

Dept. of Chemistry and Biochemistry

Organic/Inorganic Seminar Series

**Joshua Goldberger**

Ohio State University

**Friday, April 19, 2019**

Seminar at 2:30 pm, 331 KLA

*Coffee reception prior at 2:00 pm*



Hosted by David Johnson

## ***Surface Chemistry and Anisotropy in Layered Materials***

Abstract: Two-dimensional materials represent an intriguing class of materials in which both surface functionalization and solid-state chemistry can be uniquely exploited to systematically design competitive electronic, topological insulating, and catalytic properties. First, we will discuss our recent work on ligand-terminated group 14 graphene analogues. We will show the extent to which the electronic structure can be tailored using surface functionalization chemistry. Furthermore, we will highlight how the surface chemistry can lead to nonobvious interactions with other chemical species. Second, we will discuss our efforts in understanding how to control the anisotropic thermoelectric behavior in layered materials. We have discovered that  $\text{NaSn}_2\text{As}_2$ , an exfoliatable van der Waals Zintl phase, simultaneously exhibits p-type behavior in-plane and n-type behavior along the cross-plane direction. We will establish the origin of this phenomenon, show that it occurs in numerous layered materials, and discuss how it can be exploited to create new classes of electronic and thermoelectric devices.