

UNIVERSITY OF RHODE ISLAND
Department of Chemistry

SEMINAR

Room 105 Beupre
3:00 p.m, Monday, April 17, 2017

Prof. Stephen Craig

William T Miller Professor of Chemistry
Duke University
Durham, NC

**"Covalent Mechanochemistry
in Single Molecules,
Adaptive Polymers, and Soft Devices"**

HOST

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Covalent Mechanochemistry in Single Molecules, Adaptive Polymers, and Soft Devices

Prof. Stephen Craig
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Abstract: The forces typical of the macroscopic world (for example, those between a baby's fingers) are many orders of magnitude larger than the forces between the individual atoms of a molecule. It has been known for decades, for example, that breaking a piece of plastic or shearing a polymer solution can lead to homolytic carbon-carbon bond scission along the main chain of an organic polymer and a concomitant reduction in molecular weight. The magnitude of macroscopic forces, in combination with the fact that they are directional, creates an opportunity to direct chemistry that might otherwise be effectively impossible.

This talk will present studies of reactions under large, directional forces, and their applications in studies of fundamental reactivity and new classes of stress-responsive polymers. Specific outcomes include: the ability to trap transition states for extended periods of time, molecules that get shorter in response to being pulled, and quantifying reaction paths that contradict orbital symmetry rules. Within materials applications, a new class of self-healing polymers will be introduced, in which mechanical activation of chemical reactions leads to improved structure and properties under conditions that are typically destructive to both. Finally, soft chemomechanical devices will be presented that allow remote actuation of local chemical signals, with implications for new catalytic reactions.