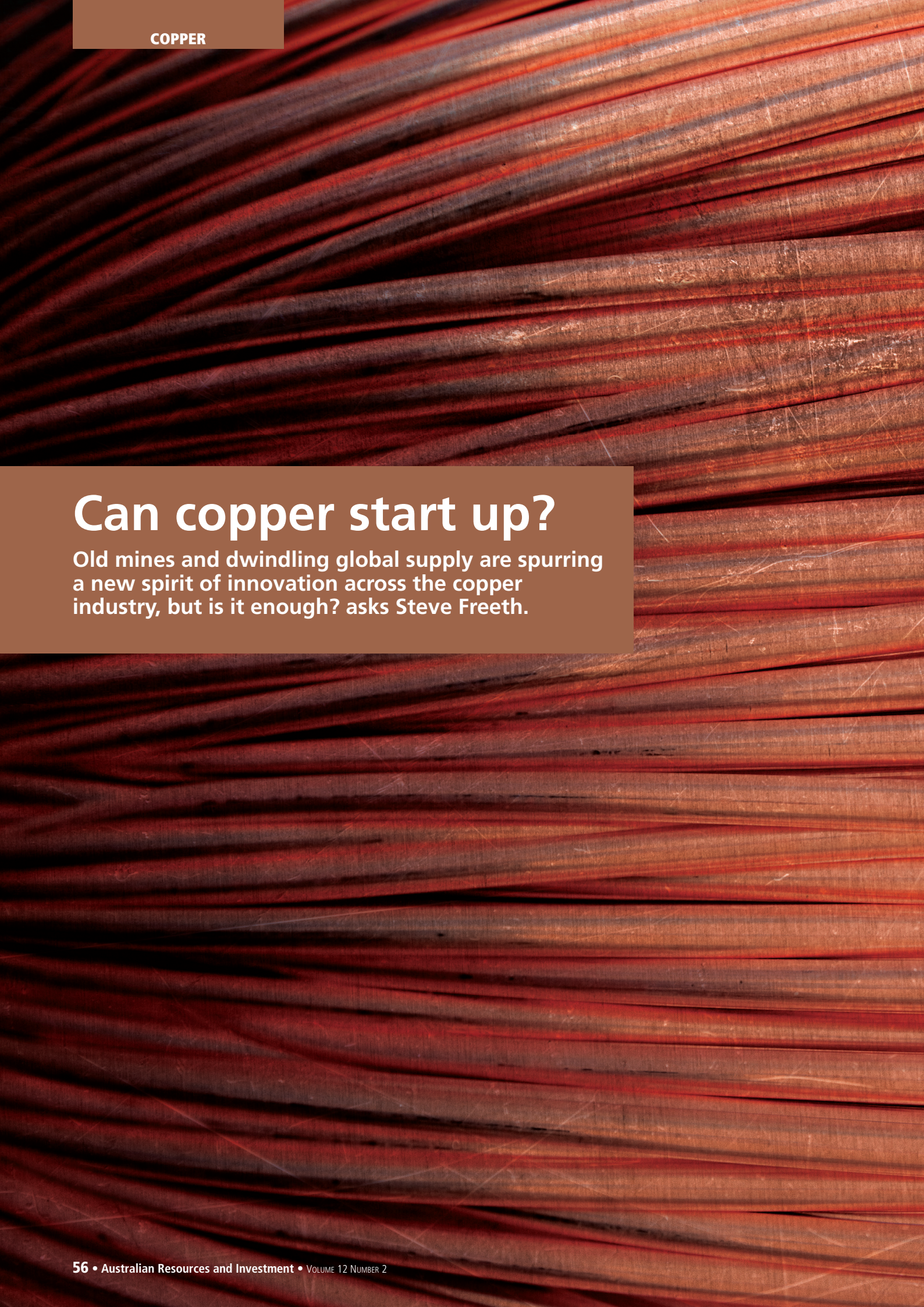

Can copper start up?

Old mines and dwindling global supply are spurring a new spirit of innovation across the copper industry, but is it enough? asks Steve Freeth.

Copper's recent bull run may still be all about China, but the spectre of long-term constraints in global copper supply is also emerging as a major market driver.

According to a recent Stockhead report, 2017's top 10 copper-producing mines are now 95 years old, on average; a situation the report called a major threat to world supply. The International Copper Study Group agrees, saying in its most recent report that the world is now in copper deficit after a two per cent drop in mine output last year, with lower grades at mines in Argentina, Canada, Mongolia and the United States all starting to kick in.

Deeper mines, depleted deposits and fewer big discoveries have sent the sector in search of smarter, greener and safer ways to get more from less. So far, that's often meant high-priced automation like driverless vehicles, robots and high-tech hubs that currently only the biggest miners like Rio Tinto, BHP or Codelco can realistically afford at scale.

Resolution Copper's proposed mine in Arizona, a joint venture between Rio Tinto and BHP Billiton, is a glimpse into the effort, money and IQ it now takes to mine into the future. Resolution Copper may hold some of the world's richest copper deposits – forecasts suggest that it could supply one-quarter of yearly US demand some day – but they're more than a mile underground in temperatures of 170 degrees Fahrenheit or hotter.

Not long ago, getting that ore up would have been science fiction, but it will take the financial might of both companies to spend a projected $8 billion to design the mine from scratch, including installing tens of thousands of advanced sensors, next-generation ventilation systems, artificial intelligence–fuelled machinery and terabytes of data to keep it all moving.

Moving upstream

Big-ticket automation is only one aspect of the type of innovation that copper will need to get right if the sector is to successfully tackle issues like efficiency, productivity, supply and environmental

performance in the coming years. In other words, doing things differently will be multifaceted.

According to innovation and technology management expert Hal Stillman, Director, Technology Development and Transfer for the International Copper Association in Washington, DC, there has to be a fundamental rethink about the way research is pushed from idea to implementation in the resources sector.

'Governments around the world, including in Australia, are supporting mining research and business innovation, but the efforts often don't go beyond early-stage funding, leaving entrepreneurs without follow-on investment or critical links to the resources industry,' says Stillman, who is also a guest speaker at the South Australian Government's Copper to the World conference in Adelaide in June.

'While the world is seeing an explosion in technology- or service-focused start-ups, also including in Australia, start-ups generally have found it difficult to partner with large miners to really drive new solutions to upstream problems in processing, energy or water.'

To help overcome the global impasse and spur faster commercialisation, Chile's biggest venture capital firm, Aurus, established a $65-million copper-centric venture fund in 2015, known as Aurus III – the first of its kind in the world. Backed by the Chilean Government – and other investors like Codelco, Mitsui, the Development Bank of Latin American, the Inter-American Development Bank, and the International Copper Association – the fund has now committed $35 million to both upstream- and downstream-focused start-ups.

By midyear, Aurus III will have backed four new upstream technologies, including:

1. MineSense – a selective ore sorting and processing start-up that uses a multi-sensor and analytics platform for real-time ore-grade measurement
2. Nova Mineralis – a leaching technology start-up using a combination of compatible microorganisms, oxidative agents and other chemical additives especially designed to sustainably process sulphide ore
3. EcoTR – turns scrap truck tyres into high-quality carbon black and carbon dioxide–free biofuel using modified low-temperature continuous pyrolysis for high-efficiency removal of hydrocarbons
4. An as-yet-unnamed start-up – set to investigate how to efficiently remove calcium oxide from tailings, an outcome of adjusting pH in

Image courtesy of EcoTR

hydrocyclones used to produce concentrates.

'We've looked at 330 companies from around the world for investment so far, including two from Australia, but industrial technology in mining is still in its infancy, so we believe there's a lot more opportunities going forward,' says Victor Aguilera, Managing Director, Aurus Capital.

'Mine-focused start-ups face a lot of challenges to get to commercialisation, but one of the biggest is being able to validate their value propositions at the mining site in front of companies,' Aguilera adds. 'These are generally difficult locations, and so integrating new technologies requires a lot of support, coordination, planning and resources.'

Starting up Down Under

It's a similar scene here. Australia may already have robust research and development infrastructure, as well as a fast-growing technology start-up 'ecosystem', but commercialising innovative technology start-ups in mining overall or copper specifically – especially when it comes to crucial upstream applications – remains tough.

Two agencies – CSIRO and METS Ignited, an industry-led, government-funded growth centre for mining equipment, technology and services – are making inroads. CSIRO is developing new upstream technologies like the sensor-based Ore Sorter – soon to be spun out as a new company – while METS supports innovation through advice, funding and an 'Australia first' start-up accelerator, but neither is copper-specific or providing long-term venture capital investment.

South Australia is making a major play to boost copper-centric innovation, as it positions itself as the country's top exporter. Last year, the University of Adelaide announced a $14.6-million Research Consortium – Unlocking Complex Resources through Lean Processing – with backing from the South Australian Government, METS Ignited, and miners OZ Minerals and BHP. The University's Australian Research Council (ARC) Research Hub for Australian Copper-Uranium is part of that process, focusing on developing technologies to remove non-target metals from copper concentrates – called precision mining – like its work on removing lead.

Image courtesy of MineSense

Image courtesy of EcoTR

But the sector here – and even overseas – will need to do more. An innovation report by Deloitte in 2016 pointed out that, while the Australian resources and technology sectors were sophisticated, 'Many barriers still exist to the whole-scale adoption of innovation within companies'.

Stillman agrees: 'There's a mismatch between corporate venturing and managers who are charged with profitably operating mines that must have a short horizon while innovation in a complex industry requires patience. What is needed is a professionally managed fund that is independent of the mining industry cycles'.