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Sustainable Mining Through Bioleaching in the Central African Copperbelt (CACB)

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Africa is home to several notable ore districts. One example is the Central African Copperbelt (CACB), spanning Zambia and the Democratic Republic of Congo with similar geology on both sides. It stretches about 50 miles wide and 140 miles long and is renowned for copper and cobalt deposits. Copper mining has been happening in this region for centuries, but it became more focused in the late 19^{th} century with the discovery of copper deposits. As mining operations grow and new exploration techniques are developed, they provide valuable information about the type and amount of minerals present to the miner and the geologist. Although the phrase "copper no longer crops out" got on the lips of old hands to describe each depletion of the lucrative surface deposits, there are always new discoveries to be made. And thus, after 77 years of discovery, attainment, and depletion, the story of copper in the two countries closed one chapter and opened another. As easily exploitable high-grade deposits are becoming increasingly depleted, there is a need for new technologies to improve exploration and mining strategies. Taking a microbial perspective in mining is an innovative approach enhancing the recovery of valuable copper resources while minimizing environmental impact. Through the introduction of bacteria and fungi, minerals are broken down, releasing copper ions that can be easily extracted. This environmentally friendly method reduces reliance on harsh chemicals and energy-intensive processes, making it a promising solution for the mining industry in the CACB. The application of bioleaching showcases the potential for sustainable mining practices that balance resource extraction with environmental stewardship. Exploration from the microbial perspective can provide insights into the formation and enrichment of copper deposits while microbial remediation techniques can aid in addressing copper contamination and ability to tolerate or even thrive in environments within the Copperbelt.