continuous supply can be difficult and costly. Despite its many disadvantages, intermittent supply is one way to reduce leakage from the distribution system in the short term. When only a portion of the system is pressurized at any given time, only a portion of the system is leaking. Even if enough water is available to pump into an intermittent system to make it continuous, rates of water loss will likely soar if nothing is done to first reduce leakage.

More research is needed to better understand how intermittent supply affects water quality, water consumption, leakage, water pressure conditions, and infrastructure integrity. This improved understanding would help governments and water utilities decide how big a priority continuous water supply should be. A better understanding of the specific effects of intermittent water supply could also help water utilities reduce or mitigate its negative consequences. It might also be helpful for formulating strategies to avoid intermittent supply in the first place.

With the support of a grant from the Tinker Foundation, I spent last summer in Managua, Nicaragua, observing workers from ENACAL, the country's national water and sewer utility. I rode around with the workers who open and close valves, monitor wells, repair pipes, look for leaks, measure water pressure, and monitor water quality. I also got the chance to talk to utility managers about how operations decisions are made and how my research could be useful to them.

Based on what I learned last summer in Managua, I formulated a research plan to monitor water quality and pressure in an intermittent system. The results of this research, which will be carried out in Panama, another Latin American country affected by intermittent supply, will hopefully help water utilities to better manage intermittent supply and understand its effects.

John Erickson is a Ph.D. student in Civil and Environmental Engineering at UC Berkeley. He received a Tinker Summer Research Grant in 2012.

A water utility employee collects a sample from a customer's tap to be tested for contamination.

Photo by John Erickson.

Photo by Wang Chun Lyg/Associated Press.

Wheel loaders transport rare earths at the Port of Lianyungang, China.

RESEARCH

Tilling the Rare Earths

by Julie Klinger

China's new government leadership appears likely to continue enforcing production and export controls on the country's rare earth industry. Currently the producer of 95 percent of the world's rare earth elements (REEs), China has been under fire since 2009 to lift its export quotas on these strategic elements essential to the manufacture of everything from iPhones to missiles. Since China restricted exports in 2009, prices for some elements have increased as much as 80-fold.

The WTO ruled twice in China's favor against charges brought by the U.S., Japan, and the EU that China's quotas unfairly disadvantaged foreign businesses. China claims that it simply cannot keep up with global demand without exhausting its own resources at a high environmental cost. China's actions are permitted under Article XX of the General Agreement on Tariffs and Trade, which allows WTO member countries to enact trade restrictions in order to conserve exhaustible natural resources, so long as they are imposed equally on foreign and domestic firms.

This is exactly what Beijing has taken pains to do. Citing environmental and safety concerns, China's central government has undertaken a three-pronged approach: reducing production quotas to levels that ensure long-term sustainability; closing down illegal mines; and forcing privately held companies to merge into larger, state-owned enterprises. These actions are calculated to facilitate greater oversight of China's domestic mining industry in hopes of curbing environmental damage as well as removing

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China from the unenviable position of having the most mining-related deaths in the world. While this move hurts certain businesses and raises prices, it addresses some of the leading causes of China's social unrest.

The effects of this strategy have been acutely felt by renewable energy, consumer electronic, and defense industries worldwide. The high prices have also opened up new horizons of mining possibilities, such as the northern Brazilian Amazon, where reserves have been known about for decades but were, until recently, considered too remote and too ecologically sensitive to extract. Not anymore: Brazil's Rousseff administration recently declared the goal of making the country self-sufficient in REEs — and eventually controlling a third of the global supply.

While a greater supply would bring welcome price relief to industries around the world, it comes at a cost. Brazil's REEs — like China's — are located in ecologically sensitive regions, some of which are populated by indigenous peoples. As China takes steps to reign in environmental degradation and mining fatalities in this strategic sector, it displaces the problem elsewhere, to places willing to look the other way while new mining concessions flout national labor and environmental protection laws.

But within this problem lies tremendous potential for international collaboration around sustainable REE production, which should include expanding specialized recycling facilities to recapture these important elements. The greatest untapped reserve may not lie beneath the forests and deserts of the world but instead in our mine tailings and electronic waste. REEs have long been a waste product in iron, silver, and phosphate mines. Before prices went through the roof, it wasn't economically feasible to filter through mine tailings for these precious resources. The game has changed.

Expanding recycling facilities and filtering for REEs in existing mine tailings will reduce the demand for China's REEs and help bring prices down. If we can afford to buy these elements from the Mongolian steppe and the high Amazon, surely we can afford to invest in advanced recycling facilities a little closer to home.

Julie Klinger is a Ph.D. candidate in the Department of Geography at UC Berkeley and a National Science Foundation Graduate Research Fellow. She studies the global rare earth industry, focusing on China and Brazil and the relations between the two.

Rare earths on display in the Inner Mongolia Autonomous Region Museum, Hohhot, China.

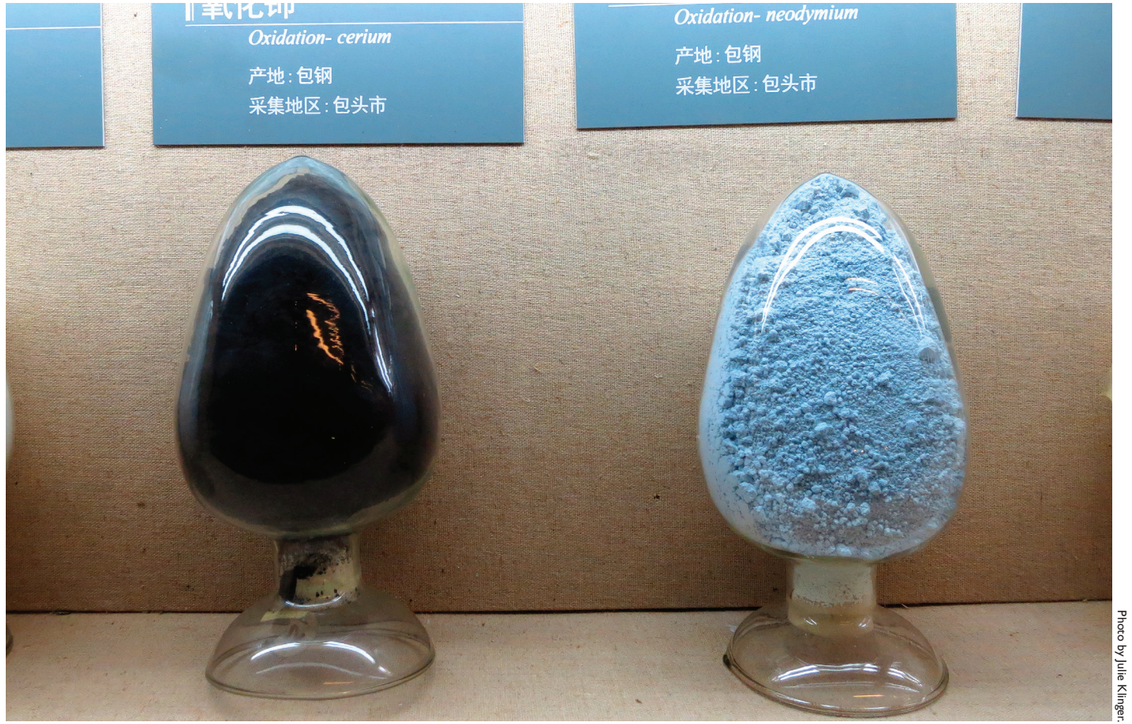

Photo by Julie Klinger.

Photo by Peg Skorpinski.

Isabel Allende signs copies of her new book at UC Berkeley.

LITERATURE

Maya's Notebook

by James Lamb

Perhaps the most powerful moments of best-selling author Isabel Allende's recent public appearance at UC Berkeley centered on her own family's experiences with drug addiction and tragedy. She shared with the audience the pain caused by the addiction and recent death of her husband's son, Harley, just "four weeks ago," the second child in the family to be lost to drug dependency. "My family is grieving right now… it has touched us in terrible ways," the author explained. These personal experiences deeply inspired her most recent novel, *Maya's Notebook*. Referencing this tragedy she said, "All the experience of Maya is what Harley lived."

Allende's revelations came in the context of an event marking the release of *Maya's Notebook* in English that took the form of a public conversation with UC Berkeley Professor Beatriz Manz. In the course of the conversation, Allende, who has been called "the world's most widely read Spanish-language author" and who once taught creative writing at UC Berkeley, reflected upon many aspects of her creative process, from how she gets to know the geographic areas she writes about to her relationship with the literary and artistic genre known as magical realism.

Maya's Notebook tells the story of a Chilean-American teenager raised by her grandparents in Berkeley, California, whose promising path as a good student and athlete is traumatically re-directed by the death of her grandfather and her grandmother's subsequent depression. In the wake of this blow, Maya begins a descent into drug use, delinquency, and crime that leads her to a school for troubled teens in Oregon and ultimately to the streets of Las Vegas, where she ends up homeless, addicted, and fighting for her life. Maya finds herself running away from her past as well as from hardened criminals, the police, and the FBI. In a climactic moment when Maya is near death on a restroom floor, the voice of her deceased grandfather gives her the motivation

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