



## **CSU PHYSICS COLLOQUIUM**

### **A Research-validated Approach to Transforming Upper-Division Physics Courses**

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**4:00 PM Monday, October 16, 2017**

**Refreshments at 3:45 PM**

**Location: 120 Engineering (Hammond Auditorium)**

#### **Abstract**

At most universities, including the University of Colorado, upper-division physics courses are taught using a traditional lecture approach that does not make use of many of the instructional techniques that have been found to improve student learning at the introductory level. We are transforming upper-division courses (E&M, quantum, and Classical Mechanics) using principles of active engagement and learning theory, guided by the results of observations, interviews, and analysis of student work at CU and elsewhere. I will outline these reforms including consensus learning goals, clicker questions, tutorials, modified homework, and more, as an example of what a transformed upper-division course can look like, and as a tool to offer insights into student difficulties in advanced undergraduate topics. We have examined the effectiveness of these reforms relative to traditional courses, based on grades, interviews, and attitudinal and conceptual surveys. Our results suggest that it is valuable to further investigate how physics is taught at the upper-division, and how education research may be applied in this context.