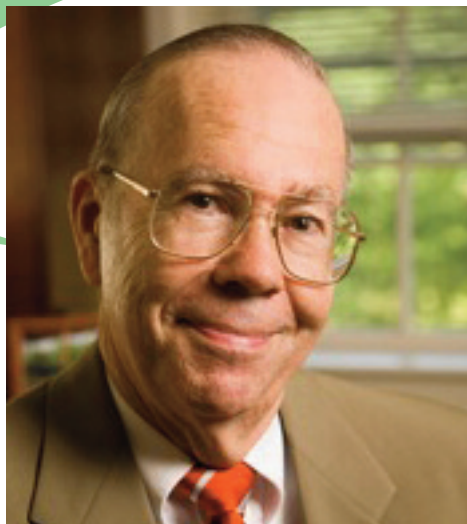


# CENTER FOR RESOURCE RECOVERY AND RECYCLING

## Graduate Seminar Lecture Series

### The Cycles and Sustainability of Metals



**Thomas Graedel**  
Yale University

Thomas Graedel is Professor of Industrial Ecology in the School of Forestry and Environmental Studies at Yale University. His research is centered on developing and enhancing industrial ecology, the organizing framework for the study of the interactions of the modern technological society with the environment. His textbook, *Industrial Ecology*, cowritten with B. R. Allenby, was the first book in the field and is now in its third edition. It, and his 2004 textbook, *Greening the Industrial Facility*, are used for courses of the same names in the Yale University School of Forestry and Environmental Studies. Graedel's current interests include studies of the flows of materials within the industrial ecosystem, and of the criticality of metals. He was elected to the U.S. National Academy of Engineering for "outstanding contributions to the theory and practice of industrial ecology, 2002."

**Thursday, April 14, 2011**  
**Salisbury Labs, Room 104, Noon**

Should we worry about the sustainability of supplies of non-renewable resources? To study this question, flows of metals into and from human use (the anthropogenic metal cycles) have been quantified for a number of the common engineering metals. Results for metals singly and grouped into "metal spectra" demonstrate aspects of extraction, manufacturing, trade, use, recycling, and loss. More recently, a methodology for assessing the "criticality" of both the common and uncommon metals has been developed, involving their supply risk, the susceptibility of corporations, countries, and the planet to supply disruption, and environmental implications. Preliminary criticality results will be presented and discussed.