

Carnegie Mellon University
Materials Science & Engineering

presents

**Rare Earths and Other Mineral Raw Materials:
The Many Faces of Criticality**

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ABSTRACT: A critical element, as the term has come to be used, provides essential properties to a modern engineered material and is subject to supply risk. The rare-earth elements are perhaps the most prominent of the critical elements in recent years because of their important uses in permanent magnets, advanced lighting, and military materials; the geographic concentration of production in China; and the dramatic run-up in prices in 2010-2011 followed by price collapse between 2011 and 2015. Yet criticality extends beyond the rare earths. What is critical depends on your perspective—who and where you are, and when you ask. This paper reviews the many perspectives on, or faces of, critical elements. It compares and contrasts assessments from industry (General Electric), government (Japan, European Commission), and academia (Yale University), as well as assessments that examine emerging energy technologies (Critical Materials Institute, U.S. Department of Energy, Joint Research Centre of the European Commission).

BIOGRAPHY: Roderick G. Eggert is a Professor of Economics and Business at the Colorado School of Mines, where he has taught since 1986. He also is Deputy Director of the Critical Materials Institute (CMI), an Energy Innovation Hub created in 2013 by the U.S. Department of Energy to accelerate innovation in energy materials. His research and teaching focus on mineral economics and public policy. He chaired the U.S. National Research Council committee that wrote the 2008 book *Minerals, Critical Minerals, and the US Economy* (National Academies Press) and served on the study committee that prepared the 2011 report *Energy Critical Elements: Securing Materials for Emerging Technologies* (American Physical Society and the Materials Research Society). He has a B.A. in earth sciences from Dartmouth College, a M.S. in geochemistry and mineralogy from Penn State University, and a Ph.D. in mineral economics also from Penn State.

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