What is medical physics?

- Application of principles of physics to practice of medicine
- Cancer radiotherapy
  - 70,000 people treated / year
  - cure rate 50% for curative Rx
- Diagnostic radiology
  - x-rays, CT scans, MRI, ultrasound
- Nuclear medicine
  - inject radioactivity and observe
Canada has a strong tradition in Medical Physics

$^{60}$Co therapy unit `invented' in Canada

Canada supplied most of the units in the world (from Ottawa)

Stamp issued June 17, 1988

Canada has dominated dose calculations for cancer radiotherapy

Cunningham 70s EQTAR (first computerized)

Mackie 80s Convolution-Superposition and energy deposition kernels

Kawrakow & Fippel late 90's Monte Carlo

Cygler first routine clinical use in world of Monte Carlo
Canadian medical physicists are world class

- 1974 – 2009: 18% of articles in Med Phys came from Canadian institutions
- 1990 – 2009: 23% of articles in Med Phys came from Canadian institutions

AAPM Awards:
- Farrington Daniels Award: 41% Canadian (30% with Ottawa connection)
- Sylvia Sorkin Greenfield Award: 30% Canadian
- William D. Coolidge Award: 10% Canadian

(some figures from a talk by David Wilkins at Carleton, Nov 10, 2011)

Graduate studies in Ottawa: OMPI

- Ottawa Medical Physics Institute
- a network of about 30 researchers in Medical Physics in the Ottawa area
- monthly seminar series around town
  (give me your email address to get announcements)
OMPI membership

- **Carleton**
  Johns, Murugkar, Rogers(CRC I), Thomson(CRC II), Xu, + Heath (starting Jan 2014)
- **Ottawa Hospital Regional Cancer Centre**
  - Buckley, Clark, Cygler, Henderson, Nyiri, Szanto, VanderVoort, Wilkins
  - MRI lab: Cameron, Thornhill
- **National Research Council**
  - Fleraru, McEwen, Ross, Saull, Tessier
- **Ottawa Heart Institute**: DeKemp, Wells
- **Health Canada**: Stocki, Wilkins
- **Natural Resources Canada**: Sinclair
- **Industry**: Wassenaar,

Kinds of things students research

- linac spectral measurements
- Monte Carlo simulations of radiotherapy treatments with IMRT
- dosimetry with novel and reference instrumentation for radiotherapy
- reconstruction algorithms for imaging
- Monte Carlo dose calculations for brachytherapy
- PeTrack algorithm development for IGRT
- cardiac PET respiratory motion correction
- effective dose to patient in nuclear medicine
- development of novel biological dosimeters

(from a listing of PhD thesis topics, fall 2011)
**CAMPEP / CCPM**

- Commission on Accreditation of Medical Physics Educational Programs
- Carleton PhD program 1st accredited in Ontario (now at least one more)

- Canadian College of Physicists in Medicine
  - certifies clinical medical physicists
    - need 2 years working with patients + very stiff exams
  - in 2016, to sit exams must have graduated from a CAMPEP graduate or residency program

**Career paths**

- MSc
  - local industries,
  - physics assistants at Cancer clinic
  - government jobs related to radiation

- PhD
  - mostly radiotherapy cancer clinics
    - requires a 2 year residency (about $60K/y)
    - must be prepared to move
    - nothing guaranteed - need CCPM exams
  - other clinical settings (imaging)
    - industry
    - government labs