar Fife

The Division of Medical Physics at CancerCare Manitoba (CCMB) is distinguished by its five separate yet interdependent service departments which cover all aspects of provincial cancer control. Medical Devices, Nuclear Electronics, Radiation Protection, Imaging Physics, and Radiotherapy Physics, each play a unique and important role in supporting the broad provincial cancer control mandate of CancerCare Manitoba. Medical Physics staff work together with other services within CancerCare Manitoba as well as with external organizations such as the University of Manitoba and the Winnipeg Regional Health Authority (WRHA) to provide support to the provincial Radiation Therapy, Diagnostic Imaging, Radiation Protection and Radiosurgical Programs. We have an active Medical Physics Research Program and support both undergraduate and graduate training programs at the University of Manitoba as well as in CancerCare Manitoba's School of Radiotherapy.

Clinical Engineering Group:
Nuclear Electronics has ten trained technologists providing full support for equipment maintenance and servicing to the CCMB Radiotherapy, Breast Screening and Medical Oncology Programs and to the WRHA Nuclear Medicine Program. The six staff within our ISO 9001 (and FDA) accredited Medical Devices Service manufacture high quality medical devices both for our own use as well as for other health care facilities. Working closely with staff in other Services, Nuclear Electronics and Medical Devices have recently developed tools and automated techniques to directly transfer patient and treatment planning information to CNC milling machines in order to automate the manufacture of compensators and patient casts. They provide a much needed resource to our various research programs and continue to manufacture phantoms (such as the Portal Imaging QC-3 phantom) for other facilities.

Radiotherapy:
Approximately 2700 courses of external beam radiotherapy will be delivered this year at CancerCare Manitoba, of which half will be planned using Pinnacle^3 software. Eight radiotherapy physicists and three physics associates support a wide variety of treatment programs including 6 linacs (7 by early next year!), a Cobalt unit, an orthovoltage unit, TBI and TSEI procedures, as well as PET/CT, CT and conventional simulation. Other supported programs include HDR, LDR prostate, and Canada's first Gamma Knife® radiosurgery program. Exciting new ventures on the horizon include the opening of a satellite facility in Brandon in 2007.

Imaging:
Four imaging physicists provide expertise throughout the province for major imaging modalities including nuclear medicine, CT, fluoroscopy, mammography, computed radiology, ultrasound, MRI, and PACS. Their key functions include evaluating existing equipment and providing technical expertise to purchasers of new imaging equipment. The most exciting items in recent months are the installation and commissioning of a new PET/CT unit and a dedicated MR for a minor injury clinic.

Radiation Protection:
The Radiation Protection Service regulates industrial, diagnostic and therapeutic x-ray equipment (up to 10 MV) in health care, academic facilities and industry and manages all CNSC licenses held by CCMB. They also provide advice relating to health hazards associated with non-ionising radiation exposure. Challenges in Radiation Protection include the rejuvenation of Provincial legislation that interprets the latest reports from the International Commission on Radiological Protection (ICRP) in a fit-for-purpose manner in Manitoba. A highlight of the year has been the formation of (together with the Radiation Safety Offices of Health Sciences Centre and University of Manitoba) the organizing committee of the Canadian Radiation Protection Association & Campus Radiation Safety Officers (CRPA/CRSO) annual conference in Winnipeg. This was a unanimous success with delegates describing the augmented scientific content as particularly edifying and inspirational – Toronto has a hard act to follow!

Research:
Of course, all of this clinical activity is performed whilst also supporting a full graduate program in Medical Physics (Ph.D., M.Sc., and a comprehensive or 'course-based' M.Sc. option)! Currently we have 7 graduate students enrolled (4 Ph.D. and 3 M.Sc.) and current research interests include novel breast imaging techniques which utilize scattered x-rays and microwaves, portal image dosimetry and patient registration, Monte Carlo simulation and modeling of radiation transport, gantry angle optimization, phantom development, magnetic resonance spectroscopy imaging for prostate IMRT, and there is some emerging interest in further development of our virtual reality applications in radiotherapy.

COMP Chair's Message… (Continued from page 112)
tools The second position is chair-elect, leading to the position of COMP chair, following the term of **Stephen Pistorius** who will be chair from 2006 until 2008. In addition, the Professional Affairs Committee, the Communications Committee and the Radiation Safety and Technical Standards Advisory Committee all need volunteers to continue their good work. As with any work of this sort the volunteer inevitably reaps rewards for his or her work which are far more valuable than the effort expended. I urge you to talk to members of the COMP executive and members of the COMP committees and …get involved!

In Memoriam — Dr. William Que

Submitted by Eugene Wong[1], Peter O'Brien[2], Bill Whelan[3]
[1]London Regional Cancer Program, London, ON
[2]Toronto-Sunnybrook Regional Cancer Centre, Toronto, ON
[3]Ryerson University, Toronto, ON

William (Weiming) Que 1961-2005

In the last issue, we briefly reported the sudden passing of our friend and colleague Dr. William Que. We would like to take this opportunity to expand on William's accomplishments and involvement in our medical physics community. William was among the few who won the prestigious China-U.S. Physics Examination and Application program (CUSPEA) scholarship to pursue graduate studies in physics in the United States. In 1986, four years after his arrival, he earned his PhD in solid state physics at Virginia Tech. William was then a postdoctoral fellow at Simon Fraser University, Beijing University and the University of Toronto. William joined John Rowland's imaging physics group at the Sunnybrook and Women's College Health Sciences Centre in 1994, making a transition into Medical Physics. After completing a medical physics residency, he joined the medical physics staff at the Toronto Sunnybrook Regional Cancer Centre (TSRCC). Since 1999, William has been an Associate Professor in the Department of Mathematics, Physics and Computer Science at Ryerson University, while maintaining a part-time clinical position at TSRCC.

William was very enthusiastic about going to Ryerson in the fall of 1999 where he was able to pursue both condensed matter theories as well as research in radiation treatment of cancer. A quick literature search of William's contributions would show a balance along these two lines, starting from his PhD in solid state physics, continuing through his postdoctoral years studying image detectors, his research on carbon nanotubes at Ryerson and his clinical work at TSRCC. He published over 35 refereed scientific papers, 21 abstracts and co-authored the book "Solid State Physics for Engineers" (Murellen Press, ISBN 0-9736580-0-2), published in 2003. We encourage the readers to visit the website http://www.ryerson.ca/~wque/Publications.htm to see the impressive list of William's publications. William was also the initial driving force behind the development of a new graduate program in Biomedical Physics at Ryerson. He was very proud of this new program and worked extremely hard to make it a reality. Most recently, in 2005, when Ryerson established a new Physics Department, William volunteered to be Chair of Departmental Council and write the new by-laws. This was typical of William, always willing to do more.

He was a quiet and thoughtful professional who was very successful in both his clinical and his scientific endeavours. Most of us came to know William through his radiotherapy work. He managed the technical aspects of the iodine-125 seed implant program at TSRCC and was awarded the 2001 Elekta prize for the best paper in the Journal of Applied Clinical Physics for work in that area. More recently he had developed a new segmentation algorithm for intensity modulated radiation therapy and had applied for a patent for that design. He had recently been successful in getting grant support for his work with the breast brachytherapy group at TSRCC. What we might not appreciate is that his work in solid state physics was equally extensive. William was a multi-faceted individual who had made this world a better place with his unique capabilities and valuable contributions. William will be greatly missed by all who knew him.

CCPM President's Message… (Continued from page 113)

tion to suit most preferences! At the next AGM in Saskatoon, Dick Drost will become your president and we will be recruiting for a new vice president. We will also be recruiting for either a Secretary/Treasurer or a Deputy Chief Examiner. If you would be interested in any of these positions, please contact either John Schreiner, the chair of the nominating committee, or any member of the board.

COMP?CCPM Executive Director Message… (Continued from page 114)

of your involvement as members. Please continue to share your ideas and suggestions – your input helps us serve you better.

COMP 2005 Annual General Meeting
MINUTES

Location: McMaster University, Hamilton, Ontario
Date: 8 July, 2005
Chair: P. O'Brien,
Secretary: W. Ansbacher
Present: 59 members (quorum is 38)

Meeting called to order by P.O'Brien at 4:35pm

1. **Adoption of the Agenda** Adopted

2. **Minutes of previous AGM,** Winnipeg, 2005 Adopted

3. **Chairman's report** (P.O'Brien)

a) The Endorsement Policy was passed at the last Executive meeting. The policy is to endorse only activities and items of benefit to COMP. Requests for endorsement are to be addressed to Exec.

b) Sylvia Fedoruk Award The Executive appointed a subcommittee to improve the process of selecting the best article for the award. The committee consists of: C. Arsenault, B. Clark and S. Pistorius.

c) Abstracts from this year's meeting will be published in Medical Physics., and the Annual Meeting will in future have a keynote speaker (M. Bronskill this year)

d) COMP Administration has changed since M. Henry resigned as Director in 2004. The new Executive Director, Ms. Nancy Barrett, was introduced. She noted that her management company, AMCES, will ensure continuity in the event of another change in director. She sees her role as assisting Exec and those outside, to raise the profile of COMP. An on-line form to gather feedback about the meeting is being developed.

The posts of secretary and director are being combined, and as a result B. Callaghan's contract ends on Aug. 31. She was recognized for her excellent work as secretary over the past years.

The Executive has changed the location of the Head Office, to that of AMCES. This change requires the approval of the Membership at the AGM (ballot not required).

Motion: (P. O'Brien, second D.Mason). That the membership approves moving the Head Office of COMP from Edmonton to Ottawa **(carried)**

e) Membership Fees, which have not risen since COMP was established, were due to be raised this year, but due to the financial success of last year's AGM Local Arrangements Committee, this can be deferred.

f) The COMP Medal was established this year, with D. Rogers chairing the search committee. Details were announced in *Interactions* (Jan 05) with nominations due on Nov. 15th for presentation at the 2006 AGM. In answers to queries: the purpose of the medal is to recognize significant contributions to Medical Physics in Canada, leadership and/or education. It can be awarded to Retired Members, and an award for young members (no more than 15 years after graduation) is also being considered

4. **CCPM President's Report** (B. Clark)

a) 3 new Fellows and 13 new Members were welcomed into the College. The MCCPM pass rate was 60%

b) A new bylaw removes any reference to the number of questions in the Question Bank, making the bank easier to update

c) A reminder that CCPM fees (included in COMP membership) must be paid annually to retain College certification. 9 fellows and members face revocation if their fees are not paid.

d) Changes on the Web site in the near future will separate the identities of COMP and CCMP, lessening the confusion between the two organizations

e) The Mammography Committee is working well; information on its activities may be found on the Web site.

f) Two Harold Johns Travel Awards were made this year (this does not set a precedent, however), to B. McCurdy and R. Hunter. A plea was also made for donations and contributions to the Fund for this award. Donations can conveniently be made at membership renewal time

COMP 2005 AGM Minutes… (Continued from page 144)

5. **Treasurer's Report** (H.Patrocino)

   a) The 2004 accounts were audited by Randal Miller and again found to be in good order.
   Motion: (W.Ansbacher, second P. O'Brien). that R. Miller be retained as auditor for 2005 (**carried**)

   b) Financial statements for 2004 (balance sheet, income statement, budget variance statement, annual meeting statement, mid-year meeting statement) and 2005 (interim balance and income statements) were presented.

   c) The 2004 meeting statements also include a separate Mid-year Meeting statement, as requested by the auditor.

   d) On the interim 2005 balance sheet, there is a new asset – the on-line processing account which will always be kept in credit. Dues have been approximately $48000 to date, and subscriptions will incur a small profit if the exchange rates continue to improve. A clarification about positive and negative amounts on the Variance was made – that a budgeted negative net amount is not a "deficit".

   e) On the 2006 budget, revenue was projected to be $103000. The Expenses for the Executive Director now includes the Secretariat, and the Mid-year Meeting item has been replaced by Exec. Board Meetings and now includes a one-day attendance at the AGM.
   Motion: (H. Patrocino, second C. Arsenault) that the 2006 budget be accepted **(carried)**

   f) Final comments: the LAC made a profit this year, but that situation cannot continue. It was suggested that the deferred $30 membership fee increase could instead be directed to the Harold Johns Fund.
   In the *future*, dues will be accepted in $CAN only – (this will not affect credit card transactions at all) – and the Exec Director will be playing a more active role in finances.
   This is H. Patrocino's final year as Treasurer; he was thanked by S. Pistorius for his dedication to the position

6. **Secretary's Report** (W. Ansbacher)

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

Category	June 2005	June 2004	Change
Full	**376**	362	+14
Associate	**5**	5	0
Student	**81**	55	+26
Retired	**5**	2	+3
Emeritus	**9**	9	0
Corporate	**19**	15	+4
Totals	**495**	448	**+47**

   The large number of student enrolments represented Hamilton students taking advantage of the Annual Meeting. The high level of interest in Medical Physics was noted, with the increasing number of inquiries regarding membership in COMP/CCPM and opportunities in Canada

7. **Communication Committee Report** (D. Mason)

   a) On-line dues payment and registration for the Annual Meeting is now available through a system administered by the AAPM

   b) Web site: there are now more than 6000 visits per month, which has more than doubled over the year. The most visited pages were Jobs (20%), the Conference page, and Public – "What is Medical Physics" and the Program pages.
   There will soon be a distinct difference between the COMP and CCPM sections; there will be a database-driven co-op placement page, and the Exec. Director is currently modifying the Corporate content.

   c) The Annual Conference was organized on-line for the first time this year, through the AAPM's AMOS system. The Committee worked with the AAPM and the COMP Chair to help set up and test the system.

COMP 2005 AGM Minutes… (Continued from page 145)

8. **Professional Affairs Committee Repor**t (P. McGee)

   a) Membership of the PAC changed: now includes the Executive Director and the Quebec delegate from ABMPQ, Luc Beaulieu. It was noted that more provincial delegates are needed.

   b) Regulation of Professions. All ten provinces were contacted concerning the Licensing issue (draft Alberta legislation implying registered engineers could supervise Medical Physicists, an undesirable and unworkable situation). Ten responses received, and are on record for inspection.

   c) The Executive Director is working to maintain a systematic method for collecting and keeping data

   d) Certification Process: PAC is working to provide organizations outside Canada with cross-referenced information to allow international comparison of certification processes. This will *not* provide or make any statements about equivalency, however

   e) CSCC (Canadian Strategy for Cancer Control), Human Resources Working Group may require alternative members, (currently J.Schreiner, P.Dunscombe, E Podgorsak and D.Wilkins).

   f) The Scope of Practice for Imaging is to be split into Diagnostic, Nuclear Medicine and MR because the single section was too unwieldy.

   g) Undergraduate memberships. A need to engage and attract undergraduates was identified, and the PAC recommended changes to make it clearer that they are permitted to join. The Canadian Association of Physicists noted that Medical Physics was on top of undergraduates' wish list.

   h) Insurance: COMP no longer has a Group plan. Our insurance company closed down the program (there were only two or three members), and there was virtually no cost saving to the individuals.

   i) The Kirkby Award, for a major contribution to the enhancement of Physics in Canada, was highlighted. A request was made for nominations in Medical Physics, to go to Paul Johns who is a member of the Selection Committee (J. Cunningham in 2002 has been the only recipient so far).

9. **Radiation Safety and Technical Standards Advisory Committee (RSTSAC)** (C. Arsenault for P. Dunscombe)

   a) Three new members of the CAPCA Standards group were introduced: M. Evans who will liaise with the CNSC; G. Mawko and R. Corns will liaise with the CRPA (Canadian Radiation Protection Association)

   b) CAPCA documents: Two, for Prostate Brachy and CT Sim – are posted on the Website. A third, for Stereotactic Radiosurgery/Radiotherapy is complete and under internal review. Six documents have now been reviewed, comments received and incorporated, and then sent to Exec for approval.

   ** **N.B. CAPCA would like submissions and comments on six more documents,** up until October 2005.

   P. McGhee will present CAPCA efforts in a poster at the AAPM conference in Seattle

10. **Nominations Committee** (C.Arsenault)

    a) Treasurer (term begins Jan.2006): Ms. M. Mondat (Montreal) was the single candidate. Nominations were called from the floor, and none were received. **M. Mondat was declared elected.**

    P. O'Brien thanked the outgoing treasurer, H. Patrocino, for his dedicated work and presented him with a plaque.

    b) Chair-Elect: C. Arsenault is requesting nominations for this upcoming position.

11. **Future COMP Conferences**

    2006, Saskatoon: to be held in the Hotel Bessborough, starting in the last week of May. P. Cadman presented the top 10 reasons to attend.
    2007, Toronto (October) will be a joint meeting with CARO. The 2008 is in Quebec, PQ, and the AAPM has been invited to a joint 2011, Vancouver meeting. Halifax has offered to host a meeting, 2010 is preferred, since the 2009 conference should go to the West (Victoria mentioned).

12. **Other Business**

    P. O'Brien thanked all Committee Chairs and Members, and the Executive for their work throughout the year..

    Motion of Adjournment: (D. Mason, second P.O'Brien): **carried.**
    Meeting adjourned at 5:55 p.m.

COMP Treasurer's Report
July 2005 AGM, Hamilton, ON

By Horacio J. Patrocinio, McGill University Health Centre, Montréal, QC

The financial statements of the COMP for 2004, prepared by the treasurer, were audited by Mr. Randall Miller and found to be in good order, and to accurately describe the financial state of COMP. The following are some of the key highlights of the 2004 financial year:

1. As of December 31, 2004 the net worth of the organisation stood at $150,447. $41,973 was in our current account and the value of our GIC investments (reserve) stood at $124,053 and there were 16,326$ in outstanding liabilities (including a $14,083 cheque to the previous executive director not yet cashed).
2. The lower net worth (compared to 188,00$ at the start of the year) is largely the result of delays in the start of the 2005 dues campaign and of delays in the transfer of profits from the 2004 scientific meeting, both of which did not occur until the start of 2005.
3. Dues for the 2004 campaign brought in $47,176 (Corporate $7,372; Full $37,760, Student $1,204, Other $840). However only $28,097 of this amount was received in the 2004 financial year. Furthermore, delays in the start of the online payment service prevented significant dues for 2005 from being collected by year's end, and therefore, the total dues collected in 2004 is significantly less than the budgeted amount.
4. Subscriptions for 2004 incurred a $623 profit (revenues $12,219 and expenses of $11,596) due to the higher US exchange rate. However, due to subscriptions paid late in 2003 and the delayed 2005 campaign, the 2004 statements show a deficit.
5. The expenses for the executive director in 2004 consist only of paid advertisements for the position. However, a $14,083 expense has since been incurred in early 2005 for the services of Mr. M. Henry, former executive director of COMP until April 2004 for the period covering September 2003 to April 2004.
6. The COMP portion of the profit from the 2004 scientific meeting (jointly with CAP) totaled $27,362 including the 20% LAC return. The net profit after the LAC return will be 21,890. However, the amount does not appear in the 2004 income statements since the payment was not received until 2005.
7. Advertising revenues from ads placed in the COMP directory, newsletter and web page make up a significant fraction of the total COMP revenues for 2004. However, a portion of these revenues is for ad placements in 2003.
8. A budget and statement for the 2004 mid-year meeting has been prepared as recommended by the auditor.
9. The web site expenses (budgeted out of the reserves) were actually paid out of the operating account to prevent a loss of investment income. This, together with 800$ of GIC interest that was not reinvested, results in an effective transfer of funds from the operating account to the reserves of 12,600$.

The following are some of the key highlights of the 2005 financial year to-date:

1. As of May 31, 2005 the net worth of the organisation stood at $218,426. $104,703 was in our current account and the value of our GIC investments (reserve) stood at $124,053 and there were 10,741$ in outstanding liabilities. In addition, 5,064.44$ stood in our new online payment account (BeanStream). This amount includes a withheld percentage of the online transaction revenues used to cover bad credit and is released after a fixed time period.
2. Dues for the 2005 campaign brought in $48,045 (Corporate $8,957; Full $37,142, Student $1,505, Other $440) to date. Subscriptions for 2005 have to-date incurred a $826 profit (revenues $12,215 and expenses of $11,389) due fluctuations in the Cad-US exchange rate.
3. The 2006 budget, approved by the membership at the AGM, incorporates several changes. First, projected advertising revenues (ads in Interactions, web site, directory, email) and committee expenses are stated explicitly. In addition, executive director expenses have been adjusted to the recognize the new role that will also include all secretariat tasks. Finally, a public relations amount has been added to include such items as advertising for COMP and medical physics at events, and at the undergraduate level.

(Continued on next page)

Balance Sheet (December 31, 2004):

Account	Description	January 1, 2004	December 31, 2004	Notes
ASSETS				
Bank Account	Main account at TD-Canada Trust	$73,964.49	$41,972.50	
GIC Accounts	3 GIC investments	$121,373.56	$124,052.70	1
TOTAL ASSETS		*$195,338.05*	*$166,025.20*	
LIABILITIES				
Credit card balance	COMP treasurer	$2,088.83	($773.56)	2
Credit card balance	Secretariat	$23.20	$25.71	
Cheques not cleared		$5,217.04	$16,326.29	3
TOTAL LIABILITIES		*$7,329.07*	*$15,578.44*	
Assets less Liabilities		**$188,008.98**	**$150,446.76**	

Notes

1. Includes interest compounding in investment accounts (Dec 31, 2004 value)

2. Denotes a positive credit on the treasurer's credit card due to a returned amount

3. Includes 14,083.04$ cheque for previous executive director contract and expenses

(Continued on next page)

In Brief

Calling All Musicians!

We are attempting to constitute a small "band" to play some fun music at the next COMP meeting in Saskatoon. If you would like to participate, please let me know what instrument you play (and can bring with you or rent in Saskatoon!) and what type of music you like to play.

Brenda Clark

LDR sources wanted!

The Cross Cancer Institute is seeking a set of lightly used Selectron LDR sources. If you have or know of a set that will become available within the next year, please contact Ron Sloboda at 780-432-8719 / ron.sloboda@cancerboard.ab.ca

Ron Sloboda

The Cross Cancer Institute achieves CAMPEP accreditation for two Residency Programs in 2005

The Department of Medical Physics at the Cross Cancer Institute (CCI), which is also designated as the Division of Medical Physics at the University of Alberta, has achieved CAMPEP accreditation, in 2005, for each of its two medical-physics residency programs: Radiation Oncology Physics Residency Program and Diagnostic Imaging Physics Residency Program. The Department had also achieved CAMPEP accreditation for its Medical Physics Graduate Teaching Program in 2002. The Department is the first to achieve CAMPEP accreditation for three programs. Further information about the three Programs can be obtained from its Director, B.Gino Fallone at gfallone@phys.ualberta.ca, or from the website: med.phys.ualberta.ca. Information about CAMPEP can be obtained from www.campep.org

Gino Fallone

Income Statement (2004):

January 1, 2004 through December 31, 2004

OPERATIONS ACCOUNT

Description	Amount (CAD$)
Bank Account Balance at Jan 1, 2004	$73,964.49
Credit card balances at Jan 01, 2004	($2,112.03)
Revenue deferred to 2004 (Scientific meeting)	($15,379.18)
Operating balance at Jan 1, 2004	**$56,473.28**
REVENUES	
Advertising	$18,173.52
Deferred revenue (2003 AGM)	$15,379.18
Donations	$420.00
Dues	$28,947.10
Interest	$33.31
Scientific meeting	$2,009.74
Subscriptions	$5,936.79
TOTAL REVENUE	**$70,899.64**
EXPENSES	
Awards/Support	$1,192.13
Bank Charges	$192.92
Committee Expenses	$112.05
COMP/CCPM Representation	$8,115.11
Corporate Fees	$30.00
Discretionary Fund	$897.04
Directory & Publications	$5,577.62
Donations	$891.07
Executive Director	$1,198.40
Mid Year Meeting	$10,677.81
Other	$135.00
Newsletter	$13,654.48
Office	$1,712.43
Plaques	$258.75
Scientific meeting	$5,379.21
Secretariat	$8,600.00
Society Memberships	$1,868.29
Subscriptions	$11,561.16
TOTAL EXPENSES	**$72,053.47**
Income less Expenses	**($1,153.83)**
Transfer to Reserve	($12,599.10)
Operating balance at Dec 31, 2004	**$42,720.35**
Credit card balances at Dec 31, 2004	($747.85)
Bank Account Balance at Dec 31, 2004	**$41,972.50**

RESERVE ACCOUNT (GICs)

Description	Amount (CAD$)
RESERVE (Start of Year)	**$121,373.56**
Web Site Development	($13,399.10)
Investment Growth	$3,479.14
Transfer from Operations	$12,599.10
RESERVE BALANCE (Year End)	**$124,052.70**

Budget:

Description	2004	2005	2006
GENERAL INCOME			
Advertising			$25,000
Deferred revenue (AGM)	$14,000	$16,000	$30,000
Dues	$47,000	$47,000	$48,000
Membership List	$500	$500	
Short-Term Interest	$100	$100	$100
TOTAL	**$61,600**	**$63,600**	**$103,100**
OPERATING EXPENSES			
Awards/Support	($1,500)	($1,500)	($3,000)
Bank Charges	($100)	($100)	($100)
Committee Expenses	($1,500)	($1,500)	
Communications			
Operating expenses			($1,500)
Directory			($5,000)
Newsletter			($14,000)
Web Site			($12,000)
PAC			($2,000)
RSTSAC			($3,000)
COMP/CCPM Representation	($6,000)	($6,000)	($8,000)
Corporate Fees	($30)	($30)	($30)
Directory	($4,000)	($2,000)	
Discretionary Fund	($1,500)	($1,500)	($1,000)
Executive Director	($19,000)	($25,000)	($45,000)
Insurance		($1,000)	($1,000)
Executive/Board meetings	($10,000)	($10,000)	($12,000)
Newsletter	($4,000)	($4,000)	
Office	($2,500)	($2,500)	($2,500)
Plaques	($200)	($200)	($200)
Public relations			($1,500)
Secretariat	($8,300)	($9,200)	
Society Memberships	($3,000)	($3,000)	($2,000)
Web Site		($5,000)	
TOTAL EXPENSES	**($61,630)**	**($72,530)**	**($113,830)**
NET (INCOME - EXPENSES)	***($30)***	***($8,930)***	***($10,730)***
Transfer to/from reserve	$30	$8,930	$10,730
RESERVE (first of year)	**$96,650**	**$104,344**	**$118,123**
Investment Interest	$3,000	$3,000	$3,000
Website development	($20,000)		
Transfer to/from Operations	($30)	($8,930)	($10,730)
RESERVE (end of year)	**$79,620**	**$98,414**	**$110,393**

51st Annual COMP/CCPM
Annual Scientific Meeting Survey

By Nancy Barrett, Executive Director COMP/CCPM

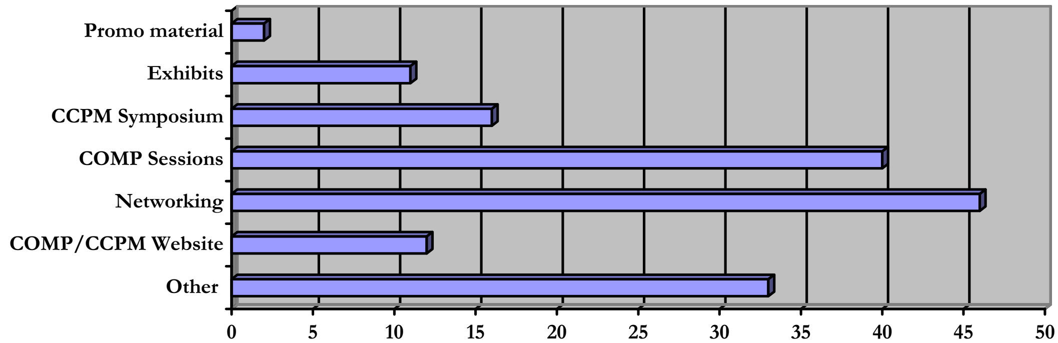
This years' Annual Scientific Meeting was a resounding success, and the results of the survey support this claim. But before we get into the number crunching, we wish to thank our members who responded to the survey – our response rate of 93 participants out of the 182 registrants speaks to the level of commitment of COMP members. Congratulations to Lesley Baldwin of the Cross Cancer Institute in Edmonton whose name was drawn from the survey participants to win a $50 Chapters gift certificate!

As you can see below, delegates came away from the meeting with a positive impression of virtually every aspect of the meeting. Of note, the bBanquet at the Botanical Gardens was very well received, with 77% of attendees rating it Excellent or Very Good. Furthermore, the COMP sessions and the CCPM Symposium were also well received. In fact, if you go down the list, there are very few aspects of the meeting that didn't receive the majority of their responses in the Excellent or Very Good categories, which makes a statement about the quality of the conference.

	Excellent	Very Good	Good	Fair	Poor	N/A
COMP Sessions	15%	52%	32%	1%	0%	0%
CCPM Symposium	23%	40%	18%	5%	0%	14%
Networking Opportunities	27%	33%	23%	10%	1%	8%
Exhibits	13%	43%	35%	8%	0%	1%
Conference Materials	15%	46%	33%	5%	0%	0%
Online Registration Process	33%	33%	24%	3%	3%	3%
Onsite Registration Process	26%	29%	6%	1%	0%	38%
Ice Breaker Reception	22%	37%	13%	3%	0%	23%
Banquet – Botanical Gardens	40%	37%	13%	0%	0%	11%
Conference Facilities	15%	46%	31%	8%	0%	0%
McMaster Residence Accommodations	11%	22%	11%	8%	0%	49%
Cost of Accommodations	10%	33%	15%	8%	4%	30%
Overall Value for Conference Registration Fee	22%	52%	18%	4%	2%	2%

In terms of what influenced the decision to attend this year's Annual Scientific Meeting, the general consensus was to network and to learn, as can be seen from the chart below [next page].

Continued on next page….



Getting into specifics, there are other questions of note that should be analyzed:

- The preferred month for the Meeting is June (57% of respondents)
- To the question: "*If the COMP/CCPM Annual Scientific Meeting was scheduled close to the AAPM Conference, which would you be more likely to attend?*"; 65.1% said the COMP/CCPM meeting, 20.9% said the AAPM Conference, and 14% said both.
- To the question: "*What is your preferred venue for the Annual Scientific Meeting?*"; 24.4% said a downtown hotel, 38.4% said a University campus and 37.2% had no preference.
- To the question: "*Overall, what did you like best about the COMP/CCPM 2005 Meeting?*"; the responses not surprisingly focused on the COMP sessions, the CCPM Symposium and the networking opportunities.
- To the question: "*Overall, what did you like least about the COMP/CCPM 2005 Meeting?*"; the respondents didn't single out one specific weakness, with responses varying from the length of the lectures to some of the venues (theatres that were too small) to general complaints about the heat in Hamilton.
- To the question "*What would improve your experience at the Annual Scientific Meeting?*"; the respondents again didn't single out one particular aspect but commented on improving the location, increasing the time allotted for the lectures, and perhaps lengthening the conference by a day to ease the time constraints.

Finally, our public lecture on Medical Imaging: The Vision for New Medical Advances was generally well received, with 57% of respondents rating it 'Good' or higher. However, given that this was our first effort at a public lecture, there is room for improvement. Some of the respondents felt that while the lecture was suitable for members, the content was not as accessible to the general public. Others felt that we needed to market the public lecture more vigorously. However, the majority did agree that the lecture was important and would help us to make the organization and the field of medical physics in general more visible to the public.

We would like to thank you once again for participating in the survey. We will use the information gathered as we prepare for the 2006 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.

Canadian College of Physicists in Medicine
Chief Examiner's Report 2005

By Katharina Sixel, Toronto-Sunnybrook Regional Cancer Centre, Toronto, ON

Membership Examination 2005

Written exam:

16 Candidates
15 in Radiation Oncology
1 in Nuclear Medicine

13 Passed written exam
80% Pass rate for written exam

Oral Exam:

16 candidates for oral exam (12 from this year, 4 repeat candidates)
13 passed oral exam
80% pass rate for oral exam

Overall:

15 new candidates to attempt both written and oral exams
9 of these candidates passed both exams
60% pass rate for new candidates

13 successful candidates:
François DeBlois, Larry Gates, Judy Hale, Adnan Ismail, Nina Kalach, Vitali Moiseenko, DeeAnn Radford Evans, Jeffery Richer, Russell Ruo, Greg Salomons, Robert Stodilka, Monique Van Prooijen, Jian Wang

All successful candidates were elected Members of the Canadian College of Physicists in Medicine at the Annual General Meeting on July 7, 2005 in Hamilton.

Fellowship Examination 2005

5 Candidates
4 in Radiation Oncology
1 in Magnetic Resonance Imaging

3 candidates passed

3 successful candidates:
Clément Arsenault, Ian Cameron, Patrick Rapley

The successful candidate were elected Fellow of the Canadian College of Physicists in Medicine at the Annual General Meeting on July 7, 2005 in Hamilton

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

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

New York State Approves of CCPM Certification

By Brenda Clark, CCPM President
British Columbia Cancer Agency, Vancouver, BC

The State Education Department of New York recently requested information on our examination process and this letter [below] contains good news for all physicists intending to practice in New York. It seems in terms of MCCPM and ABR, New York will take our currency at par!

THE STATE EDUCATION DEPARTMENT / THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY, NY 12234

State Board for Medicine
89 Washington Avenue, West Wing, 2nd Floor
Albany, NY 12234
Tel: (518) 474-3817 EXT. 560 FAX: (518) 486-4846
E-mail: MEDBD@MAIL.NYSED.GOV

May 4, 2005

Brenda G. Clark, PhD, FCCPM
President
Canadian College of Physicists in Medicine
600 West 10th Avenue
Vancouver, BC V5Z 4E6

Dear Dr. Clark:

I am writing in follow-up to the State Education Department's review of the medical physics examinations administered by the Canadian College of Physicists in Medicine.

As you may know, Article 166 of the New York State Education Law and Subpart 79-8.4 of the Regulations of the Commissioner of Education require that individuals applying for licensure in medical physics after August 25, 2004 must pass an examination acceptable to the Education Department. I am pleased to inform you that the membership specialty examinations in radiation oncology, diagnostic imaging, and nuclear medicine, which are developed and administered by the Canadian College of Physicists in Medicine, have been determined to be acceptable within the provisions of Subpart 79-8.4 of the Regulations of the Commissioner of Education.

I hope that this information is helpful and if you have any questions, please feel free to contact me.

Sincerely yours,

Thomas J. Monahan
Executive Secretary

cc: State Committee for Medical Physics
Laura Lynch
Robert Bentley

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Michelle.mogadam@varian.com

Western

The University *of* Western Ontario

Department of Physics and Astronomy

Faculty Position in Medical Physics

The Department of Physics and Astronomy at The University of Western Ontario is seeking applicants for a probationary (tenure-track) position at the rank of Assistant or Associate Professor in the area of **Medical Physics** to begin on July 1, 2006. Appointment with tenure is possible where qualifications and experience warrant.

The Department of Physics and Astronomy includes 25 faculty with research interests in the fields of condensed matter physics, astronomy, planetary science, laboratory astrophysics, and medical physics. Medical physics is a relatively new area of research within the Department. The Medical Physics group currently consists of two faculty (including one Canada Research Chair), with expertise in magnetic resonance imaging and ultrasonic imaging. The department plans for at least two hires in this area within the next four years. In addition, there is a large medical physics community in London based at the Robarts Research Institute, the Lawson Research Institute, and the London Regional Cancer Centre, and several scientists from these institutions hold adjunct appointments in the Department.

Candidates must have a Ph.D. and a proven record of research in the field of medical physics. The successful candidate will be expected to establish an innovative and independent program of externally funded research involving the training of graduate and undergraduate students. Collaborations with other members of the medical physics community in London may be possible and would be encouraged. He or she will be expected to teach effectively at the undergraduate and graduate levels.

Interested candidates should submit a curriculum vitae, a list of publications, a research plan, and the names and addresses of three referees, and arrange for three letters of reference to be sent directly to:

Dr. John R. de Bruyn
Chair, Department of Physics and Astronomy
The University of Western Ontario
London, Ontario N6A 3K7
Canada

The closing date for applications is **December 1, 2005**.

This position is subject to budgetary approval. Applicants should have fluent written and oral communication skills in English. All qualified candidates are encouraged to apply; however, Canadian citizens and permanent residents will be given priority. The University of Western Ontario is committed to employment equity and welcomes applications from all qualified women and men, including visible minorities, aboriginal people, and persons with disabilities.

CALL FOR NOMINATIONS

The CAP-COMP Peter Kirkby Memorial Medal for Outstanding Service to Canadian Physics

The CAP-COMP Peter Kirkby Memorial Medal recognizes outstanding service to Canadian physics. The medal is intended to recognize service to the physics community by strengthening the Canadian physics community, by enhancing the profession of physical scientists, by effectively communicating physics to the non-scientific community, or by making physics more attractive as a career. It is intended to provide a lasting memorial to Peter Kirkby and to recognize in others the qualities for which he is remembered best: a vision of a strong Canadian physics community, dedicated efforts to support that vision and, in all things, fairness, and honesty.

The Peter Kirkby Memorial Medal was introduced in 1996 and is awarded biennially. The previous winners were:

2004 - Dr. Robert Barber, University of Manitoba
2002 - Dr. John R. (Jack) Cunningham, Camrose, Alberta
2000 - Dr. Paul Vincett, FairCopy Services Inc.
1998 - Dr. J.S.C. (Jasper) McKee, University of Manitoba
1996 - Dr. Donald D. Betts, Dalhousie University

The next medal will be awarded in the year 2006. The deadline for nominations is December 16, 2005.

Because of the required support material, online nominations are not a viable option. Please download the Nomination Form from the CAP website: https://www.cap.ca/awards/nomination_forms/kirkby.pdf
Print and complete the nomination form accordingly, and then mail to the CAP with the required documentation.

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