

Functional metals for sustainable and key technologies: scarcity, criticality or ignorance?

Event: Research Seminar Ecological Economics
 Date: December 3rd, 2014, 5 p.m. until 8 p.m.
 Location: TC.5.13

!! Registration necessary to armin.dieter@wu.ac.at!!

Program

17:00 – 18:10	Material Efficiency: Scarce hitch-hiker metals (Prof. Robert U. Ayres) (45' presentation, 25' questions and discussion)
18:10 - 18:25	Break
18:25 – 19:35	Critical Rare Earth Elements: Myths and what we know about them (Volker Zepf) (45' presentation, 25' questions and discussion)
19:35 - 20:00	Optional concluding discussion
20:00 (or earlier)	Final remarks (" <i>Das Campus</i> " – on your own account)

Lecturers

Robert U. Ayres:



Robert U. Ayres is a physicist and economist, currently Novartis professor emeritus of economics, political science and technology management at the international business school INSEAD, in France. He has previously taught at Carnegie-Mellon University, and as a visiting Professor at Chalmers Institute, Gothenburg Sweden. He is also Institute Scholar at the International Institute for Applied Systems Analysis (IIASA) in Austria, and a King's Professor in Sweden. He is noted for his work on technological forecasting, life cycle assessment, mass- balance accounting, energy efficiency and the role of thermodynamics in economic growth. He originated the concept of "industrial metabolism", known today as "industrial ecology" with its own journal. He has conducted pioneering studies of materials/energy flows in the global economy. He is author or co-author of 21 books and more than 200 journal articles and book chapters. The most recent books are *The Bubble Economy* (MIT Press, 2014), "*Crossing the Energy Divide*" with Edward Ayres (Wharton Press, 2010) and *The Economic Growth Engine* with Benjamin Warr (Edward Elgar, 2009).

Volker Zepf:



Volker Zepf works as a researcher and lecturer at the Chair of Resource Strategy, University of Augsburg, Germany. His first career was as a professional soldier in the German Air Force where he worked as a military advisor for industry in aircraft avionic software and as flight instructor. He left the forces in a rank of Lieutenant-Colonel. Then he studied Geography, Geology, Environmental Economics, Resource Geography and Ethics at the University of Augsburg which he finished with a work about 'Africa in neocolonialist times – about the importance of strategic mineral raw materials in and for a globalized world'. From 2009 on he worked as a researcher and lecturer around scarce

metals and in 2012 his PhD thesis about Rare Earth Elements was published and awarded by Springer Publishing. His main research focus is on rare metals, rare earth elements and the impact of lifestyles on the global resource use. Since 2013 he is also coordinator in a graduate school at the University of Augsburg with the topic 'Strategic Resource Concepts for Future Energy Systems'.

Abstracts

Material Efficiency: Scarce hitch-hiker metals ***(Robert U. Ayres)***

In the last few decades progress in electronics, especially, has resulted in important new uses for a number of geologically rare metals, some of which were mere curiosities in the past. Most of them not mined for their own sake (gold, the platinum group metals and the rare earths are the exception) but are found mainly in the ores of the major industrial metals such as aluminum, copper, zinc and nickel. We call the major metals "attractors" and the rare accompanying metals "hitch-hikers". The key implication is that rising prices do not necessarily call forth greater output because that would normally require greater output of the attractor metal. We trace the geological relationships and the functional uses of these metals. Some of these metals appear to be irreplaceable in the sense that there are no known substitutes for them in their functional uses. Recycling is going to be increasingly important, notwithstanding a number of barriers.

Critical Rare Earth Elements: Myths and what we know about them. ***(Volker Zepf)***

Rare earth elements (REE) have come into focus in many scientific and economic communities as they are required for climate-relevant applications such as wind turbines and hybrid cars. Moreover, these REE have a very broad application arena and are only partly substitutable. For several years the REE were of little economic value, and China's entry into production brought prices of REE down, which in turn led to the closure of several non-Chinese mines. Next to the unquestionable advantages and positive material characteristics there is one critical issue: currently more than 90% of the global production of REE is mined and produced in China. There is principally no other mine in the world that produces significant quantities for the world market, so that specialists fear that this monopolistic situation could eventually lead to a partial lack of availability of REE. This presentation provides some more details concerning REE.