

# UNIVERSITY OF TEXAS AT DALLAS - DEPARTMENT OF PHYSICS

## PHYSICS COLLOQUIUM

<http://www.utdallas.edu/physics/lectures/info/>

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Wednesday, April 16, 2008; 4:00-5:00 PM  
Room: ECSS 2.312

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### Optimization of Intensity Modulated Radiation Therapy

**Dr. Ramin Abolfath**

*Department of Radiation Oncology, UT Southwestern Medical Center*

Radiotherapy is a common modality for the treatment of cancer. The desirable outcome of the radiation therapy is tumor ablation while avoiding damage to healthy tissues. The irradiation therefore has to be flexibly imparted on the body, often requiring uneven shaping of photon intensity through the beam field, hence Intensity Modulated Radiation Therapy (IMRT). Internal movements of body anatomy during therapy pose a particular challenge for IMRT delivery.

To minimize the error in IMRT delivery to moving targets we develop strategies based on controlling the velocity of multi-leafs and intensity rate of beams that allow the irradiation of the target to be properly re-distributed over subsequent phases of target motion. This general approach utilizes multiple solutions that provide the same dose to target while optimizing these delivery parameters that can improve the quality of therapy. The solution strategies involve complex optimization processes on diverse landscapes with multiple local minima. We explicitly explore various dynamical pathways and use the genetic approaches to arrive at efficient solutions of our multi-parameter optimization problems.

**About the speaker:** Before joining the Department of Radiation Oncology at UT Southwestern in 2007, Dr. Abolfath was involved in research in various fields of theoretical and computational physics. His MS thesis was dedicated to topics in cosmology and string theory, while his PhD in theoretical condensed matter physics was on quantum Hall effect. In 2004-2007, Dr. Abolfath was a Research Associate with National Research Council of Canada working at the Institute for Micro-structural Sciences in Ottawa on computational nano-structures and magnetism in quantum dots.