Sea floor mining: Exploration technology and best practices

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Sea floor mining is about to become a reality. For many years, sea floor mining has been an industry lurking in the shadows, something that might or might not be real, difficult to develop, and facing real and imagined economic and environmental challenges. While mining on land has been profitable with a well understood development path, sea floor mining has not been able to advance. Today new mines on land face rising costs and delays. In contrast, costs at sea are being reduced and are becoming predictable. New mining systems are being built and tested. The motivation for seafloor mining is both economic and strategic. High grades of copper and gold, and very large reserves of rare earths, cobalt and manganese have been identified. These deposits are being mapped by both interested governments and private companies.

Present exploration for seafloor minerals is motivated by a desire to start mining, not by an academic desire to conduct research. This has led to some conflict between the academic oceanographic community and those wishing to start mining. These conflicts are being resolved. The regulation of mining in international waters is managed by the UN International Seabed Authority. Numerous tenements managed by the ISA are presently being worked on. Within the Exclusive Economic Zone of individual countries, mineral exploration is regulated by national policy. Many seafaring countries have established policies intended to promote seafloor mining activity.

Best practices are now well established for seafloor exploration. Robotic exploration of the seafloor is the norm using autonomous underwater vehicles (AUVs) and remotely operated vehicles (ROVs). Methods used on land have been adapted to underwater use and purpose-built equipment is now in regular use. Excellent high-performance seafloor robotic drills exist and are being used. AUVs can provide precision bathymetry, and can conduct electromagnetic, magnetic, gravity, self potential, sea floor photography, and other specialized missions. ROVs can provide samples and video. These systems are reliable, and their productivity is high. Environmental baseline studies are regularly conducted as an integral part of the exploration process, rather than being conducted as afterthoughts to an exploration activity.

Present indications are that seafloor mining will begin in 2019 or earlier. The opportunity to find new deposits and to build new mines at sea exists now. The technology to do this is ready to be used.

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