

Department of Physics

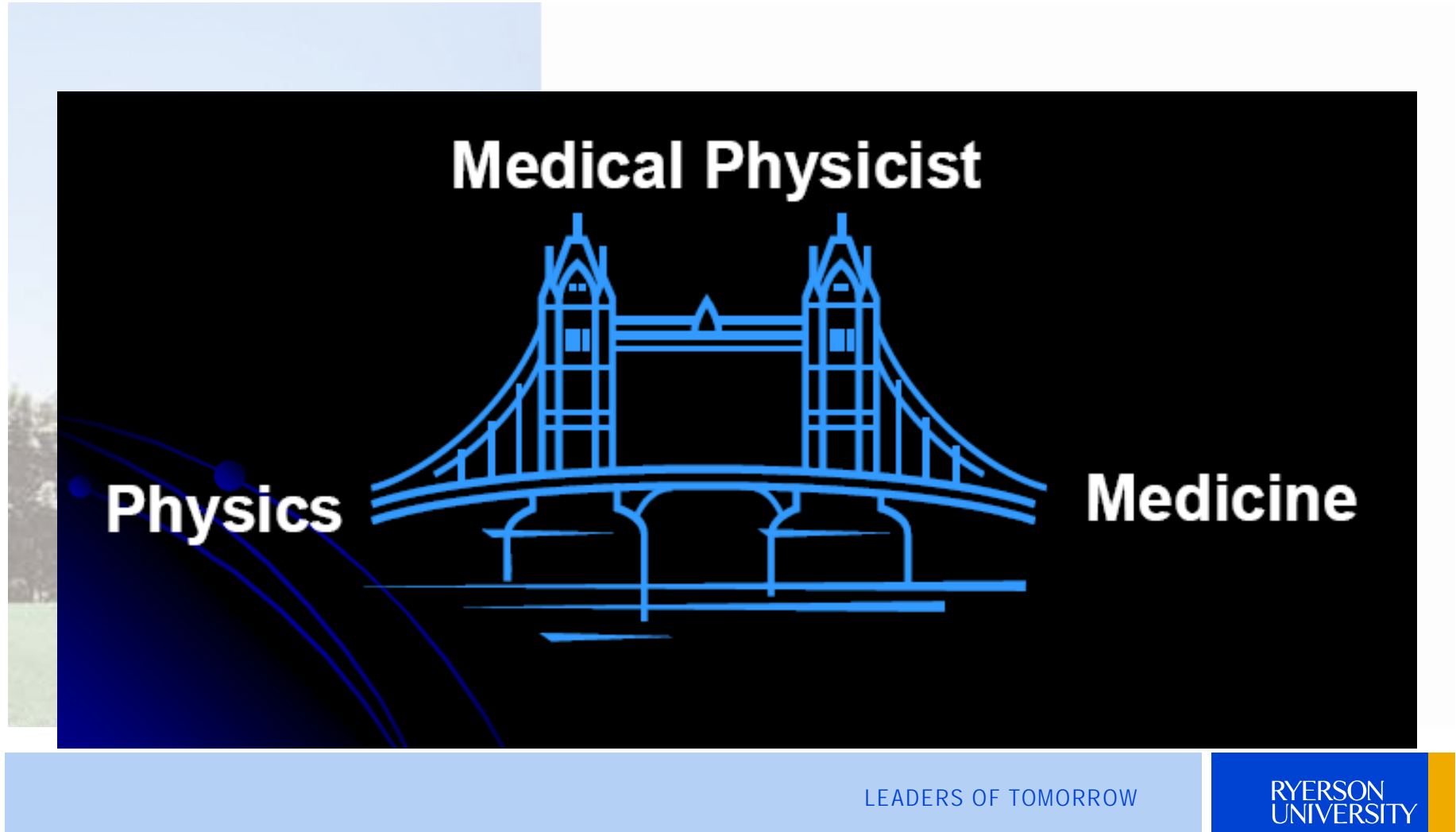
RYERSON UNIVERSITY



**Dr. A. Pejović-Milić,
Chair and Professor
and
Dr. T. Antimirova,
Assistant Chair and Associate Prof.**

- Presentation Overview:
- What is Medical Physics
- Overview of Medical Physics
and Science Programs at Ryerson
- Career Opportunities for Graduates
- Question and Answer Period
- Physics Demo Ideas

The Medical Physicist Bridges Physics and Medicine



Medical Physicist



- **A medical physicist is a professional who specializes in the application of the concepts and methods of physics to the diagnosis and treatment of human disease.**

Medical Physics Disciplines (Subfields)



- ④ **Therapeutic Radiological Physics or Radiation Physics**
- ④ **Diagnostic Imaging Physics or Medical Imaging**
- ④ **Medical Nuclear Physics**
- ④ **Medical Health Physics**

Therapeutic Radiological Physics



- ④ The **therapeutic applications** of x-ray, gamma ray, neutron, electron, and charged-particle beams, and radiation from sealed radionuclide sources.
- ④ The equipment associated with their production, use, measurement, and evaluation.
- ④ The quality of images resulting from their production and use.
- ④ Medical health physics associated with this subfield.

Diagnostic Radiological Physics



- The **diagnostic applications** of x-rays, gamma rays from sealed sources, ultrasonic radiation, and radio frequency radiation and magnetic fields
- The equipment associated with their production, use, measurement and evaluation
- The quality of images resulting from their production and use
- Medical health physics associated with this subfield

Medical Nuclear Physics



- ④ The **therapeutic and diagnostic** applications of radionuclides in **unsealed sources**
- ④ The equipment associated with their production, use, measurement, and evaluation
- ④ The quality of images resulting from their production and use
- ④ Medical health physics associated with this subfield

Medical Health Physics



- The **safe use** of x-ray, gamma ray, neutron, electron, and other charged particle beams or radionuclides in medicine (for diagnostic or therapeutic purposes).
- The instrumentation required to perform appropriate radiation surveys.
- The medical physicist often serves as the radiation safety officer.

The Medical Physicist is Part of the Medical Team

Therapy

- ④ Physician (Radiation, Oncologist, Surgeon,...)
- ④ Medical Physicist
- ④ Medical Dosimetrist
- ④ Physics Assistant
- ④ Radiation Therapist

Imaging

- ④ Physician (Radiologist, Cardiologist, ...)
- ④ Medical Physicist
- ④ Physics Assistant
- ④ Radiological Technologist

Medical Physicist Rewards

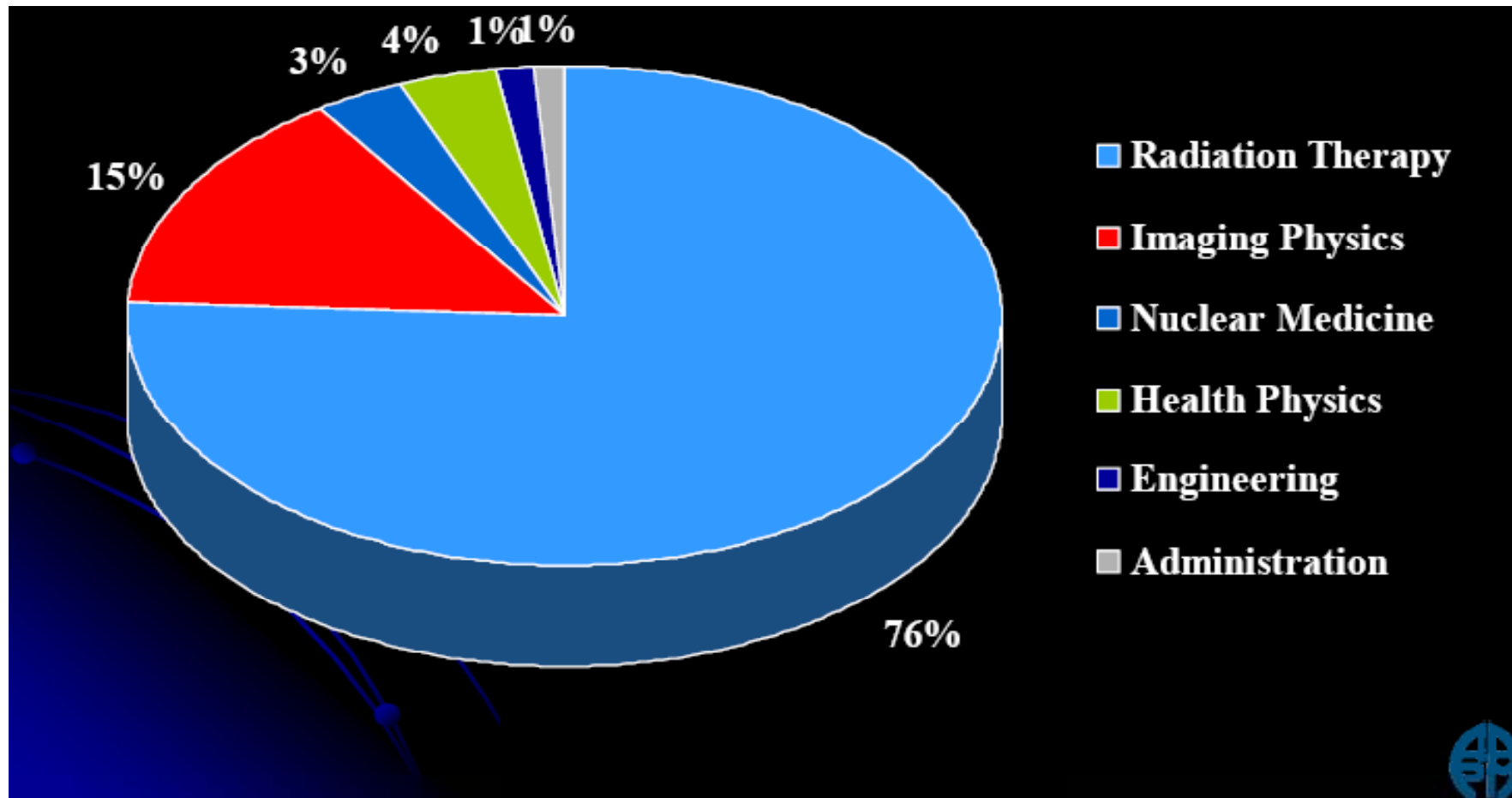
- ④ Challenge of applying the principles of physics to medicine
- ④ Satisfaction of developing new technology for medical use
- ④ Contributing to the well-being of patients
- ④ Receiving competitive compensation

What do we mean by a qualified medical physicist?

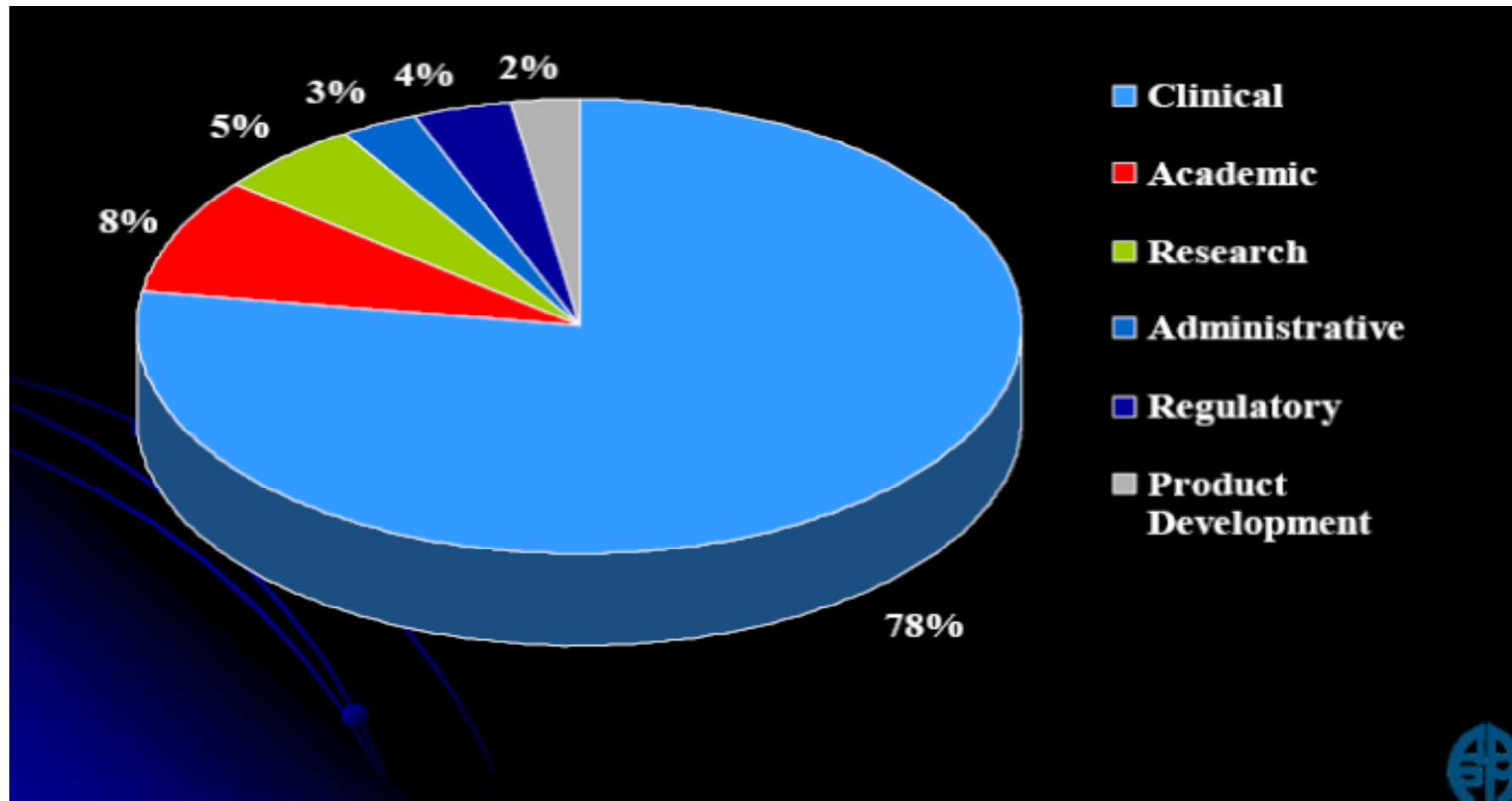
An individual who is competent enough to independently practice in one or more of the subfields in medical physics.

- Certification and continuing education (to demonstrate competence)**
- Trained to be familiar with the principles of physics used in equipment and instruments**
- Familiar with government regulations and laws**
- Familiar with performance specifications of equipment**
- Familiar with physical limitations of instruments, calibration procedures, and computer algorithms**

What is the Medical Physicist's Primary Discipline?



What is the Medical Physicist's Primary Responsibility?



RYERSON UNIVERSITY

Department of Physics



Department of Physics Ryerson University



Physics Xmas Party – Dec. 2009

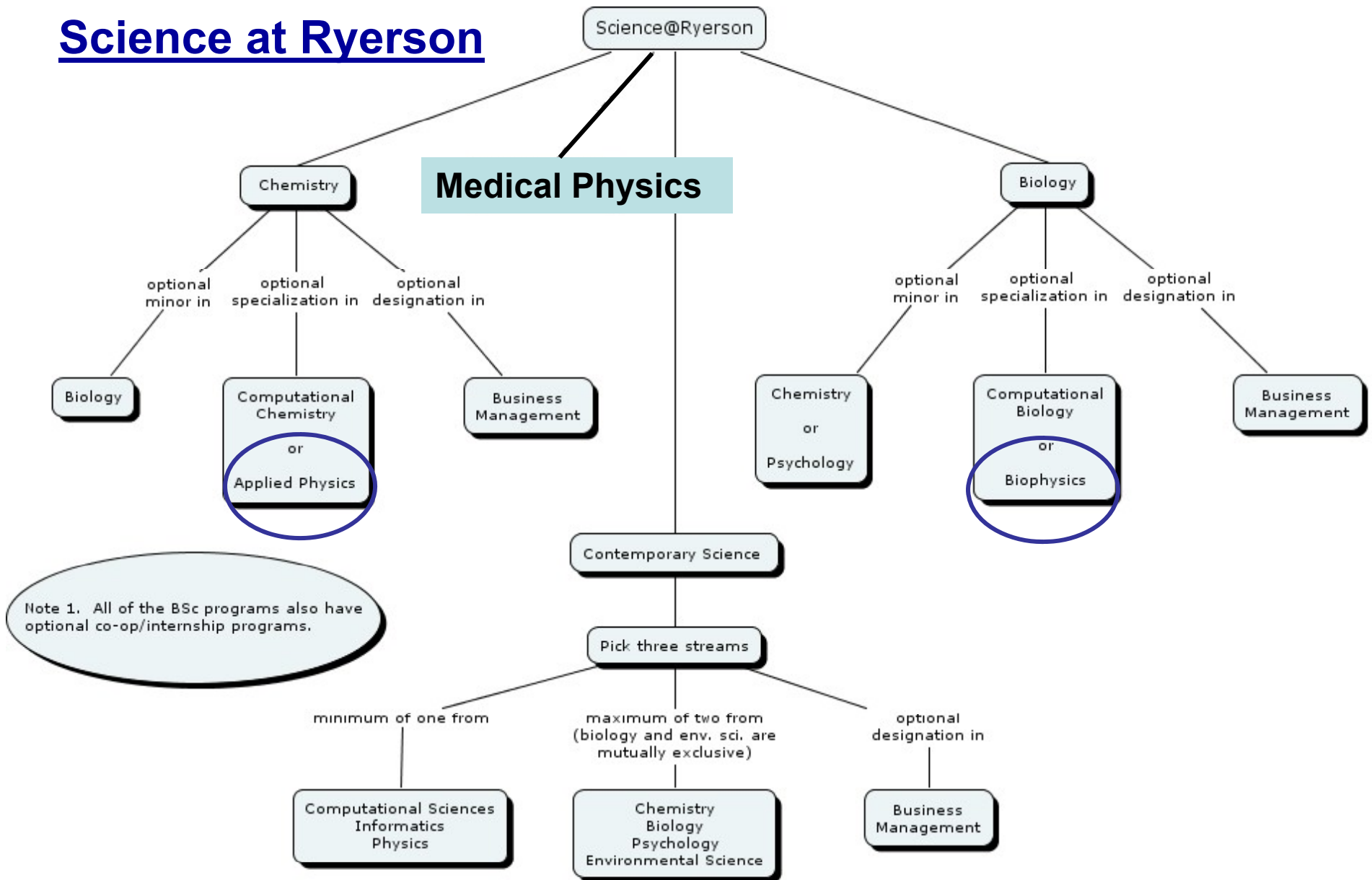
- Formed as an independent department in 2005
- 16 full-time and 15 adjunct faculty members; 23 in the area of BioMedical Physics
- Over 100 Undergraduate Medical Physics students in 2011
- 40 Graduated Biomedical Physics students (MSc and PhD) and 42 enrolled in programs in 2012/2013

Programs offered by the Department of Physics



- **Undergraduate (BSc) Program in Medical Physics**
 - Multidisciplinary program
 - To provide high quality, relevant education/training for graduates to enter into the workforce as medical or health physicists or continue on to graduate schools
- **Graduate Program (MSc and PhD) in Biomedical Physics**
 - Knowledge that is at the forefront of the research and development of novel methodologies for disease detection, treatment, and prevention, including relevant knowledge outside of their field and/or discipline

Science at Ryerson



Science at Ryerson

	Cont. Science	Biology			Chemistry			Medical Physics
Year 4	Select a minimum of one from stream A and maximum of two from Stream B	Major only or Major and minor	Computational Biology	Biophysics	Major only or Major and minor	Computational Chemistry	Applied Physics	Medical Physics 2 nd , 3 rd , and 4 th years
Year 3								
Year 2								
Year 1								
	Common First-Year				Chemistry I & II Math I & II Computers Orientation		Biology I & II Physics I & 2 Liberal elective	

Upper Level Courses in Medical Physics

Second Year	Third Year	Fourth Year
<ul style="list-style-type: none"> • Statistics I • Intro to Medical Physics • Organic Chemistry I • Geometry & Calculus • Modern Physics • Biophysics • Photonics & Optical devices • Differential Equations • Quantum I • Liberal electives 	<ul style="list-style-type: none"> • Physiology • Nuclear physics / Radiation Protection • Cell biology • Anatomy • Electricity & Magnetism • Numerical Analysis • Thermodynamics and Statistical Physics • Modeling in Med. Phys. • Professional elective • 2 Liberal elective 	<ul style="list-style-type: none"> • Radiation Biology • Medical Imaging • 2 Professional electives • Image Analysis • Physiology • 2 Liberal electives • Medical Physics Thesis (two terms)

Co-Op in Medical Physics

YEAR 1			YEAR 2			YEAR 3			YEAR 4			YEAR 5		
F	W	S	F	W	S	F	W	S	F	W	S	F	W	S
1	2		3	4	WKT 1	5	WKT 2	WKT 3	WKT 4	6	WKT 5	7	8	

**Preparation for 1st
Co-op Work Term**

Our students are eligible to graduate with a B.Sc. (Co-Operative Education) degree (an option of the program) if they are successfully completed five or four co-op work terms;

Business Management Option **in Medical Physics program**

- Provides students with a solid foundation in management sciences.
- Courses available in the spring session.
- Special designation appended to degree title.

Required Courses	Elective Courses (select one)
Entrepreneurship& Innovation Management	Management Information Systems
Operations Management	Operations Research
Investment Analysis	Managerial Accounting
Organization Design & Dynamics	Project Management
Principles of Engineering Economics	

Carrier Possibilities:



- **BSc graduates can choose employment within:**
 - **Research laboratories**
 - **Regulatory authorities**
 - **Environmental consultants**
 - **Power-generating utilities**
- **Or work with:**
 - **Medical radiation source manufacturers**
 - **Cancer clinics (as physics assistants)**
 - **Equipment developers and producers**
 - **Medical imaging technologies**
 - **Information technology companies**
- **Graduates can also pursue research degrees in Medical Physics, Medical Biophysics, or related fields.**
- **Graduates could also proceed to professional schools in:**
 - **Medicine**
 - **Education**
 - **Business**
 - **Law**

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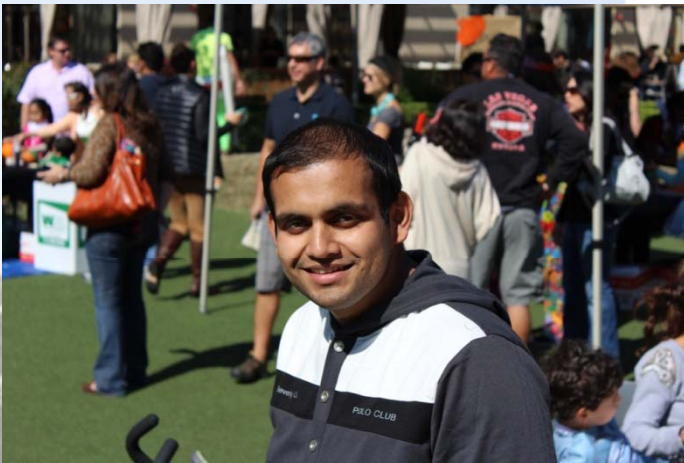


Ryerson Medical Physics Alumni

Life after graduation

Where has your Medical Physics BSc taken you?

Arjit Baghwala – Class of 2009



“After completing my BSc. in Medical Physics, I got admitted into the Health and Radiation Physics MSc. program at McMaster University.

I completed my masters in 2010 September and took up a job offer of a Medical Physicist in Houston, TX.”

Where has your Medical Physics BSc taken you?

Carolyn Halar – Class of 2010



“I was given the support and guidance I needed along the way to get where I wanted to go.

I have made many friends throughout my years at Ryerson and many memories to take with me!

I am currently attaining my Bachelor of Education (I/S-Math and Physics), at the University of Toronto (OISE).

Ryerson helped me get there by providing me with knowledge and confidence in the subject area that I want to teach.”

Where has your Medical Physics BSc taken you?

Joris Tchouala – Class of 2010

“Studying Medical Physics at Ryerson has provided me with the expertise necessary to thrive in an evolving area of health care: Medical Imaging.

I graduated from Ryerson in April 2010, and have been working as a research assistant at Sunnybrook hospital since then.”

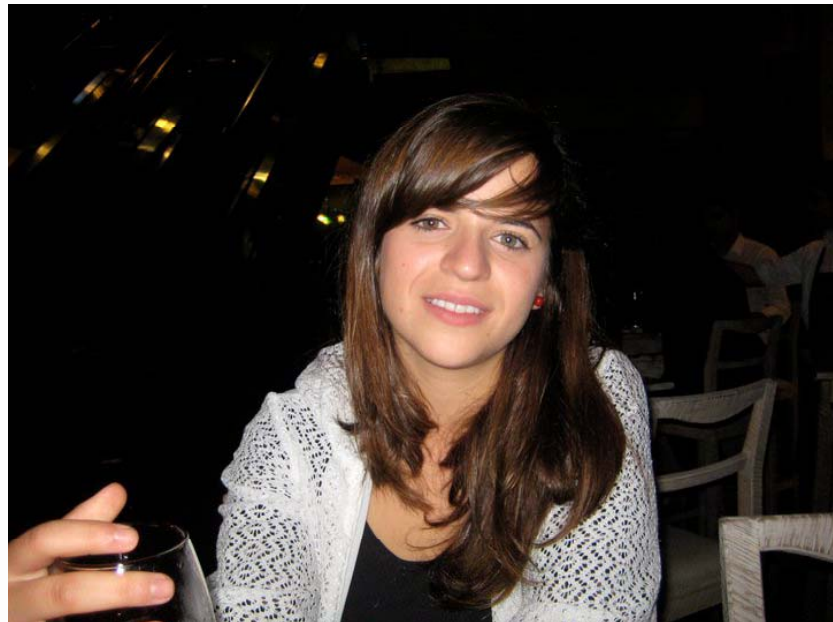


Where has your Medical Physics BSc taken you?

Melissa Martinez – Class of 2009

“I am currently doing research at a thought controlled computing company.

My job is to design algorithms for EEG analysis and to assist with creative R&D of brainwave controlled experiences and applications.”



Where has your Medical Physics BSc taken you?

Jatin Patel – Class of 2009

“After finishing my Masters degree in Health Physics at McMaster University, I am working as Health Physics at ENERGYSOLUTIONS Canada. Ryerson prepared me for graduate school by providing me with research and work experience through research assistant (RA) positions and a co-op education program.”



“By providing me with a broad exposure to many different areas of Medical Physics, Ryerson helped me to find myself as a student and as a person.”

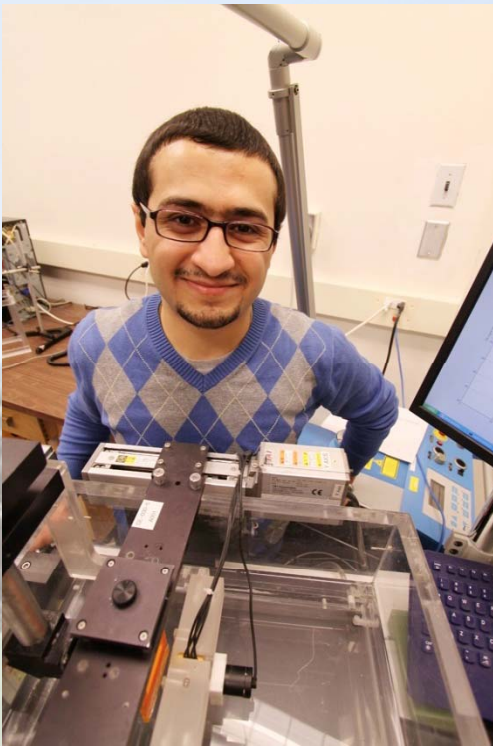


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Where has your Medical Physics BSc taken you?

Mosa Alhamami – Class of 2011



“I completed a BSc, with first-class honors, in Medical Physics at Ryerson University in 2011.

During my undergraduate studies, I worked on NSERC-funded research projects in summer 2010 and 2011 in the Department of Physics at Ryerson University.

I was involved in the development of an image-guided high intensity focused ultrasound (HIFU) system for applications in neural tissue modulation and solid tumor treatment.

In the future, I intend to pursue PhD and MD degrees, with specialization in interventional radiology.”

Where has your Medical Physics BSc taken you?

Shermiya Baguisa – Class of 2012



“I'm currently on a full scholarship for a PhD program in chemical physics at the University of Queensland (Australia).

My work is being done at the Centre for Advanced Imaging, in collaboration with the School of Physics and School of Chemistry and Molecular Biosciences.

My project involves utilizing electron paramagnetic resonance (EPR) and nuclear magnetic resonance (NMR) to understand the physics of the biomolecule melanin. ”

”

Who can apply to the undergraduate program in Medical Physics?

Admission requirements:



- **Ontario Secondary School Diploma (O.S.S.D.) with 6 grade 12 U/M or OAC courses including a minimum of 70% or higher in:**
 - **English/Anglais (ENG4U/EAE4U preferred)**
 - **Advanced Functions (MHF4U)**
 - **Two of: Biology (SBI4U), Chemistry (SCH4U) or Physics (SPH4U)**

- **Biology (SBI4U) is strongly recommended for Biology students, Chemistry (SCH4U) is strongly recommended for Chemistry students, and Physics is recommended for all Bachelor of Science programs.**

For more information visit:

<http://www.ryerson.ca/undergraduate/admission/programs/medical.html>

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Ryerson is a leader in providing student centered services!

While an undergraduate student:

- **Research assistant**
- **Laboratory technologist assistant**
- **Co-op and internships**
- **Clubs, groups, course unions, societies**
- **Professional schools (medicine, dentistry, pharmacy, etc.)**

Student Support Services

- **First Year and Common Science Office**
- **Free tutoring in first-year science courses**
- **Learning success center**
- **Access center**
- **Writing center**
- **Centre for student development and counseling**
- **Career center**
- **Ryerson student union**
- **Student financial assistance**
- **Health center**
- **Many, many more!**

Medical Physics at Ryerson University

THANK YOU!



• Any questions?



For more information:

<http://www.ryerson.ca/physics/index.html>



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