

# Elements

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## ETHICALLY SOURCED METALS

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Jon Blundy

The Central Andes is a land of llamas, salt flats and majestic volcanic peaks. It is one of most remote places on Earth and arguably the driest. In a not unconnected way, the Central Andes is also home to the world's largest copper mines. The unique combination of magmas, tectonics and climate, described in this issue of *Elements*, has conspired to create hydrothermal ore deposits that provide a third of the world's copper and a quarter of its molybdenum (see "Ore Deposits of the Central Andes" by Lluís Fontbote on page 257). Amidst the desolate beauty of northern Chile can be found some extraordinarily large holes in the ground, almost one kilometre deep and several kilometres across. Copper, like so many important metals, rarely occurs in its native form, instead forming mineral ores (sulfides and oxides) within rocks once permeated by hot, metal-bearing, magmatic fluids. Copper ores are economical to mine at surprisingly low grade. The threshold value depends on location, infrastructure and global demand, but around one percent by weight copper is frequently economic, meaning that to get 10 kg of metal then one tonne of rock must be excavated, crushed, digested and refined. No wonder the holes are so large!

Copper is an indispensable commodity and the environmental scars of its extraction are one price we pay for development. It is hard to conceive of a world without electrical wires, water pipes and copper coinage. If we can't live without copper, then neither can we live without giant open pit mines – this is the Faustian bargain of technological advancement. Yet few of us, when turning on a tap or switching on a light, give much thought to the Atacama Desert, or any of the other places where resources are extracted. It is increasingly clear that few of us know, or even want to know, where our metals come from, just so long as it is not in our neighbour's backyard. Better still, if our resources come from the other side of the world. We seem to have become a little squeamish about resources – happy to enjoy their manifest benefits, but reluctant to acknowledge the complexity and messiness of extraction and the environmental and economic consequences for the countries that provide them.

This might seem like a very First World malaise, born of modern technologies and fuelled by a modish distaste for mines, quarries, derricks and the other unsightly trappings of resource extraction. But 'resource denial' is not a new attitude – arguably, it has been ever-present in the developed world. During the eighteenth and nineteenth centuries, for example, the islands of the Caribbean were sacrificed to sugar cane cultivation to satisfy the sweet tooth of Europeans. In the affluent parlours of Paris or London, a sugarloaf was no less a contemporary status symbol than a plasma screen TV is today. Sugar was procured and consumed in serene oblivion to the environmental and socio-logical price paid for its production. These were the heady, dark days of colonialism, when land



Chuquicamata, a state-owned copper mine located in Chile, is the largest open pit copper mine in the world. PHOTO: DIEGO DELSO, LICENSE CC-BY-SA

and resources were there for the taking and local labour (mostly slave workers, in the case of sugar) was harnessed for colonial need.

Slavery has long been abolished (formally at least) and traditional empires have been dismantled. But in the global economics of resources, one might ask how much has changed. In the developed world, opening new mines (for copper or other metals) is increasingly difficult, if not impossible. For the most part, commodities continue to be extracted and transported from less affluent parts of the world, to be refined, processed and fashioned into the trappings of modern life. Yet just as sugar (a frivolous commodity, unlike copper) never bestowed great wealth on the Caribbean, so resources deemed essential to modern life all too rarely confer benefit to local populations. Chile, with its sophisticated, part state-owned, mining industry, is a refreshing anomaly. By way of contrast, 58% of the world's cobalt, an essential hi-tech component of many electronic devices, comes from the Democratic Republic of the Congo, a country currently languishing in second place on a list of the world's poorest countries. Global politics in the twenty-first century has a very different complexion to that of the seventeenth to nineteenth centuries, but a form of economic imperialism persists, fraught with the same issues of supply and demand, profit and exploitation. And the same cognitive dissonance, or disconnect between consumer and source, endures. Enjoying resources with little regard to where they come from is no more defensible than decrying all forms of mining while, at the same time, championing environmental causes and promoting international development.

The current issue of *Elements* is far too interesting to have you reaching for your mobile phone at every turn of the page. But when you eventually do, ask yourself if you know where all its component metals come from, how they are extracted, and how their supply-chain economics work. Geological exploration and natural processes are two strands of the resource equation. The all-important third strand – how to harness resources in a way that benefits both the environment and the people of the countries where they are found – is much less tractable. The history of civilisation is a tale of resources discovered, exploited and enjoyed. Contemporary attitudes to resources, in all of their many forms, needs an informed discourse on provenance, ethics and sustainable extraction. And such a discourse should be led by geologists, economists and social scientists.

The time is right to consider "ethically sourced" metals.

**Jon Blundy**  
Principal Editor