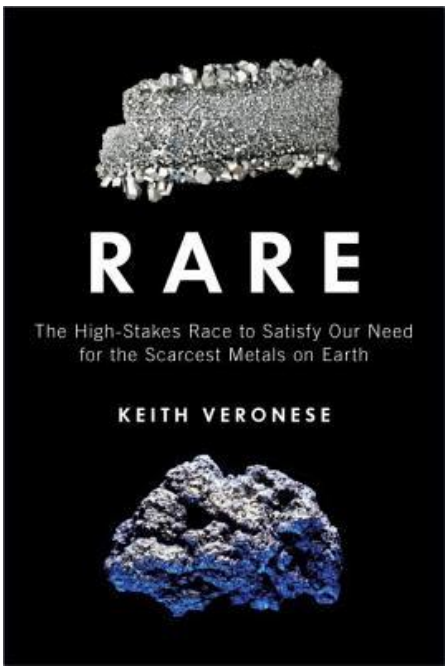

Rare: The High-Stakes Race to Satisfy Our Need for the Scarcest Metals on Earth

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Rare: The High-Stakes Race to Satisfy Our Need for the Scarcest Metals on Earth Keith Veronese How will your life change when the supply of tantalum dries up? You may have never heard of this unusual metal, but without it smartphones would be instantly less omniscient, video game systems would falter, and laptops fail. Tantalum is not alone. Rhodium. Osmium. Niobium. Such refugees from the bottom of the periodic table are key components of many consumer products like cell phones, hybrid car batteries, and flat screen televisions, as well as sophisticated medical devices and even weapon systems. Their versatile properties have led manufacturers to seek these elements out to maximize longevity, value, and efficiency, but not without a human price.

In addition to explaining the chemistry behind rare earth metals, *Rare* delves into the economic and geopolitical issues surrounding these “conflict minerals,” blending tales of financial and political struggles with glimpses into the human lives that are shattered by the race to secure them. In the past decade, the Congo has been ravaged by tribal wars fought to obtain control of tantalum, tungsten, and tin supplies in the region, with over five million people dying at the crossroads of supply and demand. A burgeoning black market in China, Africa, and India is propped up by school-age children retrieving and purifying these metals while risking their lives and health in the process. Fears of future political struggles inside China, the world’s largest supplier of these metals, have already sent the United States, Great Britain, and Japan racing to find alternative sources.

Will scientists be able to create lab substitutes for some or all of these metals? Will Afghanistan be the next big supplier of rare metals? What happens when the limited supply runs out? Whatever the answers, it is clear that our modern lifestyle, dependent on technology, is far from stable.

Rare: The High-Stakes Race to Satisfy Our Need for the Scarcest Metals on Earth Details

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From Reader Review Rare: The High-Stakes Race to Satisfy Our Need for the Scarcest Metals on Earth for online ebook

Lidja says

Meh.

Cullen Haynes says

Rare, is no doubt a very interesting book.

At times it does read like a Uni science textbook, nonetheless it’s message is clear - nothing lasts forever. Rare metals are used everyday in a wide range of products; especially technology. Soon, they will be depleted, and what then?

Will scientists be able to come up with a suitable substitute? Or will they be able to find a way to duplicate that which we have. Whatever the answer, there is no doubt our insatiable need for speed, innovation and the cutting edge will be our ultimate driver...

Steve Walsh says

Well written and approachable for the non-scientist. This account of the forgotten yet critical elements of our everyday modern life educates without getting bogged down in the fine details of chemistry. The author does a stand-up job relating the trail of mineral importance throughout history and how the rare-earth elements will be the next power struggle for our planet.

Claudio Arato says

For what this, it is exceptionally well written and accessible. It is an ideal intro to rare earths and geopolitics for any layperson. It is broad in coverage and appealing. Well done.

Diana says

Fascinating description of the world's increasing dependence on rare earth metals and the challenges and conflicts that arise due to the difficulty associated with their extraction and purification as well as their distribution among different countries and political states. The book strikes an excellent balance between the science, political commentary and history, with a sprinkling of pop culture thrown in to lighten the often dire predictions of scarcity and strife. A great read.

Zeb Kantrowitz says

Do you know what the seventeen “rare earth” elements are, do you care? Well you should. The first two are element 21 (scandium) which is used in mercury vapor and metal halide lamps. The second is element 36 (Yttruim)is used in YAG lasers, spark plugs and semiconductors.

Many of the other fifteen are also used for lasers and specialized magnets that are used in cyclytrons and colliders. Though most of the “rare earth metals (REM)” are not all that rare, some like tantalum (73) Niobium (41) Molybdenum(42) Osmium(76) and Rhodium(45) are all necessary for modern cell phones, hybrid car batteries, and flat TV (high definition). They could be made with other metals but they wouldn’t be as efficient or last as long as they do.

These metals were mined and purified in both Europe and America until the 1960s when there was a major find in China near the Mongolian border. The Chinese realized how important these metals were and at first sold them at such low prices (supported by the Chinese government and many mined by former Nationalist soldiers, criminals and opponents of the government). Because it is such an expensive process to purify these metals, once other developers were forced out of business, it became unprofitable to restart competing mines.

Therefore at this time China controls the creation and sale of these metals and is the world’s only major producer at this time. There is a major deposit of these metals (conflict minerals) in the Democratic Republic of the Congo (DRC, capital Kinshasa) but the Civil-War there has been under control of the rebels for most of the 21st Century.

Because of the major costs in smelting these metals another supply has come onto the world market. This market is based in places like India and Africa, where the rest of the world has created “dumps” for old computers, cell phones and the like. The problem with this ‘alternate source’ is that its’ major work force is children. In the countries where these dumps are, it’s cheaper to hire children to break up the equipment and find the ‘rare metals’.

This makes many children their family ‘bread winner’ and they can’t go to school because they have to work. These metals can be poisonous like arsenic and antimony, in that they are dangerous over a period of time. So these children are slowly poisoned as is the area around the dumps from the leaching of these metals into the ground waters and destroy the environment and local animals. There is no existing international organization that is involved in this trade, so China will have the world over a barrel for many decades to come.

Zeb Kantrowitz zworstblog.blogspot.com

Michelle Bizzell says

I took a chance on this book because I didn't know much about rare earth minerals, but they sounded like they had a fascinating story. This book does not tell that story. This book was a disappointment from start to finish. 1.) It never made up its mind if it was about elements that are rare, like gold a platinum, or about "rare earth minerals," a whole separate group of elements and minerals. 2.) The coverage of history and

geopolitical events in the world at large was so bad as to be offensive. I have a cursory knowledge of recent events in the Democratic Republic of Congo and modern China, and I still knew that the author was doing both countries a huge disservice in attempting to write about them. He glossed over the massacre of millions in a few brief sentences. He contradicted himself multiple times. It was bad. 3.) The actual science was equally terrible, although in a new and different way. He utterly failed to explain anything that was going in or to tell a single story from beginning to end. His citation of primary sources was poor, he didn't include a single interview, and he didn't visit any of the places described in the book.
After a long stretch of reading great science writing, this book demonstrates how not to write. ?

Michael says

Could use some editing.

Randall Wallace says

As Keith tells you, we all hold in our hands smartphones with over 40 grams of a rare earth called tantalum, but getting that tantalum through mining it from coltan in the Congo or getting other rare earths through repressive mining elsewhere around the world is a nasty story not discussed in this book. But give it up for the sleek cover; after the expensive fresh graphics I thought this book was going to teach me a lot. Nope… Most of us know that a lot of today's high tech stuff we take for granted uses rare earth metals and China "kinda" owns the market this but what else will this book teach us? If you suffer through the rather tame pages of basic stuff you might glean some useful stuff, like how aluminum was until the mid 1800's a rare sight; a parallel for isolation of today's rare earths. And I learned the many ways in which modern chemistry owes great debts to the seemingly idiotic quest of alchemy (filtration, crystallization and distillation). Of interest, he refers to US dumping sites of electronic waste as "toxic colonies" where remediation will never happen due to permanent impoverishment. In the end, not a terrible book, but not a great one because sadly, without Nicole Sommer-Lecht's great book cover design, this book disappoints.

Stefanie says

Interesting enough, but overall, not especially cohesive.

Kevin says

Some interesting content. Poorly written and edited.

Correen says

A compendium of information about rare earth metals, it is amazingly reader friendly. My interest in rare

earth metals was piqued when my husband and I had a corporate client who was the last manufacturer in the U.S. of rare earth magnets. I was then fascinated by neodymium so when I saw this book, it drew me to it.

This is a very interesting topic as the metals are often unstable, dangerous, and difficult to isolate. Many are essential to our modern life-style and hard to find. China currently holds the largest supply but that could change at any time when other countries find ways of isolating metals in the ocean floor, or in other less hospitable places. Countries may struggle for rights to the metals in Antarctica or form agreements with countries to aid in isolating the metals. Some metals are being recycled from cell phones, computers, etc. China again has led the world in this often very dirty work.

So far, environmental groups have been surprising quiet on the mining and recycling of rare earth metals. It will be interesting to watch this story unfold.

Jason Pettus says

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It was in T.C. McCarthy's great science-fiction novel Germline that I was first introduced to the concept of rare metals -- basically the same class of elements as more well-known items like aluminum and titanium, but found in even tinier amounts in the natural world, and that up to our modern age had been virtually useless as a practical material -- and the coming military wars that will eventually be fought over their deposits mostly in central Asia, because of it turning out that such ultra-contemporary items as cellphones and tablet computers simply cannot be made without them. And now here's an entire nonfiction book on the subject, from the always reliable "science for the masses" publisher Prometheus, which walks us step by step through everything you might ever want to know about the subject -- from their original discoveries in the Victorian Age, to the actual science behind why they're so valuable in electronics, what this has to do with plutonium and nuclear reactions, why that relationship fueled a lot of these discoveries during the Cold War between the US and Soviet Union, and a lot more. Just a bit too technical at points, which would be my only complaint, mostly this is a fascinating and easy-to-follow guide to an obscure but hugely important subject, one that will be in the headlines every day once our grandchildren are adults; and for anyone who is curious about what makes the teeny-tiny devices of our modern world work as well as they do, this is well worth picking up.

Out of 10: **9.6**

Ian says

On the whole I was disappointed with this. From the title I had thought the book would be about the rare metals, their sources, and their strategic and economic significance. Some of that was covered, but the author went off on tangents all over the place. One over-lengthy section provided a detailed description of how a hobbyist might extract rare metals from disused electronic goods and was followed by what, for me, was a more interesting but unfortunately much shorter section about people in developing countries forced to make a living by recycling such material from waste dumps, at great cost to their own health and the local environment. A moderately interesting section on the potential mineral wealth of Afghanistan was preceded

by an unnecessarily long diversion into poppy growing and the opium trade, as well as what seemed a very simplistic account of that country's current economic problems. Although the author clearly knows his own subject, he was prone to making impressionistic remarks whenever he ventured away from his main topic, which was often. To quote one example amongst many, the author partly explains the fact that many 19th century discoveries of elements were made by Swedish and Finnish scientists by claiming "The two countries, both allied under the Swedish flag at this time, also benefited from a comparatively strife free nineteenth century while England, (sic) France and Spain were constantly embroiled at war at home and abroad." The nineteenth century was a time when Great Britain completely dominated the world economy and contributed a wholly disproportionate share of the world's scientific and technical advances, and the period from 1815 to 1914 was a period of relative peace between the European powers that some historians refer to as the "Pax Brittanica". The book also suffers from a number of proof-reading errors. For example NASA is referred to as the "North American Space Agency," and at one point the word "electrons" is rendered as "elections." This all contributes to creating the impression of a rather hurried, ill-planned effort.

There were some interesting sections, for example the chapters about the potential future exploitation of the Arctic and Antarctic, and the section on possible future undersea mining, and I now know a bit more about the rare metals than I did. Overall though this book contains too much superfluous and poorly thought out material.

John says

Reviewed for Library Journal.

There's lots I'm going to say in my LJ review, but considering this was an "uncorrected proof" copy, I *hope* they'll correct the thousands (no joke) of typos and errors that are rampant in this book. From simple mistakes like typing "w" when he meant to type "we", to blatantly wrong things like citing the North American Space Agency (a very poor guess at what NASA actually stands for). Beyond all that, this book is just completely confused as to its aim. The author never specifies whether he's talking about rare earth elements (a distinct set of 17 elements, or so he presents it) or elements that are actually rare (gold, platinum, palladium, and sort-of-but-not-really silver). Either way, graphene (an allotrope of carbon) most certainly does not fall into either category. Lastly, the author often makes analogies that are aimed to make this book more accessible to the general (non-scientifically-savvy) public. Unfortunately, while the analogies are technically correct, they are so far off that they really only confuse the original message. The audience of this book is people who are already interested in science and thus should understand the basics, but the author talks to them as if they had never had a science class in their lives. Lack of cohesion, lack of direction, lack of order, and a surplus of extraneous information left this book quite unenjoyable.
