At present, there is a large disconnect between the ways biological systems and laboratory chemists pursue chemical synthesis. Living organisms simultaneously synthesize multiple sophisticated molecules with absolute chemo-, regio-, and stereoselectivity, starting from highly complex "soups" of chemical precursors found within a cell. In contrast, laboratory synthesis is largely reductionist in its approach: most synthetic transformations combine two high-purity precursors with a high-purity catalyst, often in the absence of air and moisture, to produce a third chemical.

The research performed in the Miljanić research group at the University of Houston aims to bridge this divide. Using equilibrating collections of compounds known as dynamic combinatorial libraries (DCLs), we have shown that complex mixtures of precursors can be used to synthesize multiple pure products in high yields and selectivities. This synthetic strategy is known as kinetic self-sorting and holds the potential to yield cost savings in the basic chemical industry, where multiple value-added chemicals could be produced simultaneously. In addition, our recent work on perfluorinated metal-organic frameworks (MOFs) is the first step towards preparing microenvironments for selective encapsulation and reactivity within crystals of porous materials. Within these pores, another biological principle—namely, physical compartmentalization—could be tested as a synthetic tool, as incompatible chemistries could be isolated within pores of different MOFs, which would act as analogs of cellular organelles.

Taken summarily, these two novel synthetic approaches are being developed to allow more rapid access to new functional molecules and materials of interest in sensing, separations, and energy applications. As just one example, this presentation will highlight the synthesis and characterization of fluorophores based on benzobisoxazole and benzimidazole nuclei. These “cruciform fluorophores” can be used to qualitatively distinguish among structurally closely related analytes from several important compound classes, including carboxylic and boronic acids, phenols, amines, ureas, and anions.

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**CBC SEMINAR ANNOUNCEMENT**

**Professor Ognjen Miljanić**  
University of Houston

**Regulated Equilibria and Compartmentalization in Synthetic Chemistry**

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**Date:** 25th July 2013 (Thursday)  
**Time:** 11:00am – 12:30pm  
**Venue:** NTU SPMS CBC Building Level 2, Conference Room  
**Host:** Asst Professor Zhao Yanli