



# FURMAN

**Chemistry Department  
2010 Summer Research Program**

**Brian Goess's Research Group**

We focus on the synthesis of biologically-active small molecule natural products and the development of new reactions designed to make such syntheses more efficient. To this end, we are currently focusing on two primary objectives:

1. Developing a new protecting group for alkenes. We have developed one of the shortest and highest-yield syntheses of the agricultural natural product grandisol, a molecule valuable in the treatment of boll weevil infestation of cotton crops. One step in the synthesis involves a chemo-, regio-, and diastereoselective semihydrogenation of a conjugated diene. A successful semihydrogenation was achieved only following significant experimentation with various reaction conditions, during which time we realized that there existed no general strategy for the regioselective semihydrogenation of dienes. Inspired by this challenge, we then developed such a reaction in a one-pot process, which utilizes a dialkylborane as a temporary protecting group for alkenes, and we are currently investigating its generality with regard to substrate scope and functional group tolerance. We plan to apply what we learn to further improve the efficiency of our synthesis of grandisol and a number of other small molecule natural products of biological interest.
2. Rescuing the biological activity of the furanosteroid family of antiproliferative natural products. Many members of the furanosteroid family of natural products possess significant antiproliferative activity. However, their high intrinsic reactivity leads to high toxicity and low enzyme selectivity. We have developed a synthesis of one member of this family, hibiscone C, and are currently preparing its cyclopropyl homolog. Based on the known parallels in reactivity between alkenes and cyclopropanes, we hypothesize that this homolog will retain the fundamentally valuable biological reactivity of a furanosteroid but to a diminished extent, which will render it more selective for its intended biological target. A biotinylated cyclopropyl homolog of hibiscone C will also be prepared and evaluated in an enzyme-binding assay to assess the effect of cyclopropane homologation on enzyme selectivity. If this project is successful, it will represent the first time cyclopropanation will have been used to access the potential biological activity of a natural product.