

Undergraduate Research Seminar  
Wednesday, December 3<sup>rd</sup>, 2014 5:30 p.m.  
Leigh 309

### **James McDaniel**

“Synthesis of Novel Diketopiperazines”

Hetero-2,5-diketopiperazines containing proline and hydroxy-proline residues represent a unique class with important characteristics in both structural detail and biological activity. Since the first reported isolation of a diketopiperazine (DKP) from the sponge *Dysidea herbacea*, there have been several reports describing the isolation of this class of compound from other marine sponges. DKPs are also reported from marine microbial sources, including the proteobacteria *Alcaligenes faecalis*, isolated from the sponge *Stelletta tenuis*. The metabolites reported in these investigations are mostly the products of 4-hydroxy-proline or proline reacting with phenylalanine, arginine, leucine, isoleucine, norvaline or alanine. Because of their important biological uniqueness, it is prime important to develop an efficient flexible, and cost-effective synthetic strategy for synthesis of these proline-based marine microbial metabolites. Our longstanding involvement in benzotriazole (Bt)-mediated oligopeptide chemistry prompted us to design a new, versatile, and flexible strategy able to provide either cis- or trans-configured DKPs starting from the same inexpensive dipeptidoyl benzotriazoles. Herein, we report a tandem deprotection/cyclization methodology which leads to the formation of marine-derived DKPs.

### **Michael Johns**

"Heritage speakers' and L2 learners' processing of non-adjacent noun-adjective agreement in code switched sentences"

Previous research has attested that inflectional morphology causes persistent difficulties for both heritage speakers (HS) and second language (L2) learners<sup>6,7</sup>. In L2 learners, inflectional morphology is acquired late, and research with HS has shown that they are more accurate with determiner-noun agreement than with noun-adjective agreement<sup>5</sup>. Moreover, research with different populations has shown that adjacency of the adjective affects agreement processing in monolinguals<sup>1</sup>, L2 learners<sup>4</sup>, and HS<sup>2</sup>. Cognitive costs in processing have also been attested when bilingual speakers engage in code-switching<sup>3</sup> (CS). As both non-adjacent dependencies and CS are attested to cause processing difficulties, this study aims to look at how these two factors interact and to determine the role of early bilingualism and CS experience in processing code-switched sentences with non-adjacent noun-adjective agreement.

Twelve high-intermediate to advanced L2 learners of Spanish and thirteen HS were recruited to participate in this study. The experimental task was a non-cumulative self-paced reading task where participants evaluated the grammaticality of sentences. Stimuli followed a 2x2x2 design, with sentences being presented either only in Spanish or with an intrasentential code-switch in English that separated the head noun (either masculine or feminine) from its adjective (which either matched or mismatched with the head noun). All trials were presented in a mixed-block design. We predicted that, overall, HS would read faster and prove more accurate

than L2 learners in both switched and non-switched sentences. Since previous research has found that there is a preference for the default masculine gender in noun-adjective agreement<sup>7</sup>, we predicted that both groups would show less sensitivity to agreement errors with feminine noun/masculine adjective mismatch than masculine noun/feminine adjective mismatch in both switched and non-switched sentences showing preference for the masculine default. Additionally, we predicted that participants would be least sensitive to switched sentences with feminine noun/masculine adjective mismatch.

The four regions immediately following the switch and containing the critical adjective were analyzed using linear mixed-effects models. Our results indicated, contrary to our predictions, that overall there were no significant differences in reading time between HS and L2 learners nor between switched and non-switched sentences. There was a significant Gender by Match interaction, such that feminine nouns with masculine adjectives were read significantly faster than masculine nouns with feminine adjectives, lending support to the masculine default. For accuracy, again there were no significant differences between switched and non-switched sentences. HS were significantly more accurate than L2 learners, and both groups were more accurate with matched than mismatched items. An interesting numerical pattern did emerge, as well: HS displayed 100% accuracy with non-switched sentences with a feminine noun/feminine adjective (matched) while L2 learners displayed their highest accuracy with code-switched sentences with a feminine noun/feminine adjective: 85%.

The results of this study suggest that neither HS' nor L2 learners' processing seems to be disadvantaged by CS; these results, however, will be discussed in terms of processing costs in CS and global inhibition.