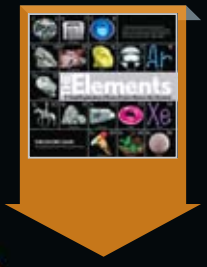
OUT OF OUR ELEMENT

The planet has limited resources. Here's what's left of the periodic table

Most congresspeople probably haven't thought about chemistry since high school, but they'll soon have to in order to protect the economy. In March, Colorado representative Mike Coffman introduced a bill to ramp up mining of 17 "rare-earth" elements, so called because large deposits of them are hard to find. Some are essential for electric auto motors and laser defense systems, and with demand for those rising, now is the time to stock up.

Rare-earths combine particularly easily with other elements to form useful compounds and alloys, such as neodymium-iron-boron, the strongest, lightest magnet for motors. "No other element can do that," says Jack Lifton, an independent metals consultant. "Once we've



Look for Theodore Gray's book *The Elements* and his iPad app at *popsci.com/theelements.*

Li 3

LITHIUM
RESERVES: 10 million tons
COST: $2/lb.
CRITICAL FOR: Batteries
OUTLOOK: Strong. Increased mining should keep up with rising demand.

Sr 38

STRONTIUM
RESERVES: 6.8 million tons
COST: $0.03/lb.
CRITICAL FOR: Red fireworks
OUTLOOK: Good. There's plenty in the ground and ocean for every Fourth of July to come.

Ta 73

TANTALUM
RESERVES: 100,000 tons
COST: $40/lb.
CRITICAL FOR: Capacitors for gadgets
OUTLOOK: Fair. At some point, industry will be forced to switch to less-efficient aluminum or ceramic capacitors.

Nd 60

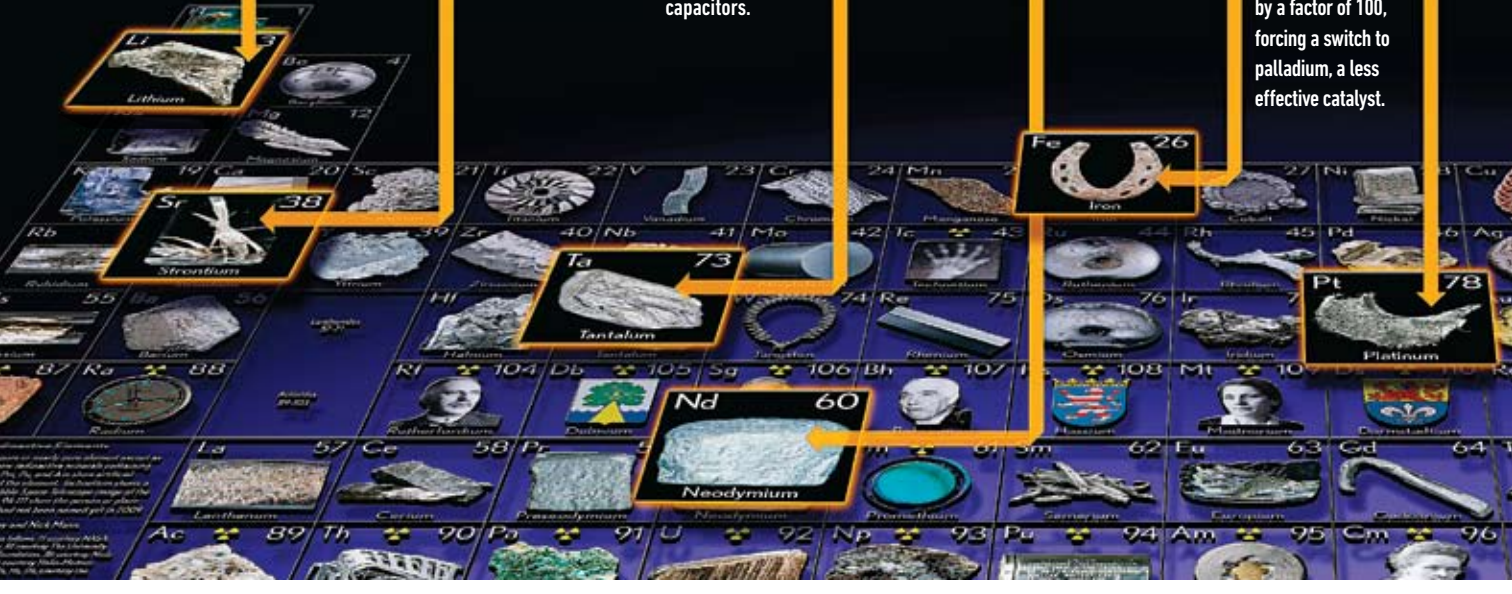
NEODYMIUM
RESERVES: Unknown but scarce
COST: $28/lb.
CRITICAL FOR: Electric motors
OUTLOOK: Poor. The U.S. must scout out more deposits and improve extraction techniques for mixed ores.

Fe 26

IRON
RESERVES: 77 billion tons
COST: $0.03/lb.
CRITICAL FOR: Making steel
OUTLOOK: Strong. Recycling is a breeze: Just smelt and recast.

Pt 78

PLATINUM
RESERVES: About 33,000 tons
COST: $17,000/lb.
CRITICAL FOR: Fuel cells
OUTLOOK: Fair. Platinum is mainly used to strip toxins from exhaust in catalytic converters, but car fuel cells would increase demand by a factor of 100, forcing a switch to palladium, a less effective catalyst.



APRIL 3 Apple's long-anticipated iPad (and the POPULAR SCIENCE iPad application) is released, providing a new way to experience magazines on the go. **APRIL 8** Wake Forest University

used them up, the periodic table is closed for business." Similar stories are playing out across the table. For many elements, we'll eventually need to find more, recycle, or move on to another. Here's the status for 10 of them.—SANDEEP RAVINDRAN

DEATH METAL

Some elements can cause wars. In 2000, speculation in the personal-tech market caused a 14-fold spike in prices of tantalum, a rare metal used in capacitors for cellphones and other gadgets. It fueled armed conflict in the Democratic Republic of Congo, which has the best deposits of this element.

Si 14

SILICON

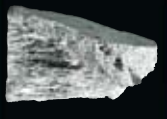
RESERVES: Unknown but vast
COST: $1.20/lb.
CRITICAL FOR: Computer chips
OUTLOOK: Very strong. There's so much that silicon is a convenient, if less effective, substitute for rarer elements.

P 15

PHOSPHORUS

RESERVES: 16 billion tons
COST: $0.04/lb.
CRITICAL FOR: Fertilizer
OUTLOOK: No worries. Americans use about 4.6 million tons in fertilizer every year. But we won't run out—it can even be recycled from sewage.

Te 52



TELLURIUM

RESERVES: 22,000 tons
COST: $66/lb.
CRITICAL FOR: Solar cells
OUTLOOK: Fair. No other element turns sunlight into electricity as well. Alternatives include pricier or less-efficient elements, such as selenium.

He 2

HELIUM

RESERVES: 630 billion cubic ft.
COST: $0.14/ cubic ft.
CRITICAL FOR: Coolant for particle accelerators
OUTLOOK: Fair. It can be conserved and recycled, including from giant parade balloons.

researchers show that applying skin cells to wounded mice using an inkjet-printer-like device speeds up healing time. The tech could help burn victims.

CYBERACTIVISM

(CONTINUED FROM PAGE 31)

page, e-mail or IM conversation contains identifying characteristics—like a virtual fingerprint. The filter scans for these packets, and if it detects that a person is trying to view a prohibited Web site, such as *BBCPersian.com* or Facebook, it will block the request and redirect the person to an official error page. Haystack subverts that process by faking the packets so that the digital trail will appear as if the person were visiting an authorized site. Then the encrypted connection to Haystack's servers will allow the real request to go through, and *BBCPersian.com* loads as it normally would.

Haystack is currently tailored to work specifically for Iranian users, but Heap says he has received requests from human-rights organizations in China and Cuba, countries that also use complicated online filtering, to adapt the technology for use there. For instance, the software could connect Chinese users to Google, which recently pulled out of mainland China over censorship disagreements. This highlights a less humanitarian benefit of getting the rest of the world online: More people using search engines, like Google, or visiting ad-driven sites could boost those companies' profits.

> "THE INTERNET IS A RIGHT THAT EVERY PERSON DESERVES."

Most likely, OFAC will wait to see how Haystack and other programs fare in Iran before loosening restrictions that ban software exports to other countries. Heap will be ready. "This is about making sure that the first open, global communication network in history continues to be used by the people, not against them," he says. "It's a right every person deserves."—CYRUS FARIVAR