In addition to recycling the nutrients necessary for the continuation of life, microbes are responsible for breaking down wastes and environmental contaminants (16). Fundamentally, if not for microbes, our planet would be filled with dead organisms, animal wastes, and hazardous materials. Although some insects, protists, slime molds and fungi initiate biomass decomposition, bacteria and archaea are needed to complete this process (10). They are also suited to perform such tasks under anoxic conditions (i.e. anaerobic respiration, interspecies hydrogen transfer, and methanogenesis) (10). Additionally, due to microbes' small size, they are able to contact and degrade contaminants easily (16). In fact, the current use of microbes by humans is extensive – particularly through microbe-based solutions for waste remediation. For instance, when there is an oil spill somewhere in the world, we use oil-degrading microbes to clean up the contaminated area (17). Microbes are also routinely used to treat sewage, clean abandoned mines, and degrade a variety of industrial chemicals (18, 19). Without microbes, we would be living in a world practically buried in waste, and our quality of life would be significantly diminished.

Conclusion

Across 200 thousand years of human history, microbes have been the essential linchpin in enabling our species to create healthy, dynamic, and prosperous communities around the globe. Given the number of menacing events that dramatically impacted the Earth across human history and well before our species, the presence of microbes today is a testament to their capability to survive throughout challenging environmental conditions. The structural simplicity, small physical size, and metabolic diversity of microbes allow them to adapt to various environmental changes and sustain themselves across millennia. Conversely, humans' remarkable advancements in technology give us the ability to potentially live a life independent of microbes. Our engineering success enables us to manipulate biological systems to create artificial products to meet our needs. That said, while a life without microbes is theoretically possible, the quality of life on this planet would be diminished. Microbes' vast influence in our biosphere, namely their roles in global biogeochemical cycles and waste remediation, are very challenging to replicate. Human life may still exist in the absence of microbes, but we certainly would not wish to live without them.