Houk-Jung **Organic Colloquium**

"Synthesis in a Boron World"

Abstract: Nature has evolved highly sophisticated machinery for organic synthesis, many of which resemble molecular assembly-line processes. So far chemists have been able to apply this type of approach in the synthesis of peptides and oligonucleotides but in these reactions, simple amide (C–N) or phosphate (P–O) bonds are created. It is much more difficult to make C–C bonds but this is central to the discipline of organic synthesis. This difficulty is why organic synthesis is challenging and why robust, iterative or automated methodologies have not yet emerged.

Here, we describe the application of iterative homologation of boronic esters using chiral lithiated carbamates and chloromethyllithium enabling us to grow carbon chains with control over both relative and absolute stereochemistry. Applications of this strategy to the synthesis of natural products will be demonstrated. In addition, the methodology is used to answer fundamental questions about nature and the specific role of methyl substituents in carbon chains. By understanding their role, I will show that molecules can be created with linear or helical conformations or hybrids of the two.

Finally, I will show new triggers for 1,2-metalate rearrangements of boronate complexes using strain release as an additional driving force and we use this chemistry to make functionalized cyclobutanes and azetidines.

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