



Please attend the PhD proposal defense of Elton Jhamba, a PhD candidate in Optics and an advisee of Dr. Hacene Boukari. His proposal defense will be on:

Friday, November 11, 2016  
3:00pm-4:00pm  
Oscar Building 1<sup>st</sup> Floor  
Seminar Room A103

Advisor: Dr. Hacene Boukari

***Title: Rotational and Translational Diffusion of Low Molecular Weight Nanoprobes in Ficoll solutions***

We combine fluorescence correlation spectroscopy (FCS) and fluorescence anisotropy (FA) methods to measure the rotational diffusion and the translational diffusion of fluorophores of different sizes, mixed in non-fluorescent –hence “invisible”- aqueous Ficoll (MW≈70 kDa) solutions under thermal fluctuations. We determine changes of the apparent rotational and translational diffusion coefficients with systematic increase of Ficoll concentration up to 1200 mg/ml. Notably, the changes cannot be accounted for by the corresponding changes of the bulk viscosity of the Ficoll solutions as would be suggested by the Stokes-Einstein relations for both diffusion coefficients. Instead, we analyze the data with the entropic model proposed by de-Gennes and fit each set of data with a stretched exponential [ $\exp(-\alpha c^n)$ ] with  $n$  being related to the quality of the solvent. The fits yield  $n$ -value close to one, suggesting a theta-like behavior of the host Ficoll-water system. However, the  $\alpha$ -value for translation is larger than that of rotation, indicating dissimilar local entropic effects on the rotation and translation, which is not predicted by the model. Further, altogether the analysis of the data indicates that Ficoll polymers behave as neutral spherical nanoparticles at low concentration but are likely to interpenetrate and entangle at high concentration.

Committee: Dr. Hacene Boukari (chair, DSU)  
Dr Cherese Winstead (member DSU)  
Dr Qi Lu (member DSU)  
Dr Yuriy Markushin (member DSU)  
Dr. Arnold Burger (external, Fisk University)