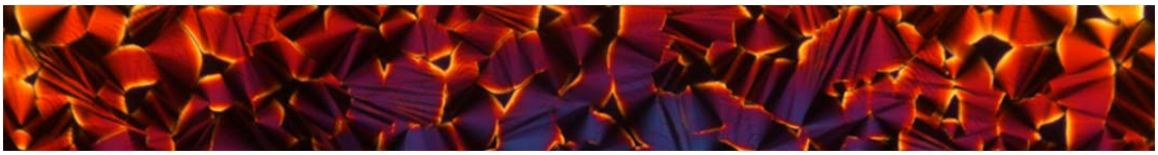

SOFT MATERIALS RESEARCH CENTER

SPECIAL SEMINAR SERIES

Structure and Fluctuations in Twist-Bend Nematic Phases

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I will present some recent results from our studies of Twist-Bend Nematic (N_{TB}) structure and fluctuations. The first part will focus on the use of resonant x-ray scattering (RSX) to probe the bulk structure of the heliconical precession of molecular orientation in the N_{TB}, including determination of its helix pitch, p. Combining pitch data with birefringence measurements of the cone angle enables characterization of the mean heliconical structure, including calculation of its molecular bend magnitude. Measurements on a series of mixtures of the bent dimer CB7CB with 5CB reveal a remarkable connection of the bulk helix structure with the magnitude of molecular bend. In the second part, I will recount the pioneering work of deGennes and the Orsay Liquid Crystal Group on the study of thermal molecular orientation fluctuations in nematic liquid crystals (LCs) by light scattering [1,2], and discuss the extension of these experiments to the nanoscale using RSX. Since the time of the Orsay work, the study of scattering from thermal fluctuation modes of liquid crystals has become a commonly used technique for characterizing phases and phase transitions on optical (micron) length scales. An interesting extension of this theme would be into the x-ray regime, where nanometer scale phenomena could be probed. A basic limitation in this regard is that generally x-ray scattering is a single photon/electron interaction process that depends only the electron density and provides no direct information on molecular orientation. We have found, however, that RSX can probe molecular orientation fluctuations, by exploiting the softness of director bend elasticity in nematic LCs near the transition to the N_{TB} phase.

[1] P.G. de Gennes, *Comptes Rendus Acad. Sci.* **266** , 15 (1968).
[2] Orsay Liquid Crystal Group, *Phys. Rev. Lett.* **22**, 1361 (1969).

Wednesday, November 2 at 1:30 p.m. in Duane Physics G126

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