Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Unfolding the physics of URu_2Si_2 through chemical substitution (Si $\rightarrow$ P) RYAN BAUMBACH, ANDREW GALLAGHER, KUAN-WEN CHEN, NHMFL, Florida State Univ., FUMITAKE KAMETANI, ASC, NHMFL, Florida State Univ., NAOKI KIKUGAWA, Natl. Inst. Mat. Sci., Tsukuba, Japan, NHMFL, Florida State Univ., SAMANTHA CARY, THOMAS ALBRECHT-SCHMITT, Dept. Chem. and Biochem., Florida State Univ. — URu_2Si_2 features all of the major phenomena that are at the focus of current research in correlated electron metals, including an exotic ordered state ("hidden order"), unconventional superconductivity, and anomalous metallic behavior. We recently undertook to study URu_2Si_2 using the novel tuning parameter Si $\rightarrow$ P substitution which, in a simple picture, simply adds electrons to the conduction band. Substitution of high vapor pressure elements in URu_2Si_2 is unprecedented, and is enabled by our new molten metal flux technique [1]. We find a rich phase diagram that includes two quantum phase transitions that are associated with hidden order and antiferromagnetism, respectively. In the hidden order region, the superconducting transition temperature is initially enhanced with P, after which it approaches zero before hidden order is destroyed, suggesting that URu_2Si_2 might be electronically displaced from "optimal" doping. We also find that the hidden order and antiferromagnetic regions are distant from each other, indicating that their origins are quite different. We will discuss these results and implications for understanding hidden order, superconductivity, and quantum criticality.

[1] R. E. Baumbach, *et. al.*, "High purity specimens of URu_2Si_2 produced by a molten metal flux technique," *Phil. Mag.* (2014).

Ryan Baumbach
NHMFL, Florida State Univ.

Date submitted: 12 Nov 2014 Electronic form version 1.4