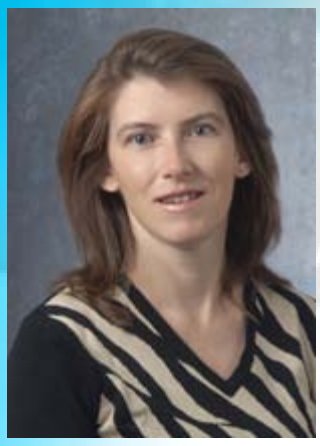
Physics Colloquium

Michigan Technological University

Tuesday, December 13, 2011 at 2:00 pm
Room 139 Fisher Hall



Macromolecular Physics: from Self-assembly to Nanoparticle-cell Surface Interactions

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Abstract: Self-assembly into nanostructures, which has been actively explored for nanotechnological applications, is among the important phenomena of macromolecular physics and. This presentation will review the thermodynamic basis of macromolecular self-assembly and discuss the kinetics of the process, which is much less understood and has become the subject of active research during recent years. We will discuss some of our recent results on kinetics of diblock copolymer micelle self-assembly in solution. There is a practical interest in this research direction as polymeric nanoparticles are being actively developed for technological and biomedical applications without a clear understanding of the principles of their formation. One of the advanced biomedical applications of nanoparticles is the selective targeting of cells with a high density of receptors (e.g. as in the case of cancerous cells) for therapeutic and imaging purposes. We will discuss the thermodynamics and kinetics of polymer nanoparticle-cell surface interactions and review some of our recent results in this area showcasing the role of analytical theory and computer simulations in elucidating the factors that control nanoparticle affinity and selectivity to cell surfaces. At the end we outline some potential future projects, related the subjects discussed in this talk.

Bio: Dr. Elena Dormidontova is an Associate Professor of Macromolecular Science and Engineering at Case Western Reserve University (Cleveland, Ohio). She graduated in 1991 with B.A./M.S. degree in Physics from Moscow State University (Russia) where she obtained her PhD degree in Physics and Mathematics in 1994. Her postdoctoral training was at University of Groningen (The Netherlands) and University of Minnesota. Since 2002 she is holding academic positions at Department of Macromolecular Science of Case Western Reserve University. Dr. Dormidontova is a recipient of a NSF Career award and is an active reviewer for NSF, NIH and leading journals in macromolecular physics, theory and computation. She was co-organizer of the symposium on “Biofunctional Architectures - Reversible Interactions and Surface Recognition” at the Spring 2010 ACS meeting in San Francisco.

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