Editorial

https://doi.org/10.1038/s41561-022-01052-8

Minerals matter

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Permeating every aspect of life – and each with a multitude of stories to tell – we celebrate the utility, beauty and wonder of minerals in a new column: all minerals considered.

Minerals are fundamental to our lives. We have been mining them for at least 40,000 years (https://whc.unesco.org/en/tentativelists/5421/) with iron-rich red hematite and specularite from Southern Africa used for pigment making. Today, more than 3 billion tonnes of iron ore are extracted annually to feed the global demand for steel. For aluminium, we turn to gibbsite, böhmite, and diaspore, found within the 300 million tonnes of bauxite mined each year[1]. But minerals remain so much more than material fodder required for manufacturing and construction. They are entwined with our cultures, record keepers of Earth's history, and present throughout our bodies. In a new *Nature Geoscience* column, All Minerals Considered (https://go.nature.com/3EjPvTd), launched with an exploration of kidney stones and the history of fluorite, we ask our authors and readers to indulge their curiosity and creativity as we uncover this mineral world.

The USGS estimates (https://www.usgs.gov/faqs/how-many-pounds-minerals-are-required-average-person-year) that the annual mineral requirement to maintain the standard of living in the United States is 18 tonnes per person. However, as societies adopt less fossil-fuel reliant technologies, mineral demands change. Between 2016 and 2020, Australia's output of spodumene nearly tripled to 1.5 million tonnes, maintaining the region's dominance in resourcing the world's transition to lithium batteries. With the metal requirements of electric cars six times greater[2], and far more complex than those of internal combustion engines, maybe chalcopyrite and pentlandite will become household names, recognised as vital sources of copper and nickel.

Rock salt is already familiar in many households. But, peer deeper into the cubic crystals of halite, and you may find a history of isolation and near-complete desiccation of an ancient sea. In settings similar to the Mediterranean, evaporation has left behind great sequences of evaporite minerals. In order of solubility, carbonates precipitate out first, followed by gypsum and then halite, before the potassic salts such as sylvite finally arrive[3]. A common component of low sodium salt, sylvite's substitution of potassium for sodium helps maintain the all-important salty taste.

As well as flavour, minerals bring colour to our lives. The trisulfur radical anion in lazurite bestows the characteristic intense blue to lapis lazuli, which has been mined in north east Afghanistan for some 6,000 years. When ground, lapis lazuli becomes the ultramarine pigment whose long-lasting vibrancy – as well as its rarity – have at times made it more precious than gold. With such a high price, it was not uncommon for artists to underpaint with the less expensive copper carbonate, azurite, before finishing with the brilliance of lapis.

Beyond the canvas, characteristics of precious metals and gemstones have ensured their entanglement with societies for centuries. The smooth and glossy greys and greens of nephrite artefacts have been found in Early Neolithic sites on the Balkan Peninsula and the Yangtze River Delta and Liaoning province, China. Jade – a catch-all translation of *yù* that encompasses the similar looking jadeite, agalmatolite, and serpentines as well as nephrite – remains highly valued in China to this day, while the chemical inactivity and warm metallic lustre of gold makes it almost universally admired. Moreover, its relative financial stability has made gold an accessible, transportable and convenient form of wealth – particularly when crafted into jewellery – over which people, often women, can have complete control[4].

Like gold, the brilliance of diamonds makes them common in jewellery, but it is their strength that truly makes them shine. Formed under massive mantle pressures, the thermodynamic stability of diamonds can protect rare samples of the deep mantle as they traverse Earth's interior back to the surface to reveal snapshots of the deep. Inclusions of ringwoodite[5] and ice-VII[6], high pressure forms of olivine and water ice respectively, reveal at least localised hydration of the mantle some 410 to 660 km beneath our feet. Beyond depth, zircons can record deep time. So durable are these nesosilicates that they can withstand multiple sedimentary cycles and, with time, they accumulate new layers that can be used to trace major geochemical changes through at least 4.4 billion years[7] of Earth's history – from the growth of continents[8] to the possible origins of life[9].

The brilliance of minerals reflects not only light but also culture. Since the 1780s, it has been common practice to name minerals after people, but just 2% are named after women (https://mgmh.fas.harvard.edu/womenclature). Of the 191 minerals named between 2017 and 2019, 5% were named after women and 49% after men, suggesting that the historical dominance of white men of European descent in the geosciences is engrained in the language and customs of the discipline.

We haven't even begun to scratch the surface of what minerals can teach us. While contributions to 'All Minerals Considered' are generally commissioned by our editors, ideas for great mineral stories can be sent to geoscience@nature.com. We look forward to uncovering this wonderful mineral world with you.

Published online: 3 October 2022

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