

# DEPARTMENT OF MECHANICAL ENGINEERING

## WILLIAM MAXWELL REED SEMINAR SERIES

### “Computation to Clinic: Investigating Deformation and Fracture in Cortical Bone under Indentation”

Kevin F. Hoffseth

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**Abstract:** Cortical bone provides unique challenges as a material for indentation testing – especially in live patients. It has a hierarchical composite structure, a dependence on hydration, and it is situated underneath layers of soft tissue in-vivo. The ability to determine its properties or quality in-vivo, with minimal damage to the overall, living patient, holds large value in biomechanics and medicine, including assessment treatment of osteoporosis, diagnosing human and equine fracture risk, and development of orthopaedic instruments. This talk will examine deformation and fracture in cortical bone underneath axisymmetric cone indentation and plane strain wedge indentation, using finite element modeling, pre-and-post mortem cortical bone indentation experiments, and high-speed microscopy. Initial work to clarify mechanical links to clinical reference point indentation will be discussed, followed by current efforts and challenges in modeling indentation fracture behavior under the effects of wedge apical angle and osteonal microstructure orientation, with results informing developing research in targeted areas.

**Bio:** Kevin F. Hoffseth is a Ph.D. candidate working with Professor Henry T. Yang in the Department of Mechanical Engineering at University of California Santa Barbara. His research interests include bio/bioinspired hierarchical composites and additively manufactured materials under indentation and advanced manufacturing processes. His work has been cited in local press (“Good Bone, Bad Bone”, The Santa Barbara Current), along with an art award for experimental photography (UC Santa Barbara Art of Science 2015), and he received the Best TA Award in the UC Santa Barbara Mechanical Engineering Department for 2015-2016.

**Date:** Friday, March 9<sup>th</sup>  
**Place:** CB 122

**Time:** 3PM  
**Contact:** Dr. Alexandre Martin 257-4462

Meet the speaker and have refreshments  
Attendance open to all interested persons