

Exploration—The Role of Innovation

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Mineral exploration creates enormous value through discoveries that become the lifeblood of the industry. Furthermore, exploration will continue as long as commodities are needed to sustain the Earth's growing population at reasonable standards of living. Making quality discoveries based on size, grade, and ease of access is, however, harder than ever, and is further complicated by the economic cycles that impact exploration more dramatically than other sectors of the mining industry.

Over the last 50 years, major step changes in exploration have resulted from radical advances in our understanding of ore-forming processes, new geophysical, geochemical, and remote sensing technologies, and new ways to integrate and interrogate data. While these have helped exploration and discovery dramatically, the need for innovation remains paramount.

There are many paths to successful exploration and discovery. Recognized ingredients for success include high-quality, dedicated teams; sustained funding over several years; a focus on the most prospective areas based on all available data; management of a portfolio of opportunities with perseverance on properties with the best potential; drill testing as early as possible; and use of an appropriate mix of field work and technologies without relying on panaceas. Innovation adds to this mix by maintaining the drive to succeed even in the face of increasingly long odds. New business and financing approaches among majors and juniors, novel interaction with other industrial sectors, and new partnerships and relationships with communities are critical areas for innovation. From the technical perspective, the focus is on innovation by advancing science-based models and developing new technologies. Examples include the following:

1. Application of conceptual models will allow more effective identification of key criteria, particularly in the distal parts of major systems, and better transfer of knowledge related to ore-forming processes to the next generation of explorers. Field/observational skills will remain critical but will be enhanced by mineralogical and geochemical methods.
2. Geophysical tools will become increasingly important in covered terrains, although depth penetration remains a limiting factor. Integration with physical properties and mineralogical-geochemical data, use of inversion modeling, and creative conceptual thinking will support targeting. The potential emergence of airborne IP in the next decade may add another regional to property-scale tool and the use of seismic methods is likely to increase where structural and stratigraphic data are critical, particularly at depths below the range of other methods.
3. Faster, cheaper, more portable drilling will have a significant impact—the more holes we drill, assuming equivalent or better efforts in defining targets, the more likely the discoveries. This is especially true in covered terrains, but is also true for mature camps.
4. Systematic collection of more downhole and core data to augment but not replace sound observations will support rapid modeling and targeting, assuming data quality is maintained. These data are the basis for geometallurgy, which will be critical for improving the quality and performance of operations.

The industry has an historical appetite for innovation, calculated risk-taking, and discovery, but a new level of commitment is required to meet financial and societal expectations.