2014 Program

SDAMPP Annual Meeting

Pathways to Success in Academic Medical Physics

Room 15, Level 4 Austin Convention Center
8:00 - 11:30AM, Saturday, July 19, 2014

Moderator: G. Fullerton, SDAMPP President-Elect

MP Academic Program Directors:
The 2014 Meeting addresses two ongoing developments of critical importance to the future of medical physics education. The intent is to seek input from SDAMPP members by reviewing developments. **Session I** looks at research education in a large program (University of Wisconsin), a medium sized program (Duke University) and at a major research program (Princess Margaret Hospital, Toronto) then opens discussion for your input. Are we teaching the right topics at the right time in the right way to meet the needs of contemporary medical physics in 2014? **Session II** looks at the most recent information on the development and implementation of the 2015 resident match program from two of the primary medical physics match program designers (John Gibbons and John Antolak) as well as a representative of the professional matching service (Jonah Peranson). Again time is set aside for your comments and questions.

Start Time	*End Time*	*Title*		*Speaker*
7:30 AM	7:55 AM	**Continental Breakfast**		
7:55 AM	8:00 AM	**Welcome**	**Talk 0**	Gary Fullerton
I. Are there options to Improve Medical Physics Research Education?				
8:00 AM	8:20 AM	**U. Wisconsin Medical Physics Research Education**	**Talk 1**	Ed Jackson
8:20 AM	8:40 AM	**Duke University MP Research Education**	**Talk 2**	Jim Dobbins
8:40 AM	9:00 AM	**A Canadian Model of MP Research Education**	**Talk 3**	David Jaffray
9:00 AM	9:30 AM	**Panel Discussion: Options for MP Research Success**	**Panel**	Group-Audience
9:30 AM	9:50 AM	**Coffee Break**		
II. Can a Match Program Improve Clinical Medical Physics Education?				
9:50 AM	10:10 AM	**Match Program to Improve Resident Placement**	**Talk 4**	John Gibbons
10:10 AM	10:30 AM	**Implementation of MP Match in 2014**	**Talk 5**	John Antolak
10:30 AM	10:50 AM	**Professional Support and Match Experience**	**Talk 6**	Jonah Peranson
10:50 AM	11:30 AM	**Panel Discussion: Options for Clinical MP Success**	**Panel**	Group-Audience
Adjourn to SDAMPP Business Meeting				
11:30 AM	12:00 PM	**Secretary's Report, Treasurer's Report**		Secretary, Treasurer

University of Wisconsin Medical Physics Research Education

Edward F. Jackson, PhD

Chair, Department of Medical Physics & Program Director

efjackson@wisc.edu

University of Wisconsin - Madison

Program Evolution & History

- John Cameron took an appointment in Physics and Radiology in 1958. Began working in "medical physics".
- Medical Physics Graduate Program, known as "Radiological Sciences", was housed in the Radiology Department; all faculty were Radiology faculty
- 1972: Formation of the Comprehensive Cancer Center and Department of Human Oncology
  - Radiation therapy became part of Human Oncology
  - Medical Physics faculty located in DHO and Radiology
- 1981: Medical Physics Department was formed. Graduate program now housed in the department. Many faculty have joint appointments in clinical departments.

University of Wisconsin
School of Medicine & Public Health

Department Overview

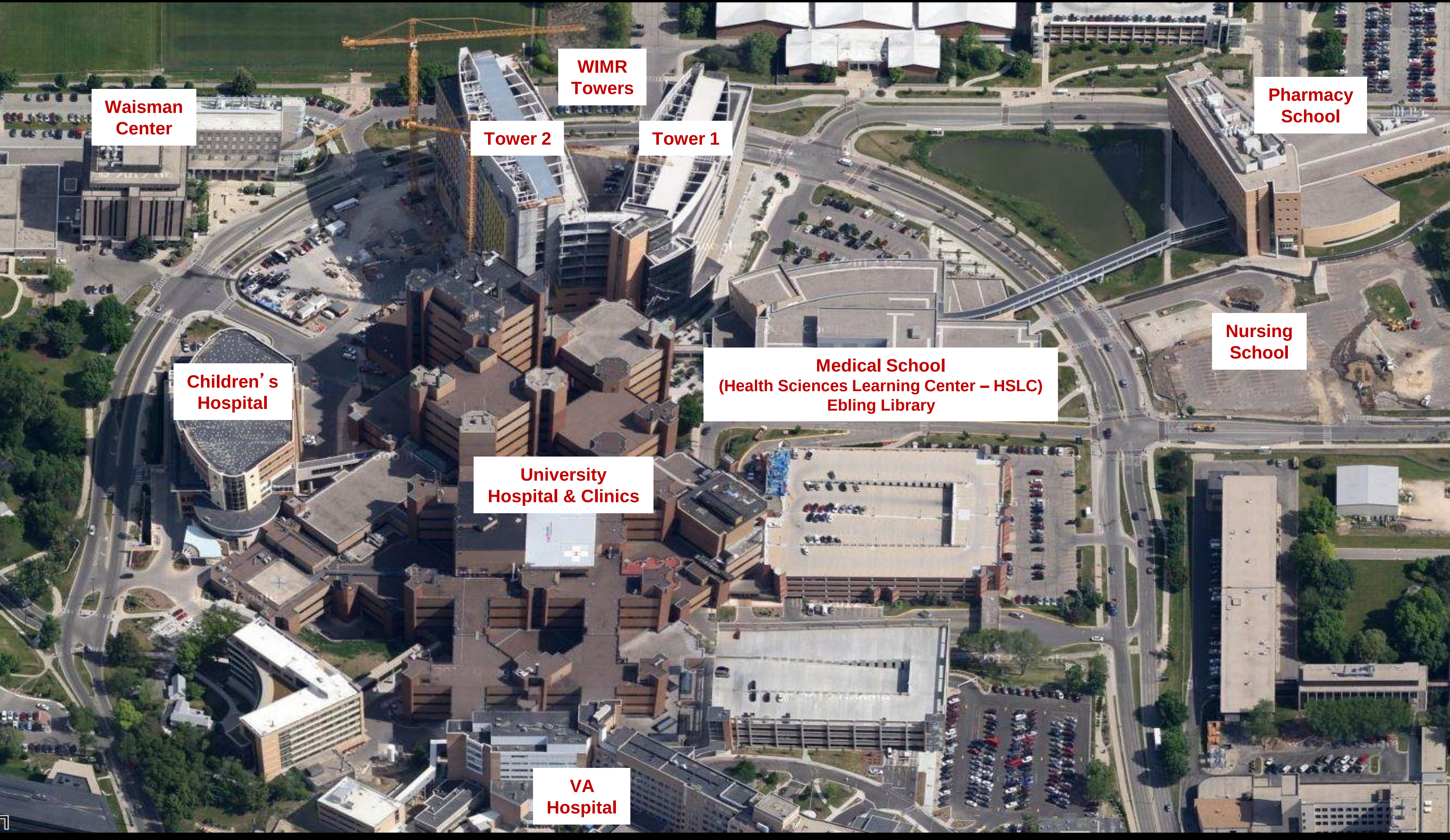
- One of 10 Basic Science departments in UW School of Medicine and Public Health
- 78 faculty, including emeritus, joint, affiliate, adjunct, volunteer, and honorary fellow appointments*
- Faculty at SMPH*:
  - 26 tenured/tenure track (many with joint appointments)
  - 6 clinical (CHS) track
  - 1 Clinical Associate
  - 5 Emeritus professors (active)
  - 2 Joint department appointments (in Radiology, DHO)
  - 16 Affiliates (in Radiology, DHO, Engineering, Psychiatry)

*As of 7/9/2014

Locations of Key Resources

University of Wisconsin
School of Medicine & Public Health

Locations of Key Resources



UW School of Medicine and Public Health

16 Clinical Departments

- Anesthesiology
- Dermatology
- Family Medicine
- Human Oncology
- Medicine
- Neurological Surgery
- Neurology
- Obstetrics & Gynecology
- Ophthalmology & Visual Sciences
- Orthopedics & Rehabilitation
- Pathology & Laboratory Medicine
- Pediatrics
- Psychiatry
- Radiology
- Surgery
- Urology

10 Basic Science Departments

- Biomolecular Chemistry
- Biostatistics & Medical Informatics
- Cell & Regenerative Biology
- Medical Genetics
- Medical History & Bioethics
- Medical Microbiology & Immunology
- Medical Physics
- Neurosciences
- Oncology
- Population Health Sciences

University of Wisconsin
School of Medicine & Public Health

Med Phys Relationships w/Other Entities

10 Basic Science Departments

- Biomolecular Chemistry
- Biostatistics & Medical Informatics
- Cell & Regenerative Biology
- Medical Genetics
- Medical History & Bioethics
- Medical Microbiology & Immunology
- Medical Physics
- Neurosciences
- Oncology
- Population Health Sciences

- Physics
- Engineering
  - Engineering Physics
    - Dual Degree (BS-MS) Program
  - Biomedical Engineering
  - Electrical & Computer Engineering
- WM Keck Lab for Biological Imaging
- School of Veterinary Medicine
- Industry (Partial Listing)
  - Accuray (Tomotherapy)
  - Philips (Treatment Planning)
  - Standard Imaging
  - Gammex/RMI
  - Marvel Medical Technology
  - GE Healthcare
  - Siemens Healthcare
  - Varian
  - Hologic (Breast Imaging)

Med Phys Relationships w/Other Entities

10 Basic Science Departments

- Biomolecular Chemistry
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- Medical Microbiology & Immunology
- Medical Physics
- Neurosciences
- Oncology
- Population Health Sciences

- Waisman Center
  - Lab for Brain Imaging & Behavior
- Wisconsin Institutes for Discovery
  - Morgridge Institute for Research
- Carbone Comprehensive Cancer Center
- Medical Radiation Research Center (Medical Physics)
- International Center for Accelerated Medical Imaging (Medical Physics)
- Wisconsin National Primate Research Center
- LOCI (Laboratory for Optical and Computational Instrumentation)
- Health Emotions Research Institute

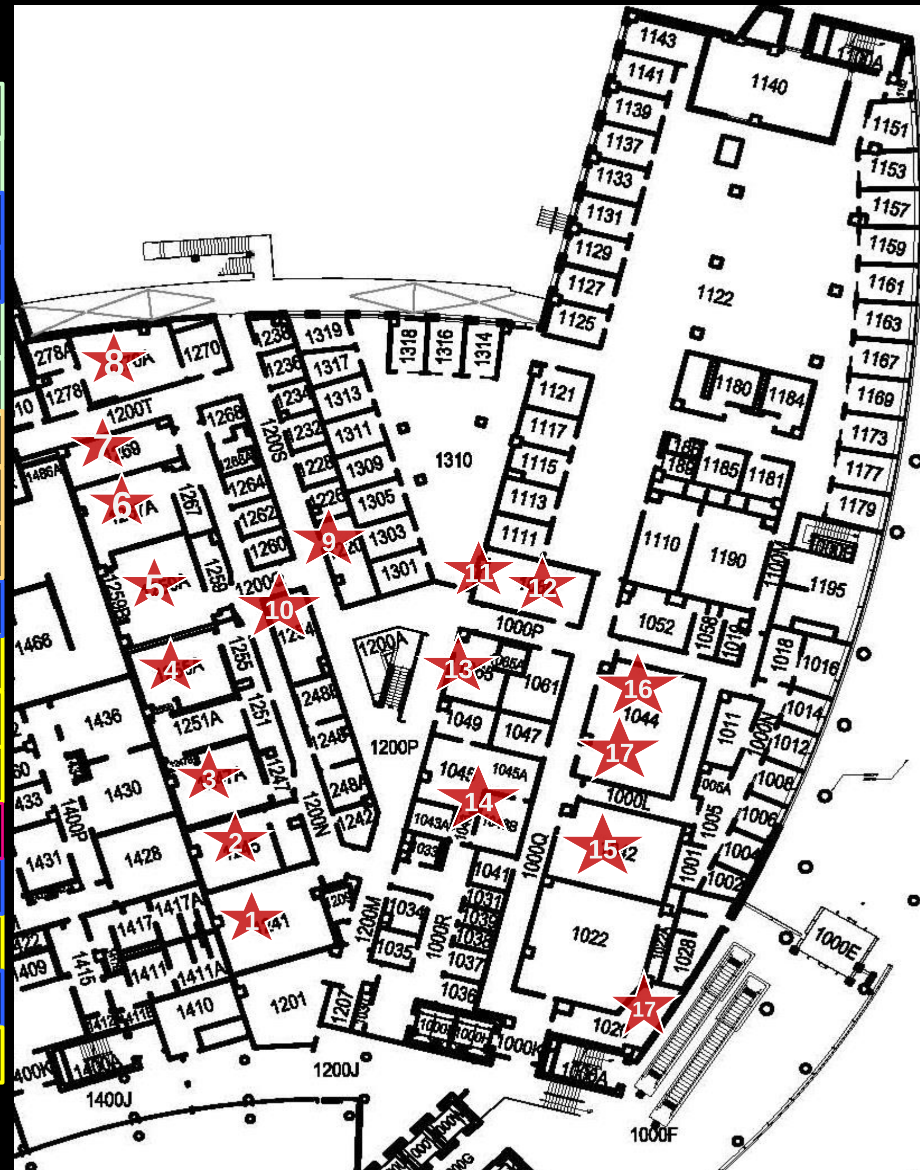
Major Research Areas

- Biomagnetism
- Diagnostic x-ray imaging, including CT
- MR imaging and spectroscopy
- Nuclear medicine, PET, molecular imaging
- Optical imaging
- Radiation dosimetry / metrology
- Radiation therapy physics
- Ultrasound physics

Locations of Key Resources

WIMR 1: Floor 1

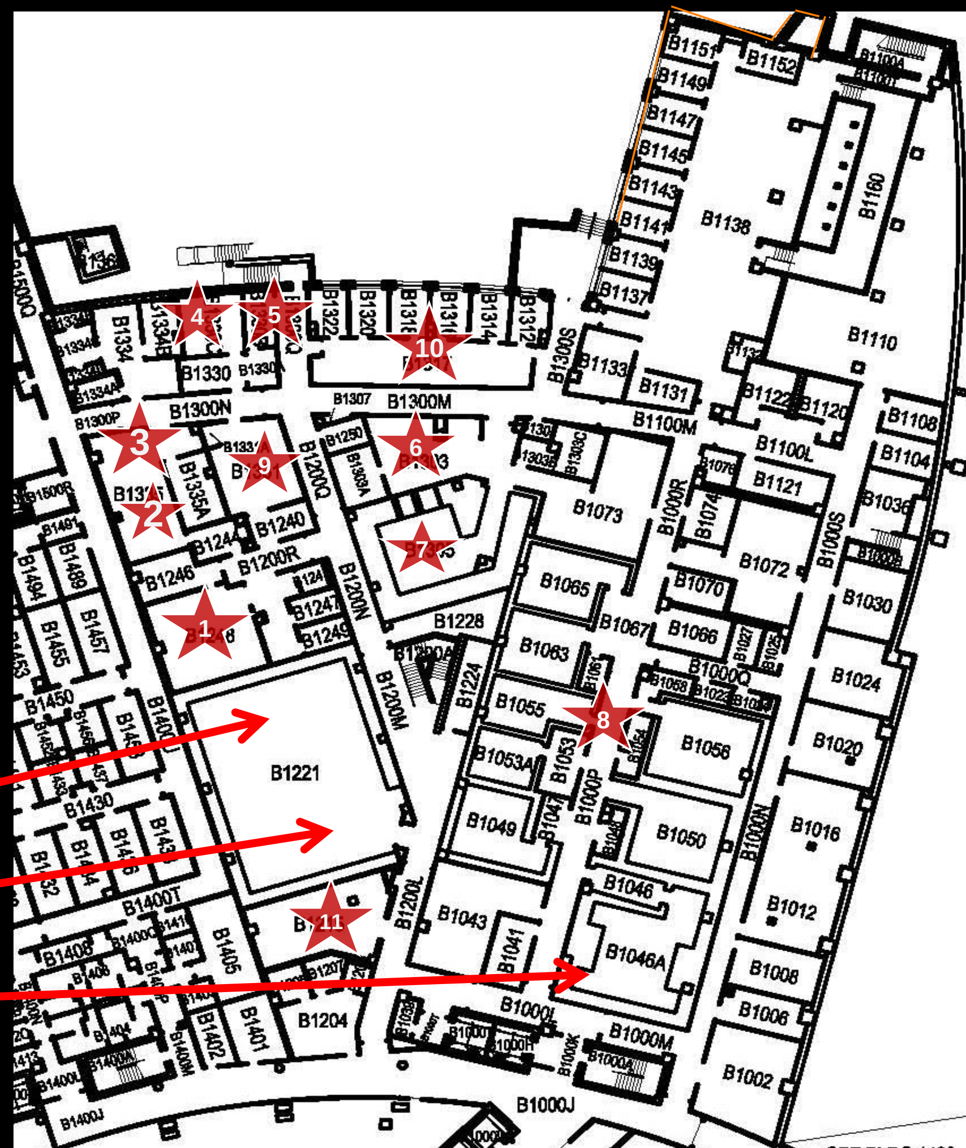
1. 64 slice, dual energy CT scanner
2. Four-flat-panel CT scanner, breast tomosynthesis
3. 1.5T MRI scanner
4. 3T MRI scanner
5. Angiography unit
6. SBDX angiography unit
7. RF/Thermal/Microwave ablation lab
8. Animal surgery suite
9. Image data processing and informatics
10. He-3 polarizer, Xe-129 polarizer
11. Medical elastography lab
12. 64 channel ultrasound machine
13. 192 channel ultrasound machines
14. 72 channel SQUID biomagnetism unit
15. Electronics/radiofrequency lab
16. Acoustics lab
17. MRI lab
17. Treatment planning system lab



Locations of Key Resources

WIMR 1: Floor B

1. PET/CT VCT scanner
2. MicroCT scanner
3. Micro PET/CT scanner
4. 4.7T small-bore MRI scanner
5. C-13 polarizer
6. Radiochemistry lab
7. Cyclotron (PETrace, 2nd RDS cyclotron @ MSC)
8. Medical Radiation Research Center / ADCL
9. PET/CT 710 scanner
10. cGMP facility (opening Q1/2015)
11. Machine shop



3.0T MR750W – Future MR/PET

Future Accuray/Tomo System

Varian 2100EX Linac

GE / UW Comprehensive Research Agreement

Addressing MRI, CT, and PET & MR/PET

MRI

- 3T MR750w Q2/2013
- 3T MR750w Q3/2014
- Next-generation MRI Q2/2018
- Next-generation MRI Q4/2018

CT

CT 750 Q1/2013

CT Optima 660 Q1/2013

Molecular Imaging

PET/CT 710 Q3/2013

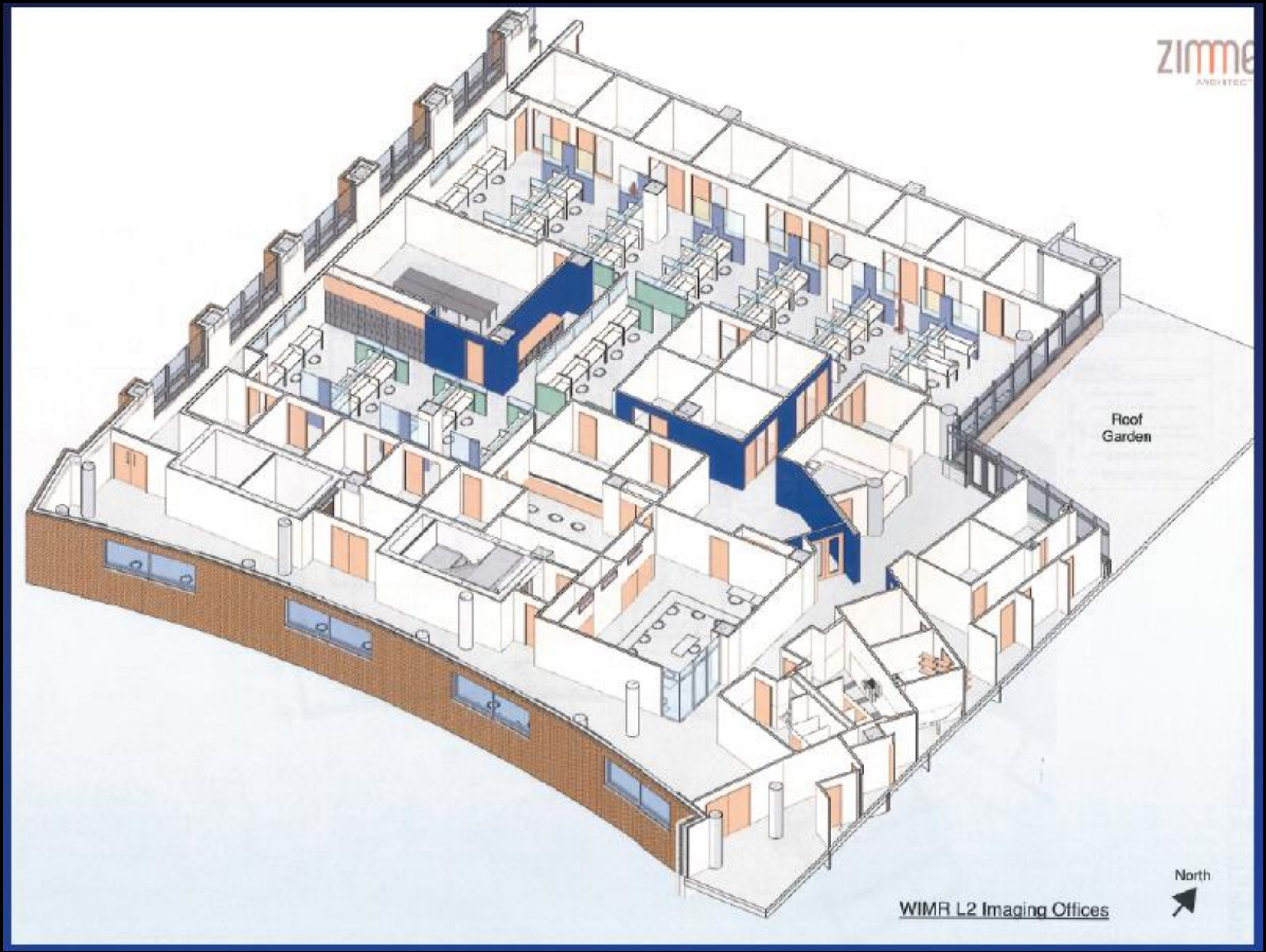
Trimodality Transfer Table Q2/2014

PET ring (integration into MR750w) Q4/2014

Combined PET/MR

WIMR Medical Physics Facilities

Radiology / Med Phys Expansion (10,000 sq ft)



Level 2 of WIMR Tower 2

Opening July 2014

University of Wisconsin
School of Medicine & Public Health

Locations of Key Resources

Waisman Center - Dedicated to the advancement of knowledge about human development, developmental disabilities, and neurodegenerative diseases.

Waisman Laboratory for Brain Imaging and Behavior

- 3T MR Scanner (fully equipped for fMRI studies)
- MR Scanner Simulator
- Siemens ECAT HR+ PET Scanner
- Siemens Focus 220 microPET Scanner
- Tandem Accelerator (7 MeV protons) and Radiochemistry Lab
- 256-Channel EEG/ERP System

Additional Waisman Center Cores:

- Admin
- Clinical Translational
- Cellular & Molecular Neuroscience
- Rodent Models

UW Medical Physics Program

- The UW Program is the largest medical physics graduate program in the US.
- It was one of the first medical physics graduate programs accredited by CAMPEP (1988) and has been continuously accredited since that time.

Enrollment Information

- Typical Program Enrollment: ~120
- Typical Entering Class Size: ~18 – 20
- Faculty also supervise students from outside of the Medical Physics Program (BME, ECE, NEEP, physics, neuroscience, *etc*.), bringing total number of students working in medical physics to >135.
- Post-Docs: ~15
- Scientists: ~15

UW Medical Physics Program

- Didactic courses addressing core Medical Physics topics
- Laboratory components
  - As part of several core courses
  - Standalone "Rad Labs"
- 1st year qualifying examination (May, MS or PhD Pass, Re-examine, Fail)
- Wide range of elective courses (by track and outside of Med Phys)
- Prelim exam (defense of PhD research prospectus, R01 format, public+exam)
- Research in broad range of areas
- Clinical exposure options (working with clinical medical physicists)
  - Radiation therapy "teams"
  - Diagnostic imaging physics team
- Dissertation defense and exam plus required separate public seminar
- Typical times: 2 years for (non-thesis) MS plus 4-5 years for PhD

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$\boxed{\text{MS Degree}}$

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University of Wisconsin
School of Medicine & Public Health

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UW Medical Physics Program

- Available Sub-specialization Tracks
  - General – typically taken by those wishing to pursue radiation therapy (research or clinical)
  - Image Science
  - Health Physics – very small number of students
- Tracks allow students to emphasize courses needed during the 1.5 years in order to make progress in their research.
- Minor is required and can be within or outside of the Medical Physics Program
- Individual Development Plans (IDPs) are required
- PhD: Min of 54 credits; MS: Min of 32 credits

UW Medical Physics Program

- The UW Medical Physics Program has defined a core curriculum that satisfies the graduate education requirements specified by CAMPEP standards*. However, the program has an "opt out" option for students who wish to complete degree requirements without taking the full slate of core courses.
- For such programs, CAMPEP accreditation requires identification of students who complete the core curriculum.
- Beginning with students who matriculated in fall 2013, those students who complete the core curriculum will receive a certificate (letter) attesting to such completion.

**Standards for Accreditation of Graduate Educational Program in Medical Physics,* www.campep.org

UW Medical Physics Program

- Breadth and depth of curriculum
  - General Medical Physics & Radiation Therapy
    - Radiological Physics and Dosimetry (501)*
    - Health Physics & Biological Effects (569)*
    - Physics of Radiotherapy (566)*
    - Advanced Radiation Treatment Planning (572)
    - Advanced External Beam Radiotherapy (571)
    - Radiation Physics Metrology (679)
    - Advanced Brachytherapy Physics (570)
    - Monte Carlo Radiation Transport (506)
    - Introduction to Energy-Tissue Interactions (535)
    - Patient Safety and Error Reduction in Healthcare (559)

*Current Core Curriculum

UW Medical Physics Program

- Breadth and depth of curriculum
  - Imaging Science & Nuclear Medicine
    - Medical Image Science: Mathematical and Conceptual Foundations (573)*
    - Imaging in Medicine: Applications (574)
    - Physics of Diagnostic Radiology (567)*
    - Diagnostic Imaging with Non-Ionizing Radiation (MR & US) (578)*
    - Principles of X-ray Computed Tomography (577)
    - Radioisotopes in Medicine and Biology (563)*
    - Advances in Medical Magnetic Resonance (710)
    - Advanced Ultrasound Physics (775)
    - Digital X-Ray Imaging (707)
    - Multi-Modality Molecular Imaging in Living Subjects (719)
    - Microscopy of Life (619)

*Current Core Curriculum

UW Medical Physics Program

- Breadth and depth of curriculum
  - Rad Labs
    - Radiotherapy Physics (661)
    - Diagnostic Radiological Physics (662)
    - Nuclear Medicine Physics (663)
    - Health Physics (664)
    - CT, MRI, and DSA Physics (665)
    - Medical Ultrasound Physics (666)

UW Medical Physics Program

- Breadth and depth of curriculum
  - Associated Courses (selected from wide range of options)
    - Radiobiology (410)
    - Ethics & Responsible Conduct of Research & Practice of Medical Physics (701)*
    - Special topics courses (471) in, for example,
      - Digital Medical Image Management
      - Targeted Radionuclide Therapy
      - Methods for Neuroimaging Research
    - Human Anatomy or Physiology*
    - Courses in biostatistics, medical informatics, *etc*.

*Current Core Curriculum

Financial Support

- Research Assistantship (RA)
  - Most first year students
  - Funding from individual professor research grants / contracts
  - Provides stipend, tuition remission, health insurance
    - Two-level stipend system, with higher rate for "post-dissertator" status
  - Availability of open positions varies
  - Strong, informed interest in the work of the lab is a plus for gaining RA support

Financial Support

- Training Grants
  - Outside department, e.g., *Biotechnology Training Program* & *Neuroscience Training Program*
    - Must be nominated by faculty member and department
  - Med Phys Dept NCI T32 – Research focus must be related to cancer
    - Tim Hall is PI; grant is in its 36th year
    - 10 pre-doc positions; must be at or past prelim exam stage (dissertator status)
    - Competitively awarded through application with specific faculty member
- Department Service Labs
  - Accredited Dosimetry Calibration Lab: Larry DeWerd
  - Diagnostic QA Lab: John Vetter, Frank Ranallo
- Self Funding

Graduates

- ~285 Ph.D. degrees since the department's inception.
- ~125 terminal MS degrees (no thesis required) <= much less common in the past 10 years

Numerous important technologies have been attributed to graduate students and their research

A DIGITAL SUBTRACTED IMAGE OF A CARTOID ARTERY

United States Patent [19]

Mistretta et al.

[11] **4,204,226**

[45] **May 20, 1980**

[54] **REAL-TIME DIGITAL X-RAY TIME INTERVAL DIFFERENCE IMAGING**

[75] Inventors: **Charles A. Mistretta; Robert A. Kruger; Theodore L. Houk**, all of Madison, Wis.

[73] Assignee: **Wisconsin Alumni Research Foundation**, Madison, Wis.

Scanning Video Densitometry–Cardiovascular Imaging and Image Processing, SPIE Publication edited by Harrison et al., 1975, pp. 183–194.

Gilbert et al., A Real Time Hardware System for Digital Processing of Wideband Video Images, IEEE Trans. on Computers, vol. C25, #11, Nov. 1976, pp. 1087–1100.

Numerous important technologies have been attributed to graduate students and their research

United States Patent [19] | [11] **4,277,367**

Madsen et al. | [45] **Jul. 7, 1981**

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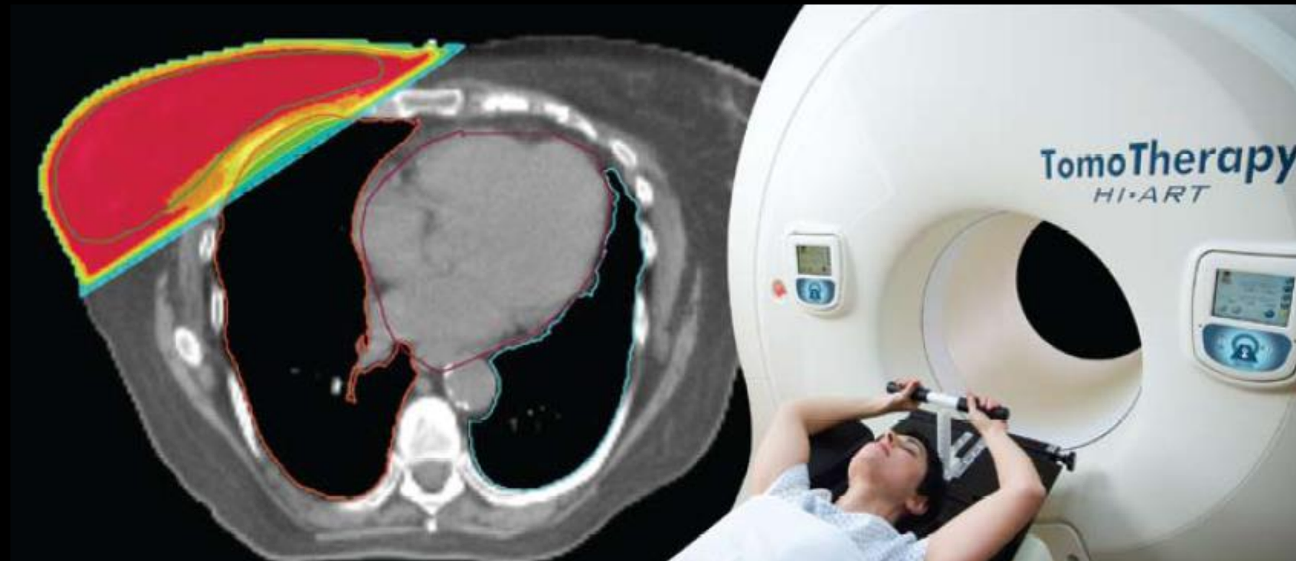
[54] **PHANTOM MATERIAL AND METHOD**

[75] Inventors: **Ernest L. Madsen; James A. Zagzebski; Richard A. Banjavic; Michele M. Burlew**, all of Madison, Wis.

OTHER PUBLICATIONS

Edmonds et al., "A Human Abdominal Tissue Phantom", pp. 323–326, 1979, NBS Spec. Pub. 525.
Fay, "Studies of Inhomogeneous Substances by Ultrasonic Back–Scattering", Ultrasound in Med. & Biol.,

Numerous important technologies have been attributed to graduate students and their research



US005528650A

United States Patent [19]

Swerdloff et al.

[11] **Patent Number: 5,528,650**

[45] **Date of Patent: Jun. 18, 1996**

[54] **METHOD AND APPARATUS FOR RADIATION THERAPY**

[76] Inventors: **Stuart Swerdloff**, 2309 Upham St., Madison, Wis. 53704; **Thomas R. Mackie**, 2310 Ravenswood Rd., Madison, Wis. 53711; **Timothy Holmes**, 12 Coronado Ct. #2, Madison, Wis. 53705

5,394,452 2/1995 Swerdloff et al. 378/65

OTHER PUBLICATIONS

Calculation and Application of Point Spread Functions For Treatment Planning With High Energy Photon Beams, Ahnesio et al., Acta Oncol. 26:49–56; 1987.
Methods of Image Reconstruction From Projections Applied to Conformation Radiotherapy, Bortfeld et al., Phys. Med. Biol. 35(10), 1423–1434; 1990.

Career Paths

- UW-Madison medical physics program graduates have gone on to a very wide range of subsequent additional training programs and careers.
- Additional training / education programs:
  - Postdoctoral fellowships
  - “On the job training” junior medical physics positions
  - Medical physics residency programs (therapy and imaging)
- Careers
  - Academia
  - Industry
  - Entrepreneurs
  - Clinical medical physics positions in academic health centers, hospitals, consulting groups

Challenges & Questions

- Funding: Given continued limited federal research funding and, for basic science departments in state universities, ever decreasing school fund allocations, how might medical physics programs best diversify funding sources to sustain faculty/staff and innovative research programs?
- Research: How do we best diversify our medical physics research portfolio? (Not abandoning the medical physics "roots" of radiology, radiation oncology and "technology push", but expanding beyond these approaches, *e.g.*, interdisciplinary PS-OC approach, multi-scale / -modality imaging, modeling biological systems, "biological application pull".)

Challenges & Questions

- Curriculum: How do we best balance an ever-expanding, conventional medical physics "core curriculum" with more novel, interdisciplinary curriculum opportunities and/or increased depth of research and course content?
- Research Training: How do we best communicate the importance of research training that is diversified, innovative, and impactful within our medical physics scientific and professional societies and beyond?
- Residencies: Will there be sufficient (sustainable) residency slots for innovative students who wish to practice clinical medical physics in addition to research? How do we best maintain an emphasis on research and critical thinking skills within our residency programs?

Acknowledgments

- Jim Zagzebski, PhD
- AAPM FUTURE Working Group
- The dedicated faculty at both the UW-Madison and UT MD Anderson Cancer Center Graduate Education Programs

- You, for listening and for contributing to stimulating and fruitful discussions later this morning!

Society of
Directors of
Academic
Medical
Physics
Programs

DUKE UNIVERSITY
MEDICAL PHYSICS
GRADUATE PROGRAM

Duke University Medical Physics Research Education

James T. Dobbins III, PhD, FAAPM

Director, Medical Physics Graduate Program
Professor of Radiology, Biomedical Engineering, and Physics

Role of research training in an era of increasing clinical activity by medical physicists

- In the past 30 years, medical physics has become an increasingly professional discipline
  - Greater involvement of physicists in the clinic
  - More systematic and consistent clinical training (residencies)
  - Greater acceptance by physician colleagues as part of “care team”
  - Still work to be done, but much progress has been made
  - This has been a great success
- However, we must not abandon our roots as an engine of creativity in advancing medical science (i.e., research)
- MS and DMP students are adequately trained for a wide array of clinical careers; PhD students should be those whose passion is to do research and academic work (along with potential clinical activities)
- At Duke, research is an important part of the training of both MS and PhD students

Key features of Medical Physics at Duke

- CAMPEP accredited graduate program and residencies
- Collaborative effort of 5 departments, 3 schools
- Balanced PhD and M.S. degree programs
- Curriculum that encompasses all four subdisciplines of medical physics (DI, RT, NM, MHP)
- Emphasis on interdisciplinarity
- Large, diverse faculty
- Strong track record of Medical Physics research (over $120 million in external research funding in 30 yrs)
- A focus on both blue-sky research and clinically-driven research
- Clinical and research facilities on one campus

Structure of the graduate program at Duke

Medical Physics Faculty

1 MD/PhD

4 MD

Radiation Oncology

- Justus Adamson, Ph.D.
- James Bowsher, Ph.D.
- Jing Cai, Ph.D.
- Zheng Chang, Ph.D.
- Oana Craciunescu, Ph.D.
- Shiva Das, Ph.D.
- Mark Dewhirst, DVM, Ph.D.
- John Kirkpatrick, M.D., Ph.D.
- Jennifer O' Daniel, Ph.D.
- Mark Oldham, Ph.D.
- Haijun Song, Ph.D.
- Zhiheng Wang, Ph.D.
- Jackie Wu, Ph.D.
- Quiwen Wu, Ph.D.
- Hui Yan, Ph.D.
- Fang-Fang Yin, Ph.D.
- Sua Yoo, Ph.D.

Radiology

- Cristian Badea, Ph.D.
- Gerald Bida, Ph.D.
- H. Cecil Charles, Ph.D.
- Nan-Kuei Chen, Ph.D.
- Bennett Chin, M.D.
- James Dobbins, Ph.D.
- Bastiaan Driehuys, Ph.D.
- Don Frush, M.D.
- G. Allan Johnson, Ph.D.
- Anuj Kapadia, Ph.D.
- Chunlei Liu, Ph.D.
- Joseph Lo, Ph.D.
- James MacFall, Ph.D.
- Neil Petry, M.S.
- James Provenzale, M.D.
- Ehsan Samei, Ph.D.
- Paul Segars, Ph.D.
- Allen Song, Ph.D.
- Leonard Spicer, Ph.D.
- Martin Tornai, Ph.D.
- Trong-Kha Truong, Ph.D.
- Timothy Turkington, Ph.D.
- Ganesan Vaidyanathan, Ph.D.
- Michael Zalutsky, Ph.D.

Radiation Safety (OESO)

- Rathnayka Gunasingha, Ph.D.
- Robert Reiman, M.D.
- Terry Yoshizumi, Ph.D.

Biomedical Engineering

- Joseph Izatt, Ph.D.
- Steve Smith, Ph.D.
- Gregg Trahey, Ph.D.
- Adam Wax, Ph.D.

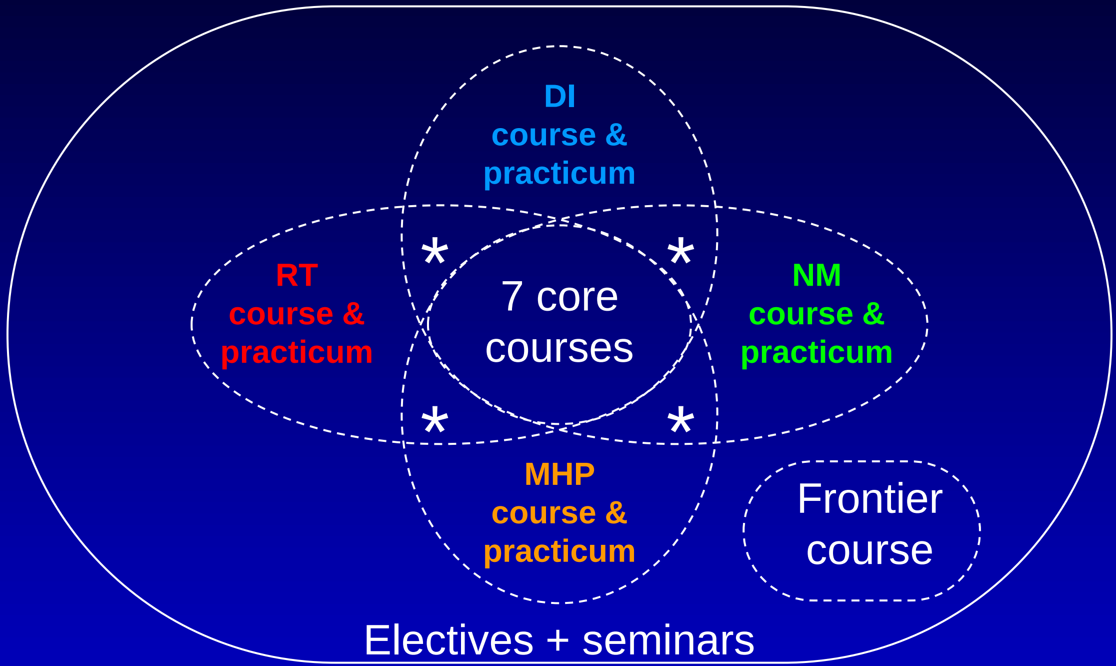
Physics

- Calvin Howell, Ph.D.
- Ying Wu, Ph.D.

Curriculum structure

MS:
35 cr. hrs
+ 6 cr. hrs. research

PhD:
41 cr. hrs



* 1 minor-track course

Core courses:

MPH 500. Radiation physics
MPH 505. Anatomy and physiology for medical physicists
MPH 710. Radiation protection
MPH 720. Therapeutics medical physics
MPH 530. Diagnostic medical physics
MPH 541. Nuclear medicine physics
MPH 507. Radiation Biology

Components of research training at Duke

Research areas in Medical Physics at Duke

Diagnostic Imaging Physics

- Advanced digital applications
- Advanced CT imaging and tomosynthesis
- Ultrasound
- Magnetic resonance imaging/microscopy
- Neutron-stimulated tomography
- Modeling and perception
- Computer aided diagnosis
- Detector and display characterization
- Digital mammography

Radiation Oncology Physics

- IMRT
- 3D treatment planning
- Stereotactic radiosurgery
- Knowledge-based treatment planning
- Image-guided radiation therapy
- 3D dosimetry, novel optical CT dosimeters
- Charged particle therapy
- 4D CBCT

Nuclear Medicine Physics

- Monoclonal antibody imaging and therapy
- Molecular imaging
- PET imaging
- SPECT imaging
- Transmission/emission functional imaging
- Detector design
- Small animal imaging

Medical Health Physics

- Dose reduction in imaging
- New models of organ dosimetry
- Phantom design
- Novel dosimeters
- Radiation safety for national security

Research for MS students

- Thesis option (95%+ have taken the thesis option)
- Thesis requires 6 credit hours of research
- Students declare a “major” track and select an advisor by end of second semester
- Students encouraged to start thesis research in second semester but many begin in earnest in third
- $1500 scholarships available for some students to stay in Durham over summer to work on thesis
- MS students encouraged but not required to do interdisciplinary thesis
- MS Students strongly urged to submit a manuscript
- Exit interviews have shown that connection with research advisor was most important contributor to positive experience in grad school

Philosophy of research training for MS students

- Thesis research is an essential component of teaching critical thinking skills; even though MS students will not likely have a research career, it is essential that they learn critical thinking
- Research training teaches how to problem solve, which will be useful in the clinic
- The rigor of the thesis causes the students to see that they can “dig deep” and learn to focus and overcome obstacles
- Thesis research projects often allow MS students further experience with clinical equipment that will aid their transition to a residency
- The weakness of the thesis model is that the limited time of an MS degree means students will only get a “taste” of research and may not appreciate the full challenge of a long project

Example MS theses (2013)

- DI — Diffusion Tensor Imaging Biomarkers of Stem Cell Therapy Efficacy in Pediatric Cerebral Palsy
- DI — Neutron Stimulated Emission Computed Tomography: Optimization of Acquisition Parameters Using Resolution and Dosimetry in the Context of Breast and Liver Cancers
- HP/NM — Use of a Novel Detector to Measure Occupational and Non-Occupational Doses in PET/Nuclear Medicine and Characterization of MOSFET Detectors against Effective Energy
- RT — Adaptive Stereotactic-Body Radiation Therapy (SBRT) Planning for Lung Cancer
- NM/RT — The Effects of PET Reconstruction Parameters on Radiotherapy Response Assessment and an Investigation of SUV-Peak Sampling Parameters
- RT — Knowledge-Based IMRT Treatment Planning for Bilateral Head and Neck Cancer
- DI/NM — Feasibility of Weighted Dual-Energy Subtraction Using Quasi-Monochromatic Beams for a Dedicated Mammotomography System

Research for PhD students

- Dissertation research does not have a designated number of credit hours of research
- Students declare “major” and “minor” tracks and select an advisor by end of second semester
- PhD students strongly encouraged to do lab rotations (~3); may start on day one with an advisor, though most declare at end of second semester
- PhD students encouraged but not required to do interdisciplinary dissertation
- PhD students expected to submit at least one manuscript (usually 2-3)
- Supported opportunities for PhD students to travel to other labs for several months of work relevant to dissertation

Philosophy of research training for PhD students

- For PhD students, critical thinking is an essential skill that can only be developed by doing independent research
- The goal of PhD training is to produce independent scientists; many may have a clinical component to their jobs but research should be an essential part of their career trajectory
- Research is essential to train PhD students to become scholars and advance the field
- We encourage PhD students to find interdisciplinary components to their dissertation because biomedical research is becoming increasing multi-disciplinary
- We expect some of our PhD graduates to become academic medical physicists and so we train accordingly; we encourage creativity and blue-sky thinking

NIH training grant for PhD students

- NIH T32 training grant, 2007-12; 4 slots per year
- Emphasis: cross-disciplinary training in medical physics
- Each trainee ***required*** to have a dissertation combining at least two subdisciplines; major and minor academic tracks
- Mentor and co-mentor from different tracks, MD co-mentor
- $1000 travel allowance per year
- 3-6 month off-site training opportunities anywhere in the world

Example PhD dissertations

RT	• Drug delivery and anti vascular effects of thermally sensitive liposomes loaded with doxorubicin
DI/NM	• Investigating Quality and Quantification of Functional Breast Images with a Dedicated SPECT-CT System
RT/NM	• On-board Single Photon Emission Computed Tomography (SPECT) for Biological Target Localization
DI	• Light scattering and absorption spectroscopy in three dimensions using quantitative low coherence interferometry for biomedical applications
RT/DI	• On-Board Imaging of Respiratory Motion: Investigation of Markerless and Self-sorted Four-Dimensional Cone-Beam CT
DI	• Correlated Polarity Noise Reduction: Development, Analysis and Application of a Novel Noise Reduction Paradigm
RT	• Quantitative 3D Optical Imaging: Applications in Dosimetry and Biophysics
DI	• Predicting Task-Specific Performance for Iterative Reconstruction in Computed Tomography

Theses/dissertations by track (2006-2014)

	MS	PhD
DI:	42%	64%
RT:	60%	73%
NM:	11%	23%
MHP:	15%	14%
Interdisciplinary:	28%	68%

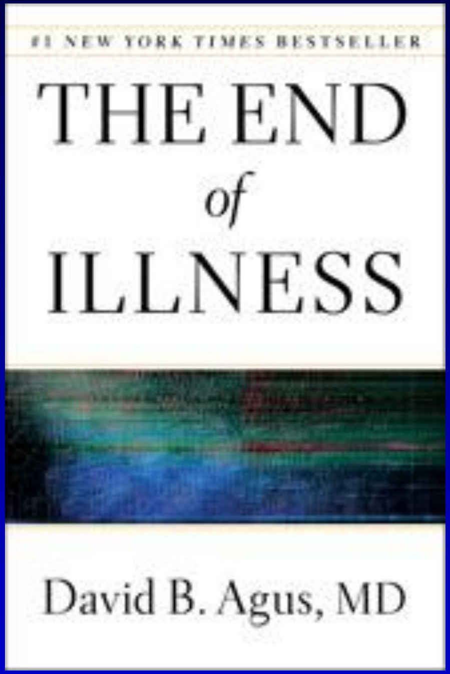
Intangible benefits of research training

Long-term success in careers …

- Students obviously have to master the material, but …
- Outcomes research has shown that intangible characteristics like "grit" are more reflective of a student's overall likelihood to succeed in life
- Necessary intangible attributes for success of scientists:
  - Determination
  - Critical thinking
  - Persistent curiosity
  - Willingness to forego immediate reward for longer term satisfaction
  - Creativity
- All of these things are enhanced by participating in research in a way that didactic learning cannot provide
- Our research training must cultivate these traits in addition to teaching "lab skills" and "head knowledge"

Reflections on the future of graduate research training

Future of medical physics as a field



Medicine is moving towards personalized, prospective, molecular dx and tx

With blood markers for cancer, heart disease – role for imaging?

With molecular therapies – role for radiation therapy?

Likely that role of clinical medical physicists will change substantially in next 20-30 years

What will be role of physics in biomedical research in 30 years?

The evolving role of physics in medicine

- Of the physical sciences, physics has had one of the most profound impacts on medicine for the past 100 years (x-ray, CT, MR, nukes, rad tx)
- Going forward, biologists and chemists are likely to be the project leaders
- What role will physics play?
- We are exceptionally good at blue-sky thinking, finding creative solutions, understanding complex systems, and building devices
- What will be the “next PET” or “next MRI” or “next IMRT”? How will these fit into molecular medicine? Global disparities in healthcare?

The changing “scale” of biomedical science: from nuclear/atomic to molecular/nano

- The “golden era” of physics in medicine has highlighted physical processes at nuclear/atomic scales (MR, PET, x-ray) or at anatomical scales (recon algorithms)
- Going forward, a lot of medicine will be at molecular (“-omics”) or nano scales
- We need to explore physics at these scales and involve our students in that work

Efforts at defining the future

- WG on Future Research and Academic Medical Physics (Robert Jeraj, Thomas Bortfeld)
- President's Symposium, 2013 (Hazle): "Medical Physics in the age of genomic medicine"
- President's Symposium, 2014 (Bayouth): "The necessity of innovation in medical physics"
- Despite these efforts, many MPs are still uninformed about these issues

Actions need for “future of medical physics”

- Define “Grand Challenges” of biomedical research that physics can address
- Explore interdisciplinary bridges with groups not traditionally associated with MP, such as molecular biology, biochemistry, biophysics
- Investigate the role for physicists in informatics / “big data”
- Determine educational needs to train for research of the future

We must take the initiative …

We should not abandon our current strengths and "core business" of graduate and residency training.

However, we, as program directors, must take an active role in preparing our students for inevitable changes in the role of physics in medicine; otherwise, we risk becoming a field with a past but not a future.

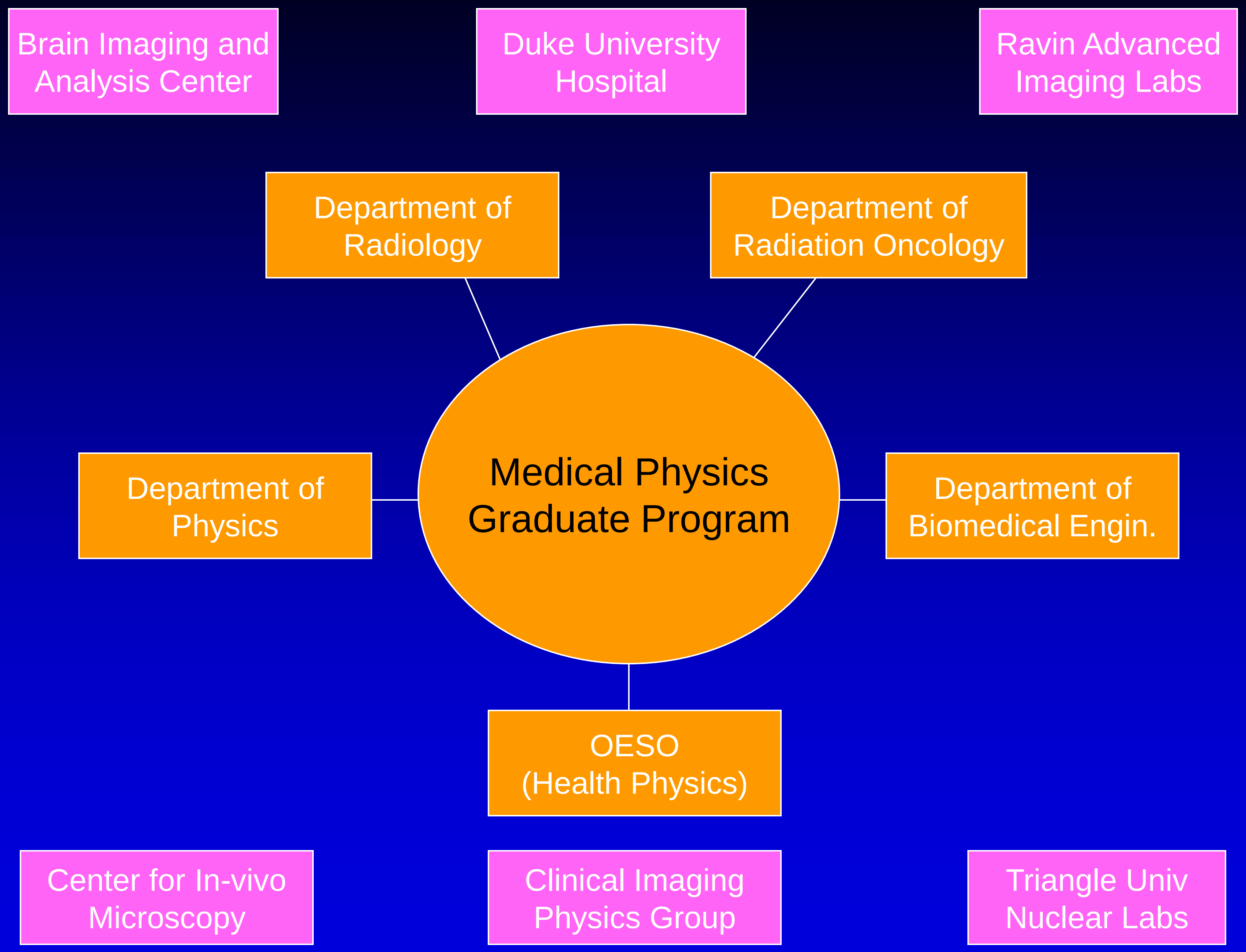
This involves preparing students for clinical work of the future (after it is defined) and providing them with research opportunities to help shape the future.

Thank you

medicalphysics.duke.edu

Jim Dobbins, PhD
james.dobbins@duke.edu

DUKE UNIVERSITY
MEDICAL PHYSICS
GRADUATE PROGRAM



Brain Imaging and Analysis Center
Duke University Hospital
Ravin Advanced Imaging Labs
Department of Radiology
Department of Radiation Oncology
Department of Physics
Medical Physics Graduate Program
Department of Biomedical Engin.
OESO (Health Physics)
Center for In-vivo Microscopy
Clinical Imaging Physics Group
Triangle Univ Nuclear Labs

The medical physics family at Duke

- 59 students total in 2013-14
  - 34 MS total, 25 PhD total
  - 17 MS, 6 PhD (entering class, Fall 2013)
- 50 regular faculty members
  - Radiology, Radiation Oncology, Radiation Safety, Biomedical Engineering, Physics
- 1 emeritus faculty, 1 adjunct faculty, 3 educational affiliates
- 2 staff members

Additional training features

- Frontiers of Biomedical Sciences course
- Varian treatment planning workstations
- Student travel allowance ($500) for presenting at a scientific meeting
- Up to $2000 support per student for MS thesis equipment, supplies
- Global outreach: new Duke Kunshan University graduate program in medical physics

Key leadership opportunities for students

- Student representative on Administrative Council
- Student Advisory Board
- Graduate and Professional Student Council representative
- Leadership forum for training in leadership
- Mentoring program
- Newsletter editorship
- Alumni association

Success in Graduate School …
(what we tell our students)

- You are ultimately responsible for your own learning
- Classes are less important than in undergraduate schooling
- Grades don’t really matter (unless you get a bad one!)
- The main point of graduate school is not to learn facts, but to learn how to think
- Focus on your research/scholarship – that’s where you learn to think
- Prepare well for your major exams (qualifier, prelim)
- Get to know your fellow students -- you will learn from them as well as from your professors
- Learn to be professional and responsible
- Have the mindset of making the world a better place

A Canadian Model of MP Research Education

D.A. Jaffray

Princess Margaret Cancer Centre
Techna Institute/Ontario Cancer Institute
University Health Network
University of Toronto
Toronto, Ontario, CANADA

UNIVERSITY OF TORONTO
FACULTY OF MEDICINE

TECHNA

UHN
Toronto General
Toronto Western
Princess Margaret
Toronto Rehab

How it works (or doesn't) in Ontario and some suggestions.

D.A. Jaffray

Princess Margaret Cancer Centre
Head, Radiation and Imaging Physics
University Health Network
University of Toronto
Toronto, Ontario, CANADA

UNIVERSITY OF TORONTO
FACULTY OF MEDICINE

TECHNA

UHN
Toronto General
Toronto Western
Princess Margaret
Toronto Rehab

Acknowledgements

Jean-Pierre Bissonnette, Ph.D.

Director, Radiation Physics Residency Program

Dept. of Radiation Oncology, University of Toronto

Jerry Battista, Ph.D.

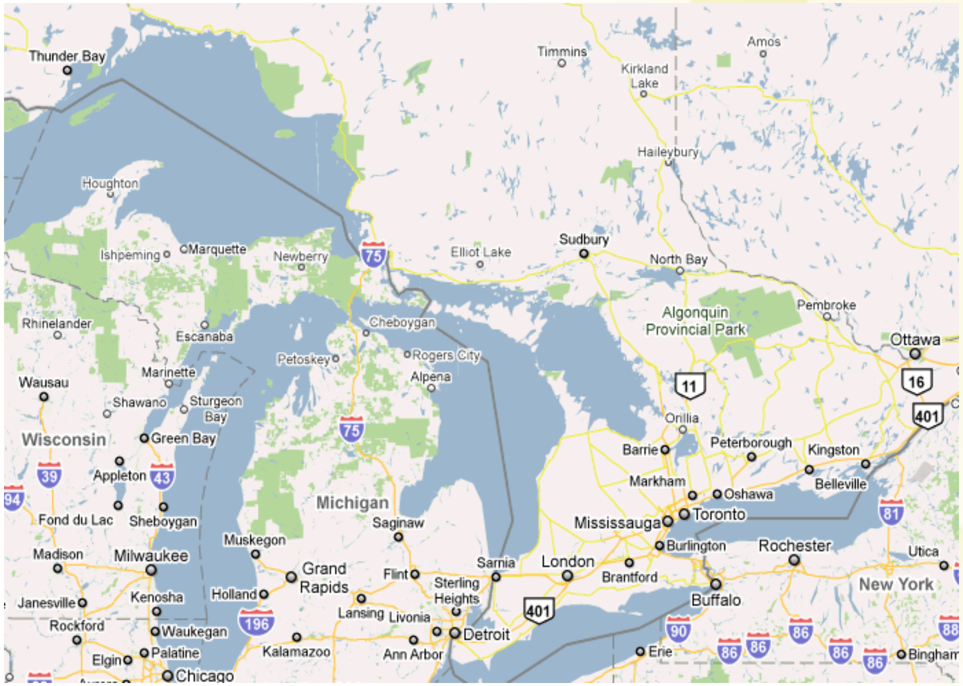
Lead, CCO Medical Physics Residency

Dept. of Oncology and Medical Biophysics

Ontario's Medical Physics Staffing Guidelines

(Radiation Oncology)

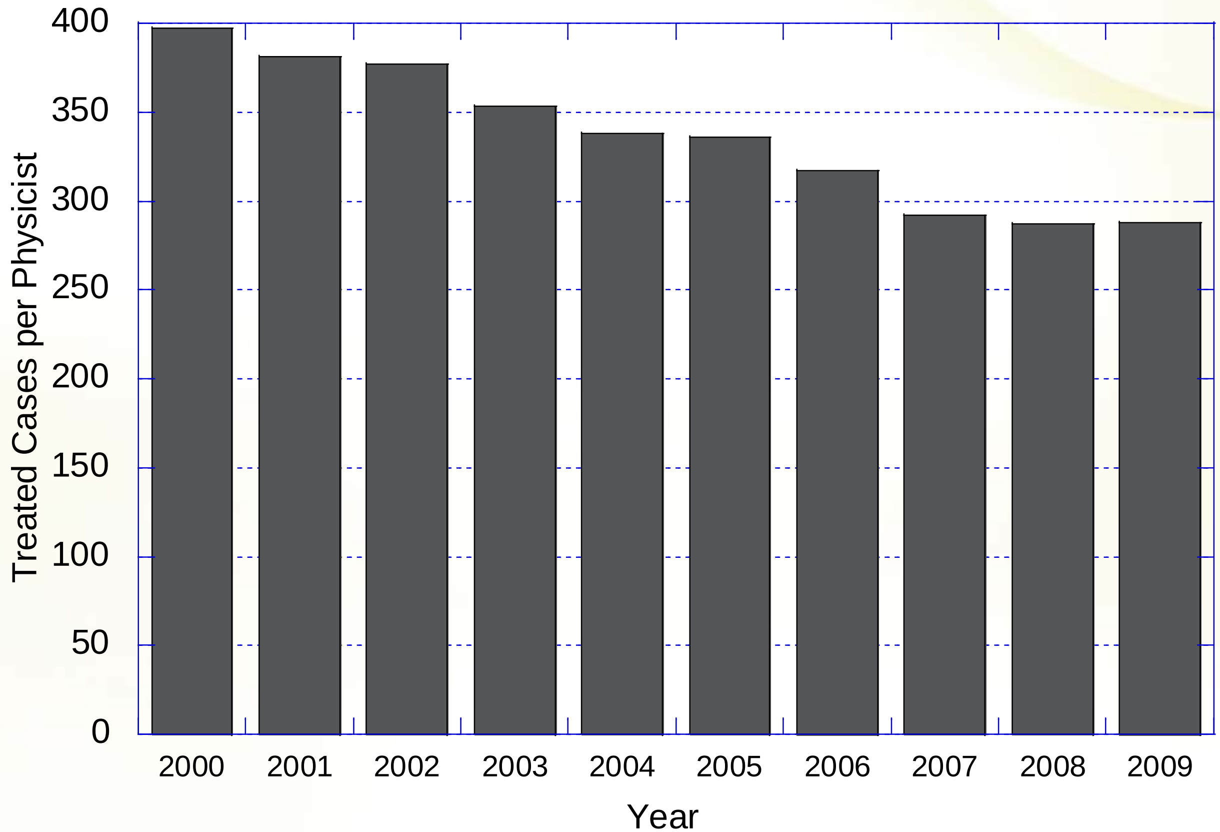
Jerry Battista
Brenda Clark
Michael Patterson
Luc Beaulieu
Michael Sharpe
John Schreiner
Miller MacPherson
Jake Van Dyk



PPAC - 2011

cancer care ontario | action cancer ontario

Ontario Technological Burden



Medical physics staffing for radiation oncology: a decade of experience in Ontario, Canada.
Battista JJ, et al.
J Appl Clin Med Phys. 2012 Jan 5;13(1):3704

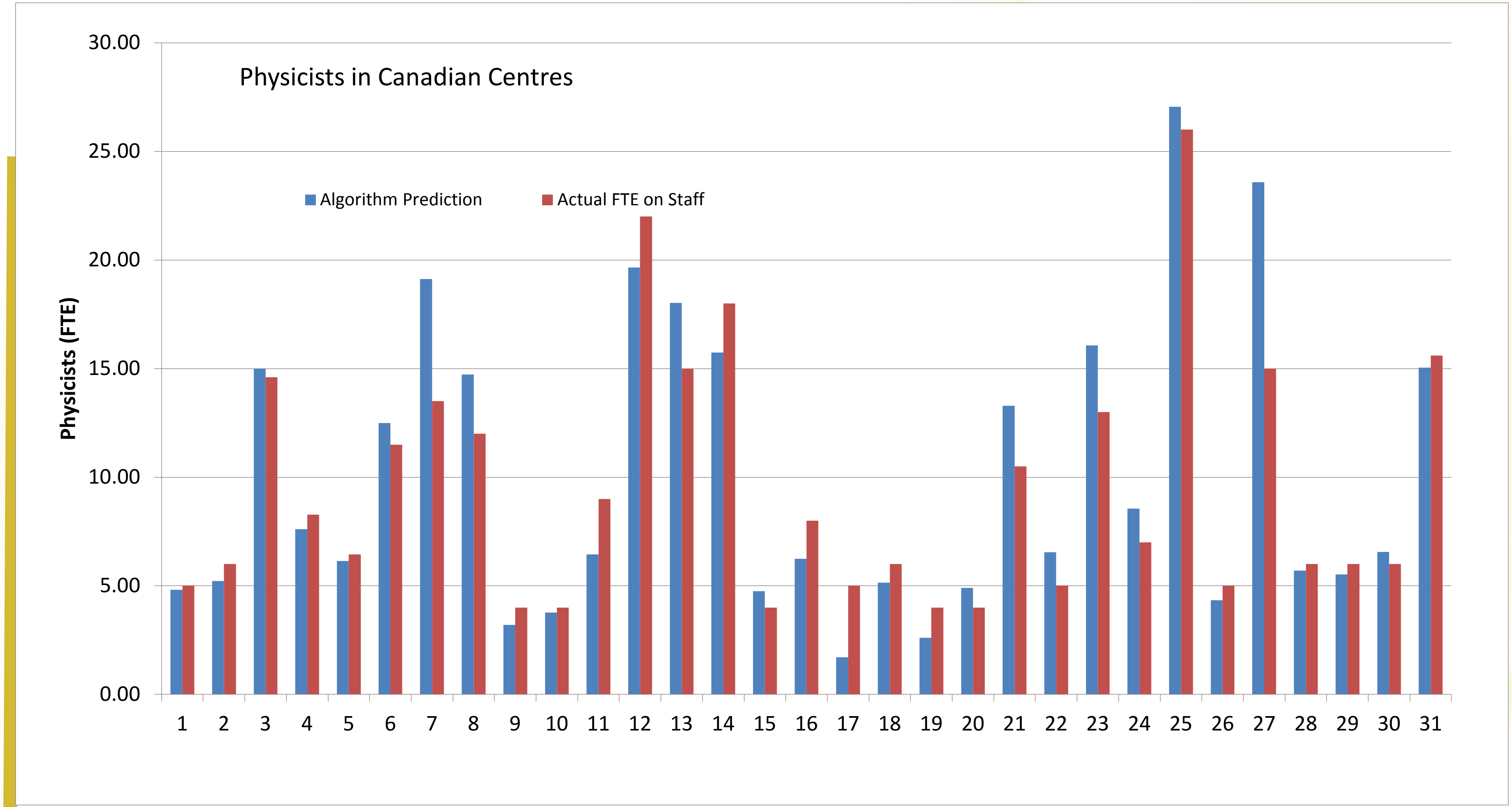
Staffing Algorithm 2011
(for local Centre Planning)

ITEM	WORKLOAD	FTE Weighting Factor					
		Physicist	Physics Assistant	Dosimetrist	Engineering		IT Support
					Electronics	Mechanical	
CLINICAL PROCEDURES and SERVICES							
All radiation beam/source therapy - includes external beam therapy and brachytherapy	1000.00	0.50	0.20	2.00		0.20	0.10
Complexity bonus increment for inverse IMRT including tomotherapy, clinical trial protocols, gated beams, 4D plans, multi-modality image fusion (cases/yr) .	100.00	0.15		0.30			0.10
External beam - special procedure bonus increment (total body X or electron, radiosurgery) (cases/yr)	100.00	0.50	0.25	0.10		0.10	
Brachytherapy - LDR or HDR (fractions/yr)	100.00	0.20	0.05	0.04			
Brachytherapy - interstitial seed implants (cases/yr)	100.00	0.50	0.20	0.20			
RADIOTHERAPY EQUIPMENT SUPPORT							
Accelerators (all linacs, including tomotherapy and robotic linacs)	1.00	0.20	0.30		0.30	0.10	
Major ancillary RT equipment: TPS (1 per vendor per 10 workstations), PET-CT, MR-Sim, 4D CTsim, HDR	1.00	0.10	0.05		0.20	0.05	0.10
Minor ancillary RT equipment: X-ray Sim, CT-Sim, LDR unit, Cobalt unit, Gamma Knife, orthovoltage unit, ultrasound unit, gating/motion monitoring device	1.00	0.05	0.03		0.10	0.05	
TRAINING and EDUCATION of specialists							
Radiation Oncology Residents*	1.00	0.11		0.05			
Radiation Therapy Students	1.00	0.02		0.05			
Clinical Physics Residents**	1.00	0.20		0.05			
Medical Physics Graduate Students	1.00	0.10					
SubTotals		2.63	1.08	2.79	0.60	0.50	0.30
Physics Administration (Chief, Radiation Safety Officer)***		0.39					
Clinical development (20%), conference attendance, courses, site visits	0.25	0.75					
Time away for paid holidays and vacation (FTE per employee)	0.10	0.30	0.11	0.28	0.06	0.05	0.03
Total required staff of each type		**4.07**	**1.18**	**3.07**	**0.66**	**0.55**	**0.33**

Table 3

cancer care ontario | action cancer ontario

Staffing Algorithm Predictive Power
Trans-Canada Survey

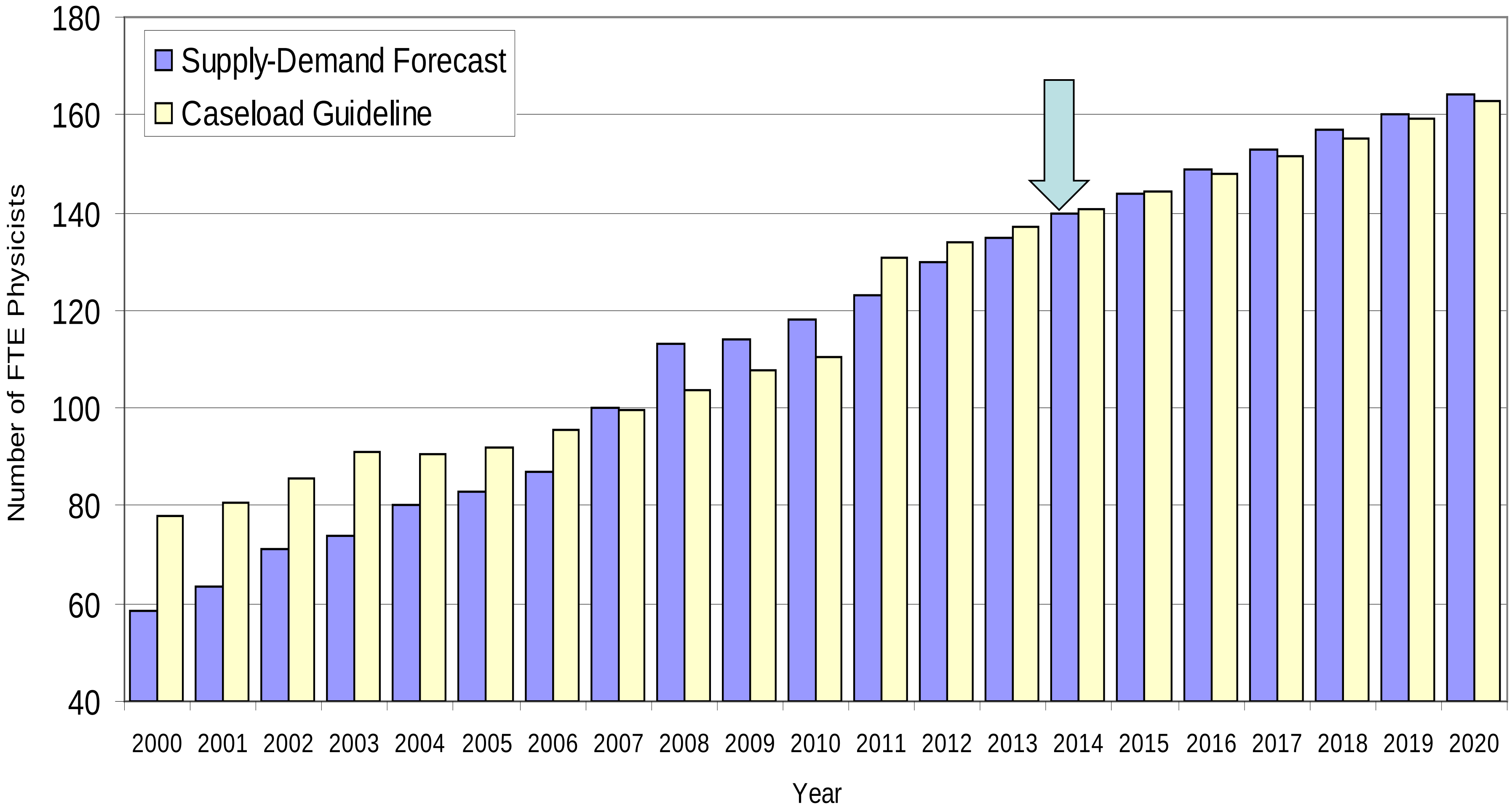


cancer care ontario | action cancer ontario

Clinical Physicist Forecasting to 2020

2.5% growth in incidence, no growth in RT utilization

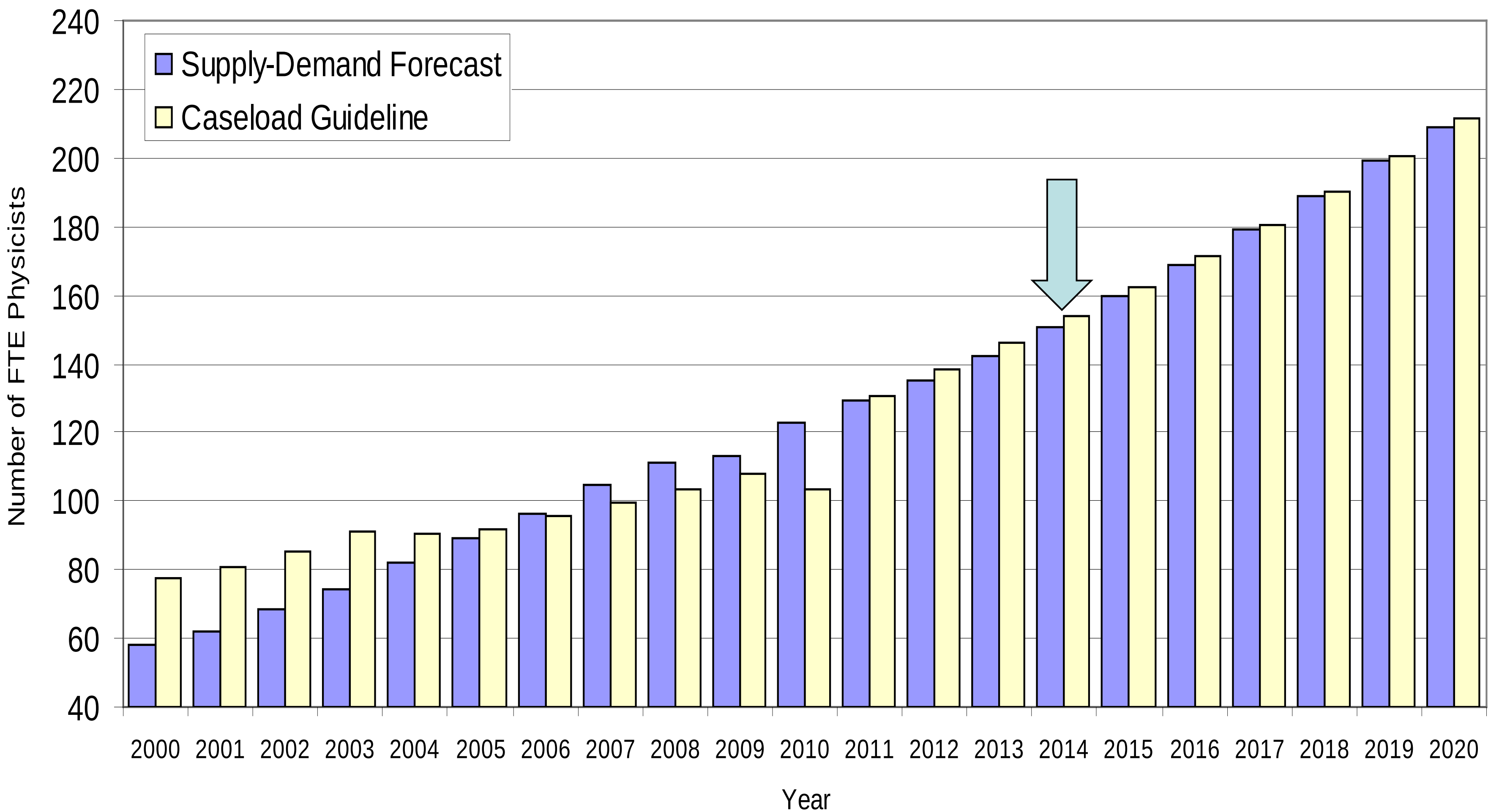
New FTE Guideline in 2011



Clinical Physicist Forecasting to 2020

2.5% growth in incidence, 3% growth in RT utilization

New FTE Guideline in 2011



Ontario Medical Physics Residency Programs

- Funding through Ministry of Health and Local Institutions
  - Approximately 20 positions across the province
- Five residency programs (London, Toronto, Ottawa, Hamilton, Kingston).
- Three of them are CAMPEP accredited.
  - Push back from Medical Biophysics Programs and Graduate Schools
    - Re: training professions vs scientists.
  - Charging professional tuition vs graduate tuition.
- Total of 8 CAMPEP accredited in Canada

University of Toronto – Medical Physics Residency Program

- Produce highly qualified and competent health professionals
  - Comprehensive understanding of clinical physics
  - Radiation therapy and radiation oncology practice
  - Enhanced leadership, research & teaching skills

University of Toronto – Medical Physics Residency Program

- Housed within the Department of Radiation Oncology in the Faculty of Medicine
- CAMPEP Accredited
  - Radiotherapy Physics Residency Program
- Total Medical Physics Faculty: 37
- Interlaced with Radiation Oncology Medical Residency Program

University of Toronto – Medical Physics Residency Program

	University of Toronto **DRO / IMS**	
	Ryerson University **Medical Physics**	
	University of Toronto **Medical Biophysics**	
Physics Depts. University of Toronto York University Ryerson University		

Undergraduate	Graduate	Residency	Fellow	Job
3-4 years	M.Sc. | Ph.D.	2 years		

Career Path

University of Toronto – Medical Physics Residency Program

Princess Margaret Hospital

Cancer Care Ontario/MOH ($$$)

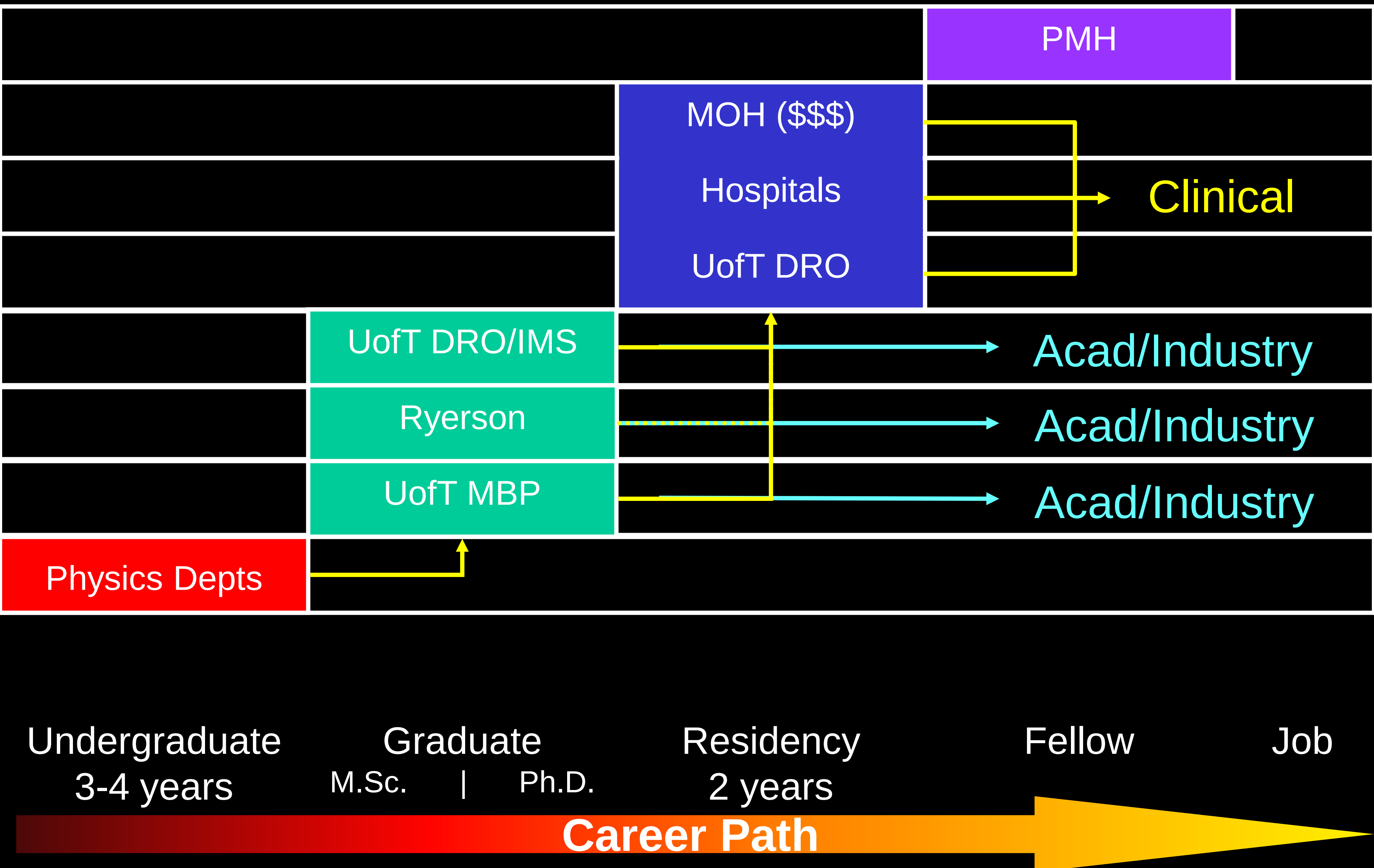
PMH (5)
Sunnybrook (3)
Affiliates (3)

University of Toronto
Radiation Oncology

Undergraduate	Graduate	Residency	Fellow	Job
3-4 years	M.Sc. | Ph.D.	2 years		

Career Path

University of Toronto – Medical Physics Residency Program



University of Toronto – Medical Physics Residency Program

- 5 sites in the greater Toronto area
- 10 resident positions

- Multidisciplinary direction
- Attainment of core competencies
  - Clinical rotations
  - Projects
- Inter-professorial faculty
- Mentorship
- Clinical research project

University of Toronto – Medical Physics Residency Program

- Residents are supported by employment
  - Funded by Cancer Care Ontario/MOH and hospitals
  - Citizen or landed immigrant status required at start of program

- 2 year program
  - Clinical and QA rotations at each site
  - Residents travel to sites offering unique rotations or technology (Tomotherapy, Gamma Knife, MR-sim, teaching, professionalism, etc.)

University of Toronto – Medical Physics Residency Program

- Intake
  - Subject to CAMPEP entry requirement
  - Program is very attractive
    - Largest program in Canada
    - State-of-the-art technology
    - Strong research programs for residents
  - Entry is competitive (~30% interview)
  - Matching model for placement across sites.

Resident Intake, 2006-2012

• University of Toronto	15
• University of Western Ontario	3
• University of Alberta	2
• University of Manitoba	2
• McMaster University	2
• Other Canadian	3
• International	2

Resident Intake, 2010-2012

• University of Toronto*	1
• University of Western Ontario	2
• University of Alberta	2
• University of Manitoba	2
• McMaster University	1
• Other Canadian	2
• International	1

* Medical Biophysics graduate program not CAMPEP accredited.

University of Toronto – Medical Physics Residency Program

- Research Opportunity for Resident
  - Nominal 20% research activity
  - Supervised, preferably in context of peer-reviewed funding
  - Publication expected outcome, but not mandatory
  - Topic selection guided, but not directed
    - Align with skills but try to expose to ‘clinical research challenges’

Are we teaching the right topics at the right time in the right way to meet the needs of contemporary medical physics in 2014?

That depends.

What does a large clinical and academic program look for in a Medical Physics recruit?

Medical Physics Employment
Princess Margaret Cancer Centre

- CCPM or Equivalent Certification
- Combined Clinical Support/R&D Model (80/20)
- Expected to be appointed at the level of Assistant Professor (30% Research/Education)
  - Publications/Aptitude/Skills
  - 3-yr Performance Review
    - Publications, Independence, Grant Funding
- Support for grant writing and educational development.
  - Hospital and University
  - Time/Skills Development/Mentorship

Radiotherapy physicists have become glorified technicians rather than clinical scientists

Howard I. Amols, Ph.D.
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(Tel: 212-639-6807; E-mail: amolsh@mskcc.org)

Frank Van den Heuvel, Ph.D.
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Colin G. Orton, Ph.D., Moderator

(Received 1 January 2010; accepted for publication 4 January 2010; published 9 March 2010)

OVERVIEW

With the advent of the requirement for graduation from an accredited medical physics residency program in order to become certified and the emergence of Doctorate in Medical Physics, there has been some concern that radiotherapy physicists are becoming more like "trained" professionals, or even "glorified technicians," than "educated" scientists. This is the concern debated in this month's Point/Counterpoint.

Arguing for the Proposition is Howard I. Amols, Ph.D. Dr. Amols was awarded his Ph.D. in Physics by Brown University in 1974. He then became an NCI postdoctoral fellow at Los Alamos Laboratory and subsequently has held professional positions in therapy physics at the University of New Mexico, Brown, and Columbia Universities, and (according to him) used to be a

Ph.D. in Physics from the Fr
main interests lie in patient a
rating radiobiological models
ing computers to make his lif

FOR THE PROPOSITION:

Opening Statement

Unlike most Point/Counte
the pros and cons of somethi
not useful, etc.), this column i

Active and lively discussion about the future of our field – glorified technicians or clinical scientists?

The Profession

National Institutes of Health Funding in Radiation Oncology: A Snapshot

Michael Steinberg, MD, William H. McBride, PhD, DSc, Erina Vlashi, PhD, and Frank Pajonk, MD, PhD

Department of Radiation Oncology, David Geffen School of Medicine at University of California, Los Angeles (UCLA), and

The majority of grants were awarded to radiation biology (n = 156, 79.2%); 26 awards (13.2%) had a physics topic, and only 15 awards (7.6%) were clinical investigations.

The total amount of active NIH funding for radiation oncology/biology/physics projects for FY 2013 was $85,511,067 (direct plus indirect costs), with an average award size of $449,294 ± $537,065.50.

NIH currently supports investigators with $30.9 billion annually through more than 50,000 grants, with an estimated $5.4 billion spent on cancer in FY 2013. This suggests that less than 0.3% of NIH-funded PIs are working in the field of radiation oncology, and radiation oncology secures only 1.6% of the funding provided for cancer research by the NIH.

The British Journal of Radiology, *84* (2011), 485–498

HOUNSFIELD REVIEW SERIES

The physical basis and future of radiation therapy

[1]T BORTFELD, PhD and [2]R JERAJ, PhD

[1]*Department of Radiation Oncology, Massachusetts General Hospital and Harvard Medical School, Boston, USA, and* [2]*Department of Medical Physics, University of Wisconsin, Madison, USA*

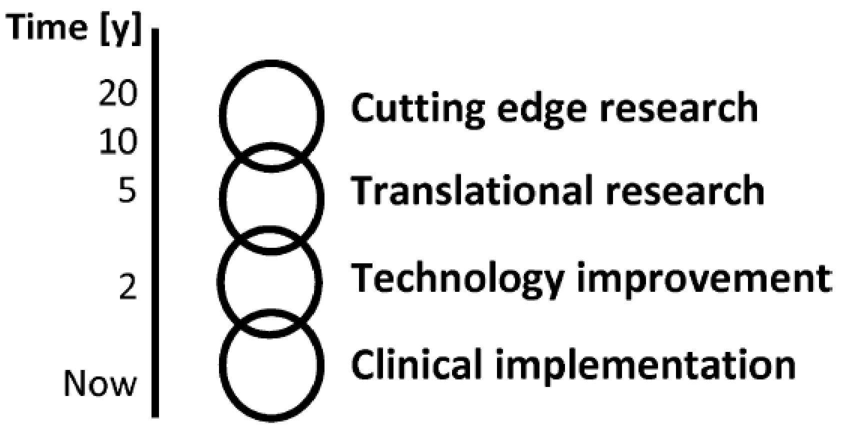

Figure 3. Optimal medical physics chain. Each of the links should be equally strong for optimal development of the medical physics field. Weakening of any of the links will result in prolonged time from the discovery to clinical implementation, and a break of any of the links would lead to the break and fall of the whole medical physics field. Time scale is approximate and indicates approximate time horizon of each of the component of the medical physics spectrum.

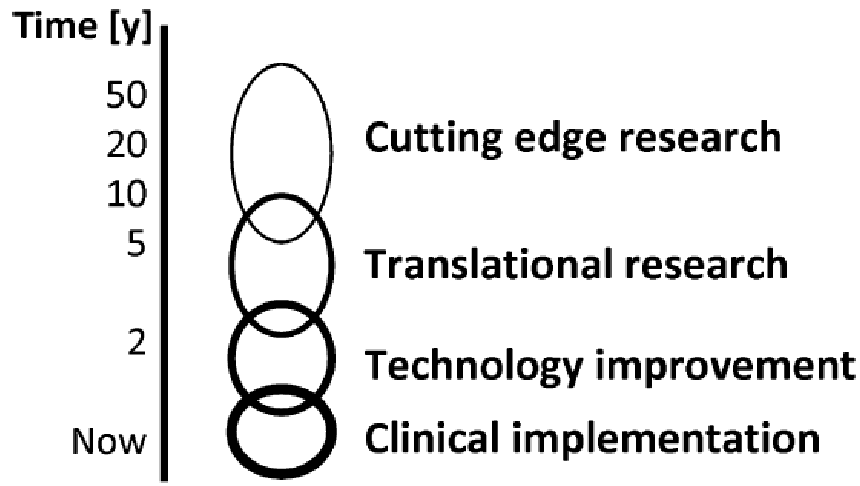

Figure 4. Suboptimal medical physics chain. Currently we are experiencing an increased emphasis on consolidating the clinical part of the medical physics spectrum, leaving the research part behind. This leads to the prolongation of the time between invention and clinical implementation, particularly severe as the relative time scale is not linear.

‘Optimal’

‘Sub-optimal’

1. Embrace Heterogeneity

- Combined clinical and research programs need to deliver high quality care.
- Not all the physicists need to be highly proficient in research and clinical practice.
- However, they need to understand the value of both.

2. Multi-disciplinary/Collaborative

- Medical physics research, like all other, is becoming highly collaborative.
- Cross-disciplines, inter-institutional, global networks, industry and academia.
- Need skills in collaboration, communication, and team work.
- Team <u>member</u> or team <u>captain</u>.

3. Computation/IT Skills

- Computational and programming skills are extremely important.
- The IT components of Medical Physics for practice and for research in the clinical setting have become a huge factor in success.
  - both understanding and execution.

4. Contextually Aware

- Where do I fit in to the healthcare innovation cycle?
- How does my clinical work relate to my role as innovator/clinician scientist?
- How does new technology make it to the clinic?
- How do we build evidence for it’s benefit?

Are Quality and Innovation Competitive?

Fresh Thinking on Innovation and Quality

An ASQ
White Paper

The idea that innovation must embrace both the blue sky and the practical is neither new nor radical, yet we cling to our fascination with the home run.

It makes sense to manage innovation activities with the same management tools and approaches that are used in other major sectors of the business.

ASQ (American Society for Quality) is the world's leading authority on quality and sole administrator of the Malcolm Baldridge National Quality Award.

ASQ 2010

Continuous Expertise/Knowledge Development – Contribute and Benefit

Deasy et al. - *Int J Radiat Oncol Biol Phys*. 2010 March 1; 76

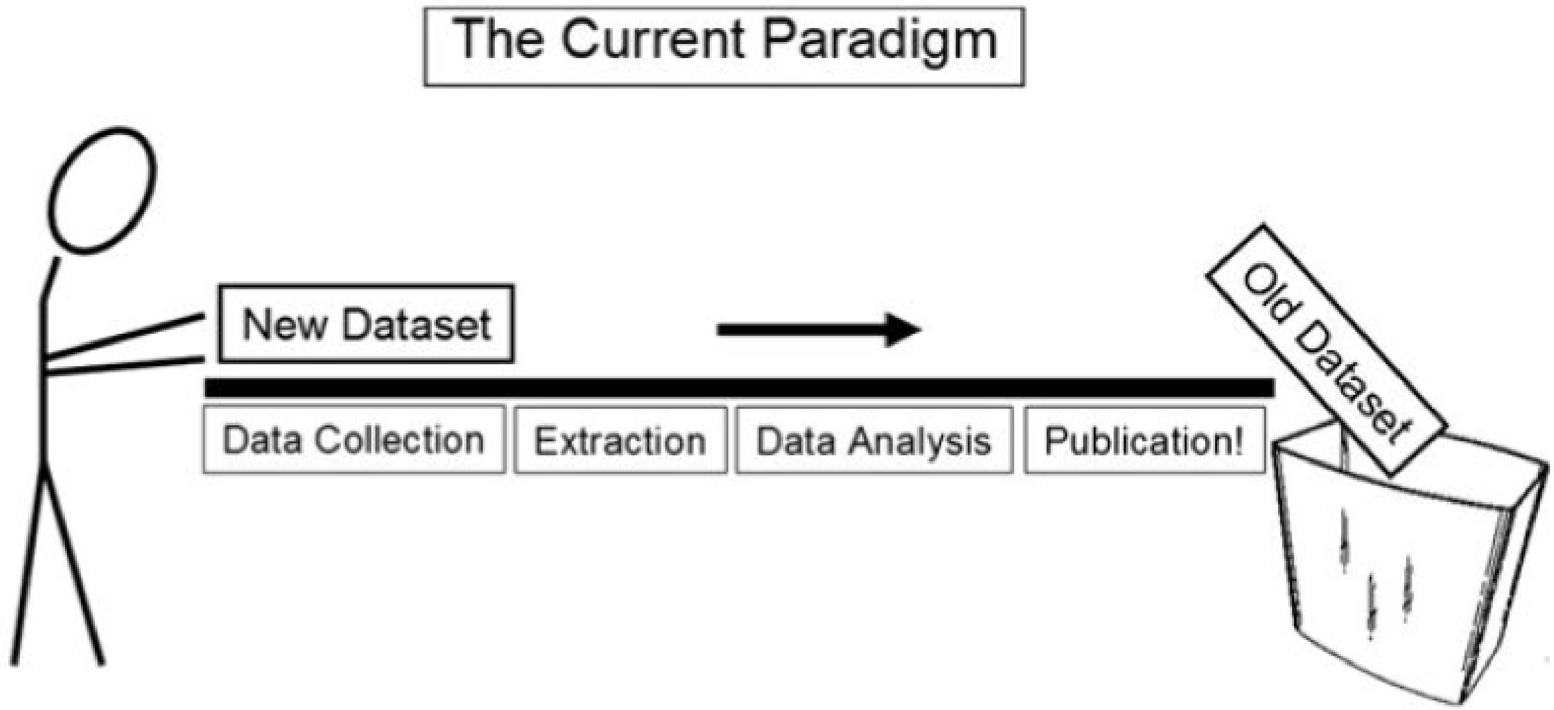

Fig. 2.
"The current (data-loss) paradigm." Data are effectively lost to the wider scientific community after publication. Capturing key datasets in query-able data repositories would accelerate the discovery of causative factors and increase the accuracy of parameter estimates.

5. Leadership: Skills, Knowledge, Opportunity

- The combination of technical skill, growing relevance of technology in health care, and our clinical role is an opportunity for medical physicists to take leadership roles in health care.
- Are we teaching our graduate students and trainees about this opportunity?
- Are we giving them the tools?

Who do they see as their research/academic peers?

6. Scientific Method

- It is too easy to find someone at the end of residency that still doesn't <u>really</u> understand the importance of the scientific method.
- This does not position medical physicists to have impact or gain the respect of their medical peers.

Particularly the case for those that have been on 'medical physics profession plan' from day 1.

Summary

- The residency programs have been built to train physicists to be medical physicists.
- Occasionally, a strong scientist comes through.
- This is good because there are huge opportunities for scientific contributions by physicists in medicine.
- There is lots of room to move this from <u>good fortune</u> to <u>good practice</u>.


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ON MEDICAL PHYSICS & BIOMEDICAL ENGINEERING
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SCIENTIFIC PROGRAM
SPONSORSHIP & EXHIBITS
REGISTRATION & ACCOMMODATION
EVENTS & TOURS
GENERAL INFORMATION
Congress Begins in 406 days
Save The Date!
Registration Opens
October 2014
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Stay Informed
Join the IUPESM 2015 newsletter to receive Congress news
Sign Up
Visiting Toronto
Learn more about the host city and the activities that await you.
View
Important Dates
Abstract Submission Opens September 2014
Registration and Housing Opens October 2014
Congress Dates June 7 – 12, 2015

Match Program to Improve Resident Placement

SDAMPP Annual Meeting
July 19, 2014

John P. Gibbons, Jr., Ph.D.

Director, Radiation Oncology Physics Residency Program

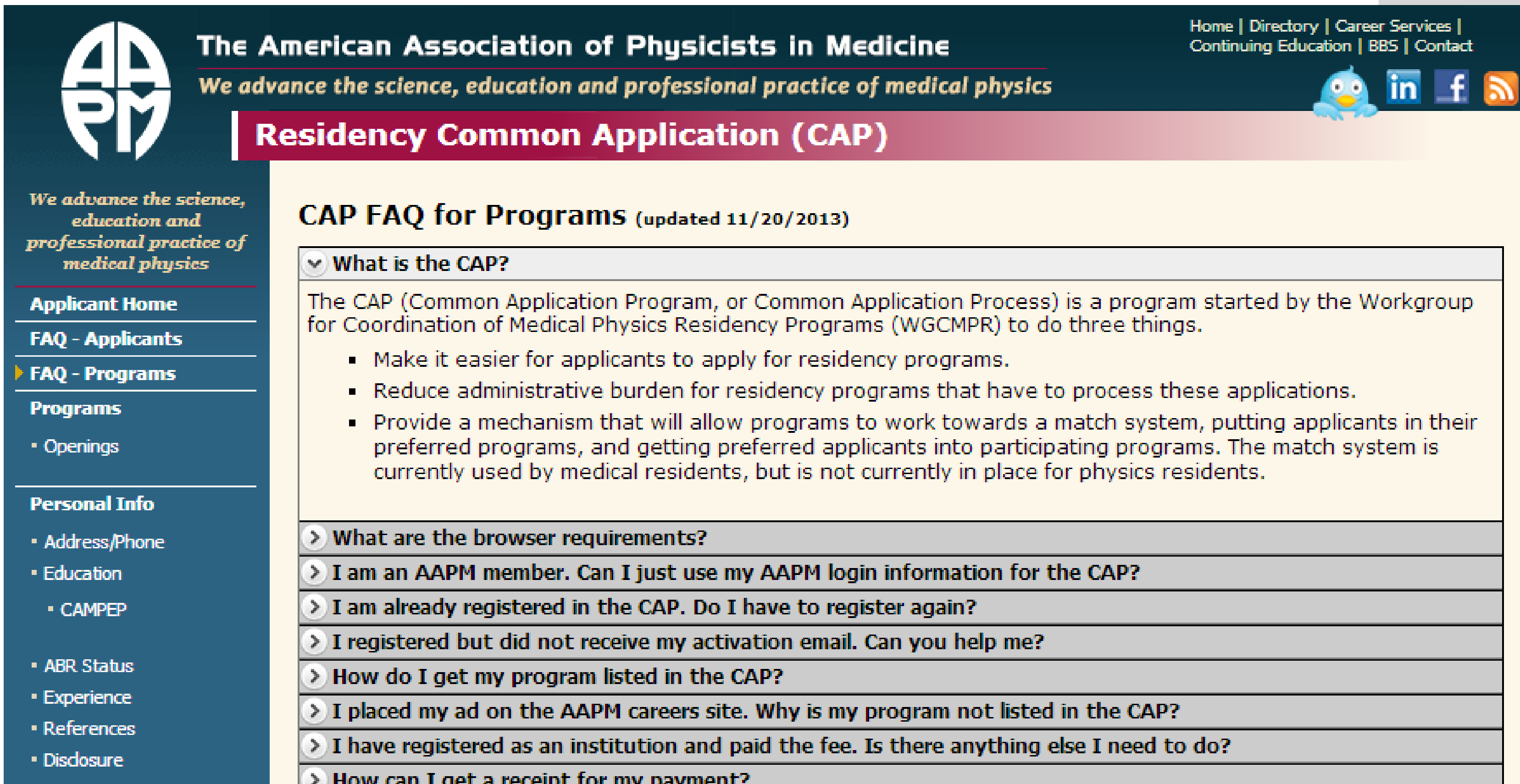
MARY BIRD PERKINS
CANCER CENTER
Fighting Cancer For Over 40 Years.

Physics Residency Programs Program Statistics

- Accredited Residency Programs (2/7/14):
  - Therapy – 70 approved, 10 in process, 1 incomplete (~122 residents)
  - Imaging – 9 approved, 3 in process, 7 incomplete (~29 residents)
  - DMP – 1 approved, 3 in process, 3 under consideration
- Goals to meet staffing needs:
  - Therapy 125-150 residents/year;
  - Imaging 25-30 residents/year.

Physics Residency Programs Applicant Statistics

- AAPM Common Application Program



AAPM Common Application Program 2012-2013 Statistics

- Institutions: 37 Programs with 46 Positions
  - 35 therapy programs received 57 – 157 applicants
  - 12 therapy programs required PhD. All others MS or PhD
  - 15 programs required CAMPEP degree
  - 2 imaging programs got ~50 applicants, with no more than 5 of those applied only for imaging
- Applicants: 275 unique applicants
  - Number of applications ranged from 1 – 37. (3 applied for all 37 positions)
  - Total of 3642 applications.

MARY BIRD PERKINS
CANCER CENTER
Fighting Cancer For Over 40 Years.

AAPM Gentleman's Agreement

- 2013 Statement:
  - No app deadlines before 12/1/13
  - No offer deadlines before 2/17/14

http://www.aapm.org/org/committees/committee/article.asp?id=3340

American Association of Physicists in Medicine

Home Minutes Guidelines

Work Group on Coordination of Medical Physics Residency Programs Website

Gentleman's Agreement for Therapy Residency Programs

Many physics residency programs now synchronize their program start dates with medical residencies. This often makes administration easier since you can utilize the existing infrastructure for recruiting and orientation of medical residents. It is also an eventual goal of such programs to work towards a match system, to improve upon our current recruitment situation, both from the perspective of the programs and the candidates. The WGCMPR came up with a gentleman's agreement to make the recruitment process more civilized, to give all programs a fair chance to recruit good candidates, and not overly drag out the process. The following describes the current status of the gentleman's agreement.

Gentleman's agreement about resident recruitment (updated 9/2/12)

Scope

The gentleman's agreement is intended for therapy physics residency programs that have start dates on our about the first of July. Programs that have different start dates should be aware of this agreement, however, since it may affect their recruiting. The gentleman's agreement is generally not applicable to diagnostic physics residency programs, because there are much fewer of them, and recruitment problems are not as prevalent.

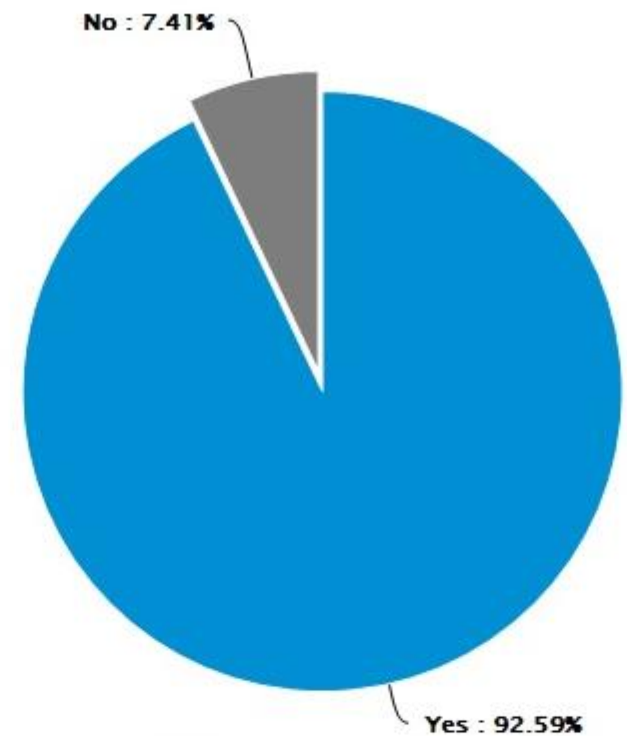
Gentleman's "Disagreement"

- Programs wishing to obtain top applicants make early offers.
  - Because the applicant/residency slot >> 1, students accept less-desirable positions.
  - Over time, more programs violating agreement and extending early offers
- Unfair to applicants
- Unfair to programs
  - Lose desired applicants
  - Recruitment logistics difficult

Gentleman's "Disagreement"

Aware of WGCMPR Gentleman's Agreement (GA)

93% Aware



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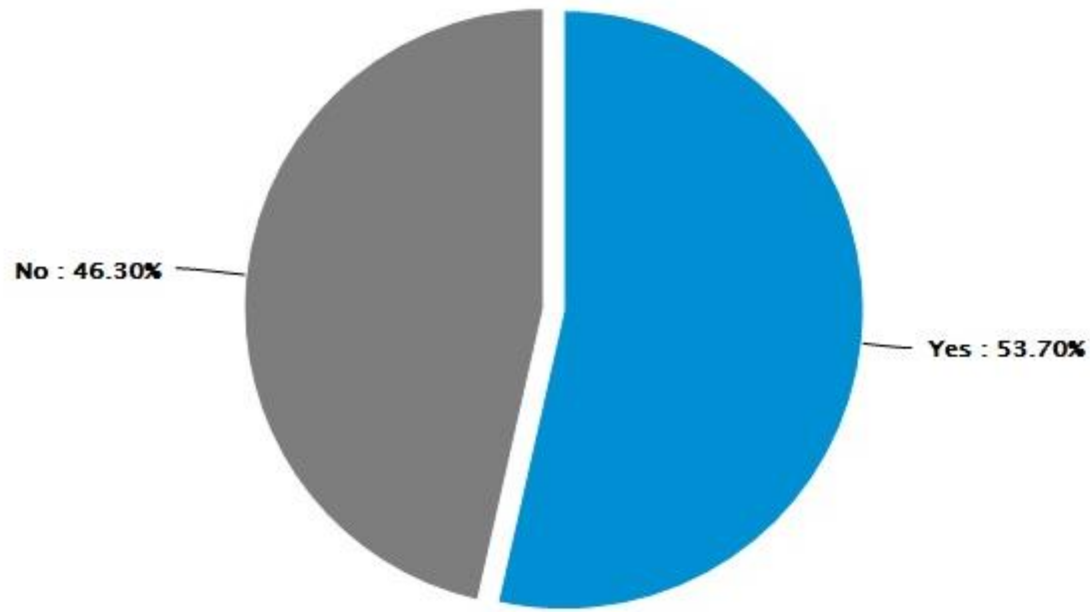
Gentleman's "Disagreement"

Followed GA for 2014 recruitment

54% Followed



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Possible Solution: National Medical Physics Match Program

- Establish National Match Program which parallels the NRMP for physicians.
- Algorithm is straightforward, and can be implemented using data from the current CAP system.
- Applicants/Programs that participate could sign a pledge not to seek/recruit for positions outside of the match.

Recent Developments

- July 2013 – AAPM WGCMPR voted to implement match system, after seeking legal opinion
- Sept 2013 – AAPM's legal council advised against running program through AAPM; recommended using NRMP.
- October 2013 – WGCMPR voted to modify Gentleman's agreement for 2014

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Recent Developments

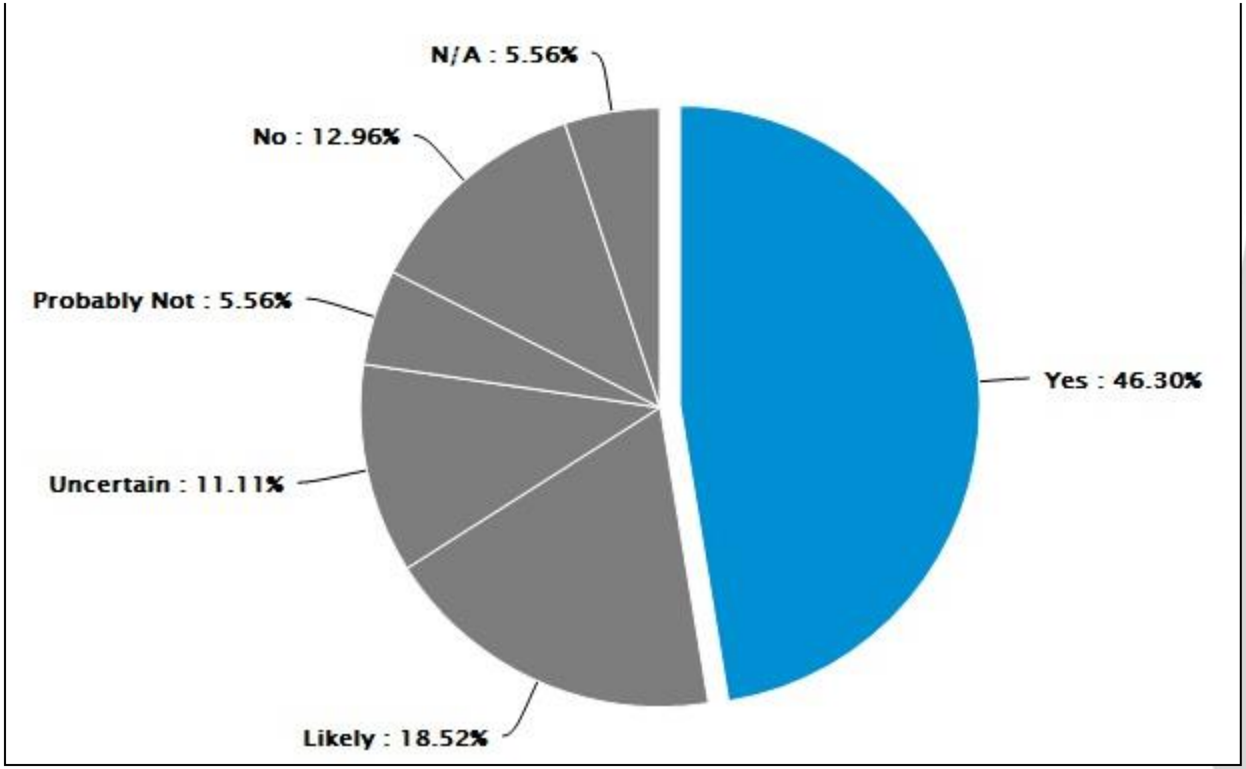
- Dec 2013 – Bayouth forwarded previous rejection from NRMP
- Jan 2014 – John Antolak, Dan Bourland (SDAMPP) and I contacted National Matching Services, Inc.
- March 2014 – Antolak presented NMS Match proposal to AAPM SPC

Recent Developments

- Apr 2014 – National Match discussed in AAPM Newsletter Article; Med Phys P/CP
- May 2014 –Antolak surveyed accredited residency program directors re: match

Program Directors Support for Match System

If the AAPM and/or SDAMPP were to sponsor a Match Program for physics residency programs that recruit for a July (or near July) start date, would you be willing to participate?



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Recent Developments

- Apr 2014 – National Match discussed in AAPM Newsletter Article; Med Phys P/CP
- May 2014 –Antolak surveyed accredited residency program directors re: match
- June 2014 – Starkschall requests AAPM funding to subsidize program cost(100% for years 1-2, 50% for years 3-4)
- July 2014 – AAPM Board to vote on match funding proposal

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Overview of the Proposed Medical Physics Residency Match Process

Disclaimer: All details about the match process are preliminary and subject to change.

PRELIMINARY

Seven Core Activities

- Register to participate
- Receive applications
- Interview and evaluate
- Submit Rank Order Lists
- “The Match”
- Distribution of Match Results
- Post Match Process

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PRELIMINARY

1. Register to participate

- Programs should be CAMPEP-accredited or "in the process"
  - Full disclosure in positions advertisements
- Participants (programs and applicants) agree to abide by Match Agreements
- Programs must offer all positions through the Match
  - Some exceptions under consideration
- Free for programs and applicants
  - Initial sponsorship being sought from AAPM

Programs register starting Aug-Sep
Applicants register starting Oct 1

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PRELIMINARY

2. Receive applications

- Application process is separate from the Match
  - Registered programs and applicants will receive discounts on CAP fees
- CAP and Match will exchange limited data to facilitate statistics and data reporting for the benefit of participants
  - Extent of data sharing and reporting will be defined by a steering committee
    - AAPM and/or SDAMPP

Application timelines defined by program (mid-Dec?)

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PRELIMINARY

3. Interviews and Evaluations

- Applicants and programs interview and evaluate each other independently of the Match

DO	Freely discuss any matter Express interest in an applicant Voluntarily disclose your intention to rank
DO NOT	Make any offers Solicit information about rankings Disclose information about rank positioning

Interviews in Jan-Mar

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PRELIMINARY

4. Submit Rank Order Lists

- Each applicant and program submits a Rank Order List of preferred placements to NMS
- Submit lists online via secure ROLIC system
- Submit and certify list, or withdraw by the Rank Order List deadline

Rank Order List deadline is 11:59 p.m. ET on Mar. 20, 2015

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PRELIMINARY

Tips for Ranking

- Rank your choices in order of <u>true preference</u>
- <u>Longer Rank Order Lists</u> generally reduce the likelihood of unfilled positions
- Rank only those applicant <u>that you consider acceptable</u>

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PRELIMINARY

"The Match"

- Algorithm is strategy proof
  - Cannot improve your result by ranking in any order other than according to your true preference
  - Ranking a "likely" applicant first or second on your list does not improve your chances of filling the position
- Algorithm is stable
  - No resulting applicant-program pair prefers each other to their current match
    - Each applicant is placed with the most preferred program available
    - Each program is matched with the most preferred applicant(s) available

PRELIMINARY

6. Distribution of Match results

- Results will be sent by e-mail and accessible in a secure manner on the web
- Results constitute a commitment between the applicant and the program
- Programs send a letter of confirmation of result to each matched applicant within 10 working days
- Applicants return the letter within 30 days

Match results will be released to programs and applicants at 12:00 p.m. ET on March 27, 2015

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PRELIMINARY

7. Post Match process

- Unmatched applicants and unfilled programs negotiate directly with each other to fill available positions
  - List of unmatched applicants
    - Access restricted to registered programs (password required).
  - List of programs with available positions
    - Access can be restricted.
    - Potentially can be updated online by programs (password required).

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PRELIMINARY

Why not modify CAP?

- NMS can perform the actual matching independently
  - Experience with other matching programs
- AAPM/CAP can avoid any suspicion of bias in the results

PRELIMINARY

Next Steps

- Endorsement of match process by AAPM and SDAMPP
- Funding/subsidy of match process by AAPM
  - Proposing full subsidy for 2 years, followed by partial subsidy for 2 years
  - Proposing CAP subsidy for match participants (programs and applicants)

MAYO CLINIC

National Matching Services Inc.

Medical Physics Matching Program

Introduction to NMS and Matching Programs

Agenda

- Introduction to NMS
- Benefits of a Match

National Matching Services Inc. (NMS)

A **trusted partner** for professions looking to structure, enhance and optimize their recruitment markets

- Founded in 1985
- Office in Toronto, Ontario
- 10 employees
  - Half programmers, half customer support

Our Work

We provide match administration and support to the major matching programs in North America

Match Program Administration

- Pharmacy Residencies
- Osteopathic Medical Internships and Residencies
- Psychology Internships
- Dental Residencies
- Optometry Residencies
- Neuropsychology Residencies

Matching Software and Support

- US Medical Residencies (NRMP)
- Canadian Medical Residencies

Our Clients

We are the leading provider of matching services to professional organizations and industry associations

What does NMS bring to the table?

We are an objective, third-party that brings best practices in process and execution to our clients

- Nobel Prize recognized Roth-Peranson matching algorithm – same one used by NRMP
- Experience and best practices to ensure:
  - No one falls through the cracks
  - People are protected from themselves
- Enhancements to help accommodate special needs like couples, diversity needs, reversions, school limits

Technology Services and Program Management

We have a suite of tools to tailor a Match to meet the needs of the profession

Secure SaaS Platform	– Directories, rankings, data validation, results, post-match
Customer Support	– Live agent e-mail and phone support trained and located in Toronto
Data Analysis	– Statistics and correlated analysis of application, survey and Match data
Communications Management	– Contact list maintenance, email notfications, reminders, etc.
Application Service	– Collection and distribution of information (not verification)

Agenda

Introduction to NMS

Benefits of a Match

Why use a Match?

A Match provides an orderly process to help programs and applicants obtain placements of their choice

- Prevents market “unraveling”
- Provides opportunity for proper evaluations
- Reduces/eliminates premature decisions, guesswork and undesirable behavior
- Provides a “level playing field”

Ensures optimal results for applicants and programs

How does it work?

Adapting the Current Recruitment Process

– Applicants and Programs register to participate in the Match

– Applications, interviews and evaluations processes are unchanged

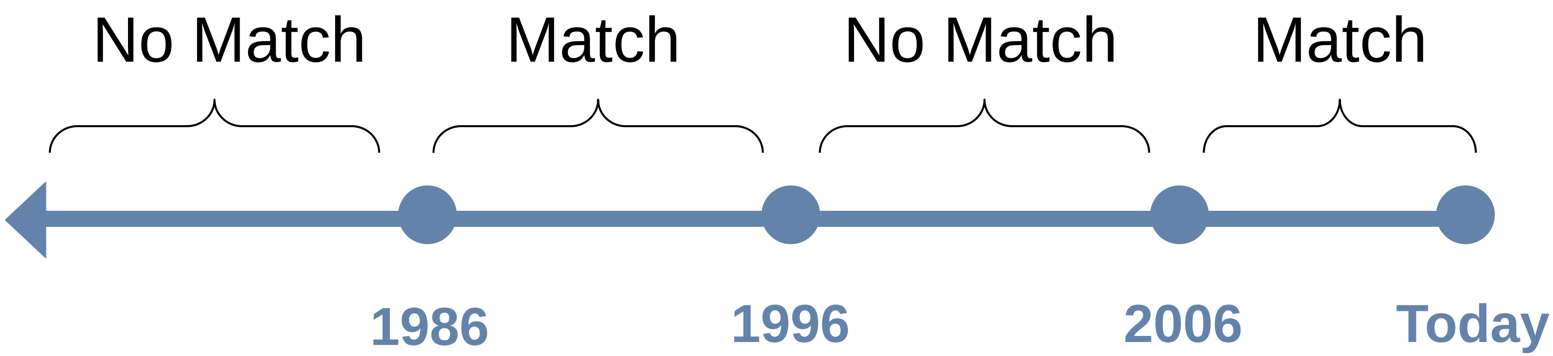
– No direct offers are made. Instead, each applicant and program submits to the Match a list of desired placements in rank order of preference

– These stated preferences are processed by the Matching Algorithm. All offers, acceptances, rejections and final placements occur simultaneously - results are final

– The Match ensures applicants and programs end up with the best possible result

Experience of Gastroenterology

The benefits of a Match can be observed from a case study of resident recruiting in Gastroenterology



What happened when the specialty abandoned the Match?

Source: Niederle, Muriel and Alvin E. Roth, "Unraveling reduces mobility in a labor market: Gastroenterology with and without a centralized match", Journal of Political Economy, vol. 111, No. 6, December 2003, 1342 – 1352

Recruiting with no Match

Impacts on the Process

- Longer recruitment period
- Increasingly earlier initial interview and offer dates
- Fragmented timing (not all programs recruiting at the same time)
- More interviews cancelled or rejected
- Offers made and/or accepted before interviews completed

Source: Niederle, Muriel and Alvin E. Roth, “Unraveling reduces mobility in a labor market: Gastroenterology with and without a centralized match”, Journal of Political Economy, vol. 111, No. 6, December 2003, 1342 – 1352

Recruiting with no Match (cont.)

Impacts on the Outcome

- Interviews less informative and less evaluative of quality and fit of program and applicant
- Tendency to go for what is safe vs. what is best
- Decreased opportunities for applicants
- Decreased applicant mobility

Source: Niederle, Muriel and Alvin E. Roth, “Unraveling reduces mobility in a labor market: Gastroenterology with and without a centralized match”, Journal of Political Economy, vol. 111, No. 6, December 2003, 1342 – 1352

Psychology experience

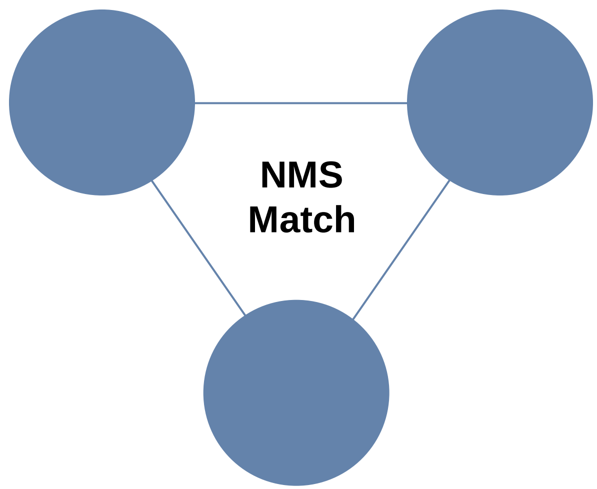
Psychology conducted an evaluative survey after implementing a Match for internship recruiting

What was the impact?

- Reduced pressure and stress
- Fewer instances of unethical conduct
- Increased satisfaction with results

Benefits of a Match

A Match can provides benefits to all stakeholders



Applicants

Receive the best results from their available opportunities

Experience a fairer environment

Higher satisfaction with process

Programs

Receive the best results while avoiding yield uncertainty

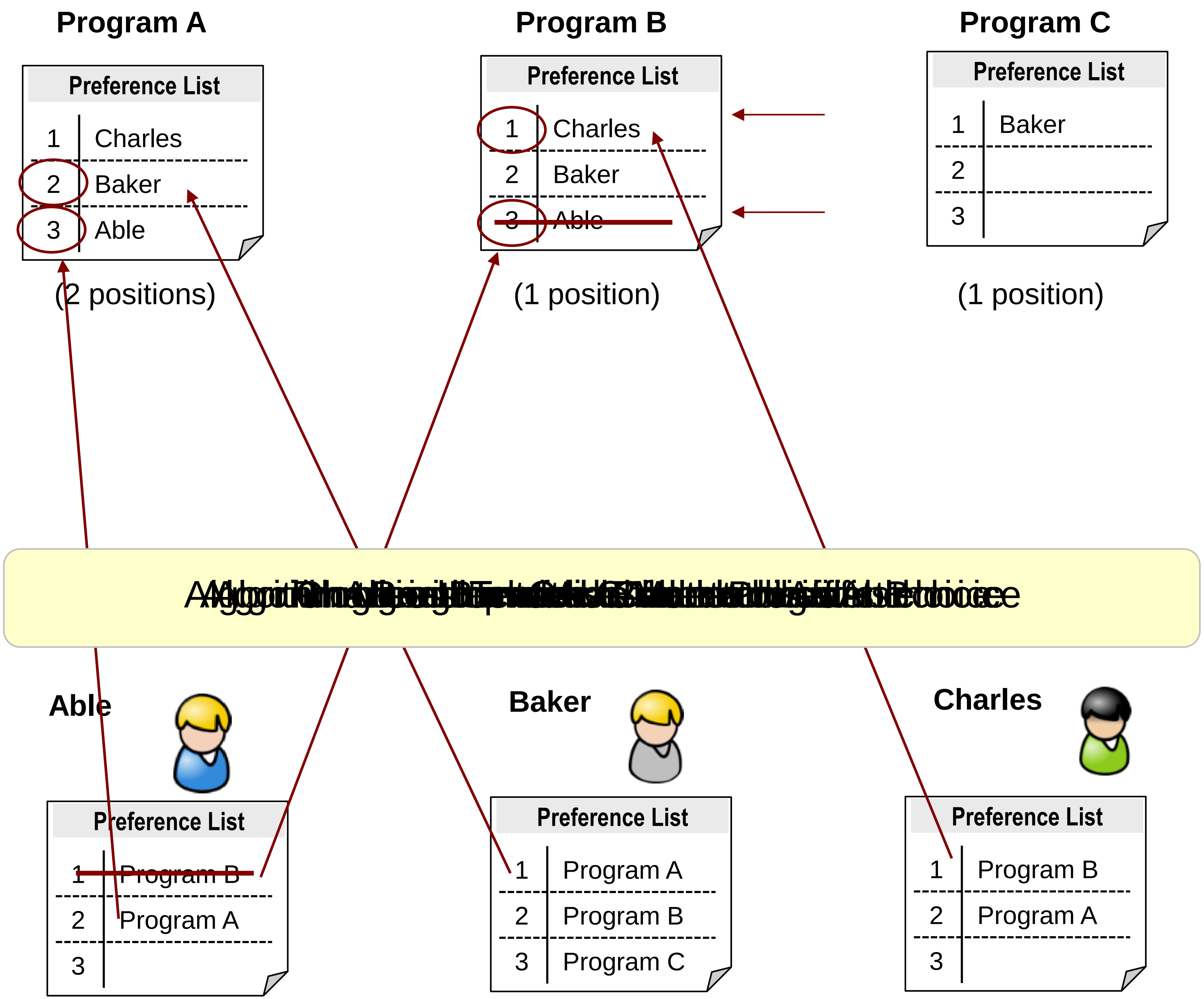
Access to value-added recruitment data

Flexibility to accommodate program-specific needs

AAPM

Facilitate an orderly recruitment environment

Receive data to enhance planning and professional efforts


Program A
Preference List
1 Charles
2 Baker
3 Able
(2 positions)
Program B
Preference List
1 Charles
2 Baker
3 ~~Able~~
(1 position)
Program C
Preference List
1 Baker
2
3
(1 position)
Able
Preference List
1 ~~Program B~~
2 Program A
3
Baker
Preference List
1 Program A
2 Program B
3 Program C
Charles
Preference List
1 Program B
2 Program A
3

Example 1

Program A (1 position)
1. Applicant Y 2. Applicant X

Applicant X ("likely" strategy)	Applicant Y (true preferences)
1. Program A	1. Program C
2. Program C	2. Program D
3. Program D	3. Program A