

# Departmental Colloquium

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**Monday, September 21, 2015**  
**2:00 p.m., HH-3017**

## **Breaking the Ice: Ice-Structure Interaction using 3D Discrete Element Modelling**

### **Abstract:**

A 2008 appraisal by the United States Geological Survey estimates that the Arctic holds 13 percent of the world's recoverable undiscovered oil and 30 percent of the world's recoverable undiscovered natural gas; moreover, most of these resources are found offshore. Understanding how sea ice interacts with offshore structures is critical in designing platforms, bridge supports, breakwaters, and similar structures in support of hydrocarbon development in arctic and cold regions.

Recent work by the C-CORE Centre for Arctic Resource Development uses a three-dimensional discrete element method (3D DEM) bonded particle model to simulate ice interacting with an upward-sloping cone. The research used the geometry of the Confederation Bridge across Canada's Northumberland Strait as a starting point to examine ice failure, as well as rubble pile characteristics such as height, shape, volume, and formation mechanisms (such as sliding, rotation, and collapse).

The presentation will focus on qualitative observations and learnings arising from the 3D simulations. These insights contribute to our current understanding of ice interaction with cones and serve to guide others wishing to undertake similar 3D DEM research into ice. The presentation will conclude with a discussion of extensions of this research which are currently underway at CARD.