UCMERCED | CHEMISTRY & BIOCHEMISTRY

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CHEMISTRY & BIOCHEMISTRY SEMINAR SERIES:

Catalysis with Earth Abundant Elements: Opportunities in Synthesis

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Abstract:

Transition metal catalysis has revolutionized chemical synthesis. Reactions such as metal-catalyzed cross coupling, asymmetric hydrogenation and C–H functionalization have changed the way chemists approach bond constructions and ultimately expand molecular space. Our group has been studying catalytic transformations with earth-abundant, first row transition metals that exploit the unique electronic structures available to these elements that provide new reactivity or selectivity. Levering one- or two-electron redox changes determines which application is most appropriate. For the former, unique metallobased radical chemistry has been applied to a $C(sp^3)$–$C(sp^3)$ bond formation by cycloaddition and cross coupling methods for assembly of $C(sp^2)$–$C(sp^3)$ bonds relevant to the synthesis of active pharmaceutical ingredients. For two-electron reactivity, transformations of interest include site-selective C–H functionalization that is governed by the ability of the metal catalyst to distinguish the electronic differences between various C–H bonds and the site and stereoselective insertion of arenes into metal-hydride bonds.

About the Speaker:

Paul J. Chirik is the Edwards S. Sanford Professor of Chemistry and Chair of the Princeton Chemistry Department. Chirik is a synthetic chemist with broad interests in catalysis and sustainability. His research group focuses on chemical reactions with reduced carbon footprint, reliance on earth abundant rather than precious elements and new bond disconnections that reduce waste and separations. A native of Philadelphia, Pennsylvania, he obtained his B. S. in chemistry at Virginia Tech where in the laboratory of Joseph Merola, his interest in the chemistry of the transition metals began. Chirik earned his Ph.D. at Caltech under the supervision of John Bercaw and following a brief postdoctoral appointment at MIT, began his independent career at Cornell in 2001. In 2006, he was promoted to Associate Professor and in 2009 was named the Peter J. W. Debye Professor of Chemistry. In 2011, Chirik and his research group moved to Princeton University where he was named the Edwards S. Sanford Professor of Chemistry. His teaching and research have been recognized with an Arthur C. Cope Scholar Award, the Blavatnik Award for Young Scientists, a Packard Fellowship in science and engineering, the 2016 Presidential Green Chemistry Challenge Award, the 2017 the 2019 Eni Enivornmental Solutions Prize, the Gabor Samorjai Award for Creative Research in Catalysis and the Linus Pauing Medal. Chirik is the author of over 250 peer reviewed publications, inventor on more than 20 patent applications and current Editor-in-Chief of Organometallics.

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