MINING INNOVATION

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Inaugural Editorial

Mining Innovation: Connecting Disciplines, Industries and Nations

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Mining is one of the oldest engineering disciplines and remains fundamental to modern civilization. Throughout history, the extraction and utilization of mineral and energy resources have underpinned industrial development, technological progress, and economic growth. Over time, mining has evolved into a highly interdisciplinary field, drawing on geology, geomechanics, mechanical engineering, materials science, energy systems, and environmental engineering. Its advancement has been driven not only by developments within mining engineering but also by the adoption and integration of innovations from other disciplines.

Today, the global mining and extractive industries are entering a new era of transformation. The accelerating energy transition, growing demand for critical minerals, and rapid advances in artificial intelligence (AI) and digital technologies are reshaping global resource demands. Renewable energy systems, electric vehicles, energy storage, advanced manufacturing, and AI-powered computing infrastructure all depend on reliable supplies of minerals, energy, and industrial materials. These developments highlight a fundamental reality: **the more technologically advanced our society becomes, the more essential the responsible development of mineral and energy resources will be.**

At the same time, the mining industry faces increasingly complex challenges. Resources are being developed at greater depths, in more remote locations, and under increasingly demanding geological and operational conditions. Meanwhile, expectations for safety, efficiency, environmental protection, and emission reduction continue to rise. Meeting these demands will require more than incremental improvements to conventional mining practices. It calls for fundamental advances in scientific understanding, technological innovation, and international collaboration.

Against this background, we are delighted to launch *Mining Innovation*, a new, open-access, peer-reviewed international journal dedicated to scientific advances, emerging technologies, and practical innovations across the global mining and extractive industries.

Innovation beyond traditional boundaries

Mining has long benefited from interdisciplinary collaboration, but the opportunities for technological convergence have never been greater. AI, robotics, advanced sensing, autonomous systems, digital twins, and clean energy technologies are opening up new possibilities for the exploration, extraction, processing, and management of mineral and energy resources.

Importantly, transformative technologies need not originate within traditional mining disciplines. Innovations developed in aerospace, space exploration, autonomous transportation, telecommunications, and advanced manufacturing may offer solutions to longstanding mining challenges. Conversely, technologies developed through mining research may find valuable applications in other industries.

We believe that **mining innovation should not be confined to technologies developed within the mining industry. Rather, it should embrace the transfer, integration, and adaptation of advances from diverse scientific disciplines and industrial sectors.**

This philosophy underpins the mission of *Mining Innovation*. The journal welcomes contributions from mining researchers and engineers, as well as scientists, technology developers, and practitioners working in related and emerging fields. We particularly encourage interdisciplinary research that introduces new concepts, methodologies, and technologies to address challenges in resource development.

The journal covers all major extractive industries and resource sectors, including coal mining, metalliferous mining, quarrying, industrial minerals, construction materials, oil and gas, marine mineral resources, and emerging frontier resources. Its scope encompasses the resource value chain, from exploration and extraction to processing, environmental management, mine closure and rehabilitation, and resource recovery and recycling.

Although broad in its disciplinary and industrial coverage, our focus remains clear: advancing meaningful scientific and technological innovation to support safer, smarter, more efficient, and more sustainable resource development.

Connecting innovation across nations

Mineral and energy resources are distributed across the world, and different countries have developed distinct areas of expertise, technological capabilities, and operational practices. Nevertheless, many of the mining industry's most pressing challenges, including improving safety, enhancing resource efficiency, strengthening environmental sustainability, and accelerating digital transformation, are shared across national boundaries.

We strongly believe that **international collaboration and the open exchange of knowledge are essential to the future of mining and resource development.** Innovations developed in one country can inspire solutions elsewhere, while insights gained from different geological settings, technological approaches, and regulatory

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environments can accelerate scientific progress and industrial transformation.

Mining Innovation aims to provide an international platform for researchers, engineers, and industry practitioners to share scientific discoveries, technological advances, and practical experience. We welcome collaborative research, comparative studies, industrial demonstrations, and innovations with the potential to be adapted and applied across different regions and resource sectors.

Our ambition extends beyond disseminating research findings. We seek to foster the exchange of ideas, technologies, and experience in ways that strengthen international cooperation and accelerate innovation.

Bridging scientific discovery and industrial practice

Mining engineering is distinguished by its close connection to industrial practice. However, translating scientific discoveries and emerging technologies into reliable industrial applications remains challenging, particularly in the face of geological uncertainty, operational complexity, and the demanding conditions associated with resource extraction.

Mining Innovation seeks to strengthen the connection between scientific research, technological development, and industrial implementation. The journal welcomes original research articles, critical reviews, perspectives, technical contributions, and high-quality industrial case studies. We particularly encourage contributions that demonstrate scientific originality, rigorous validation, technological advancement, or practical insights that can be transferred to other settings.

We recognize that innovation can emerge through fundamental discoveries, new methodologies, technological breakthroughs, and the creative integration of existing technologies. While industrial relevance is central to our mission, we also value fundamental research that advances scientific understanding and lays the groundwork for future innovation.

Building a global innovation community

As the founding Editor-in-Chief, I envision *Mining Innovation* as more than a conventional academic journal. I hope it will become a dynamic international forum that connects disciplines, industries, and nations; encourages emerging ideas; and facilitates the exchange of innovations that shape the future of resource development.

We are committed to upholding high standards of scientific quality, editorial independence, research integrity, and constructive peer review. We also aspire to build an inclusive and internationally diverse academic community that brings together established experts, emerging researchers, and innovators from both within and beyond traditional mining disciplines.

Mining Innovation is sponsored by the Chinese Institute of Coal Science, published by Tsinghua University Press, and distributed through SciOpen. We sincerely appreciate the support of these organizations, our international Editorial Board, and the wider research community in establishing this journal.

We warmly invite researchers, engineers, industry professionals, and technology innovators from around the world to contribute their best work, share their experience, and join us in this collective endeavor.

The future of mining will be shaped not by any single technology, discipline, or nation, but by our collective ability to connect knowledge, embrace innovation, and translate scientific advances into meaningful progress.

Mining Innovation is founded on this vision—**connecting disciplines, industries, and nations to advance the future of global resource development.**

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