The work presented here focuses on two broadly related research areas, namely the development of boron-linked porous materials and chemical sensors. Boron, being a metalloid, has properties intermediate between those of metals and nonmetals. Given the empty p-orbital on neutral boron, most boron containing species can serve as Lewis acids capable of bonding Lewis bases. As such, coordination between boron and nitrogen will be discussed as a recognition motif in sensing applications as well as a basis for molecular assembly. More specifically, small fluorescent boronates exhibit different optical responses upon binding amines depending on Lewis acidity/basicity of the pair and steric interactions in the host-guest complex. Coordination between boronate diesters and diamines produce polymorphic materials with solvent-dependent structures ranging from discrete macrocycles to extended crystalline polymer networks. Some of these materials contain persistent pores and show selective guest uptake, for example adsorbing benzene over toluene, ethylbenzene or xylene (BTEX), while others undergo a color transition upon guest binding.

Relating to guest binding, Mother Nature has had millions of years to develop highly selective receptors and pathways, yet there are still essential biological processes that rely on cross-reactive recognition events that help us navigate through the world on a daily basis. This concept of cross-reactivity serves as the foundation for efforts to discriminate unique molecular signatures arising from aberrant glycosylation patterns as a means to diagnose and stage cancer. To do this, we generate Synthetic Lectins (SLs) based on the differential display of boronic acids on peptides. Incorporating these SLs into an array format allows us to monitor changes of Tumor Associated Carbohydrate Antigens (TACAs) associated with oncogenesis and metastasis and consequently detect the presence/absence of the disease (diagnose), metastatic potential, clinical stage and ethnicity; thereby providing a new paradigm for the development of a cancer diagnostic.

**From Porous Materials to Chemical Sensors, Sensing**

A Paradigm Shift Where “Not Selective” Does Not Mean Not Useful

*Tuesday, September 10th, 2019 at 4:15 p.m.*

Stowell Hall, Room 211

*Light refreshments will be served. All are welcome.*