



SOUNDINGS

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Dr. Philomene A. Verlaan, Editor

Underwater Mining Institute 2012 **registration now open** **Tongji University, Shanghai, China, Oct. 15-20**

The 41st international conference of the Underwater Mining Institute (UMI 2012) will be held Oct. 15-20, 2012 at the Tongji University in Shanghai, China. The conference's theme is "Marine Minerals: Finding the Right Balance of Sustainable Development and Environmental Protection."

Registration, hotel, field tour and related details have been updated and are available at two websites: the International Marine Minerals Institute of SME, www.immsoc.org, and UMI 2012, www.underwatermining.org.

A provisional program will be posted soon and will include topics covering seabed deposits for base metals, private and government-sponsored marine mineral exploration efforts, new commercial seabed mining operations in the near term, considerations for all resources that could be impacted, including mineral, biological, economic, and cultural, as well as other issues of timely importance.

UMI 2012 is being hosted by Tongji University in Shanghai, the largest city in China and one of the largest cities in the world. Tongji University is one of the leading universities in China and the School of Ocean and Earth Science is a premier center for marine science. The Ocean Science and Environmental Research Center of COMRA is also on campus. Tongji University plays a key role in many Chinese deep-sea research fields. The Days Hotel Tongji Shanghai is offering a special discounted room rate for UMI participants and is a convenient 10-minute walk to the campus conference center where the institute will be held.

A special cultural activity and a day tour for spouses and guests are optional features of the UMI, as well as a three-day geotechnical field tour to explore active mines and other interesting sites.

The deadline for regular registration, hotel reservations and the geotechnical field tour is Aug. 31, 2012. A fee will be assessed for late registrations.

Please join us for what is certain to be another highly productive and unique UMI experience.

Sponsoring organizations include:

- China Ocean Minerals Research and Development Association (COMRA)
- Tongji University, School of Ocean and Earth Science
- Odyssey Marine Exploration, Florida USA
- Technip-France
- International Seabed Authority
- International Marine Minerals Society
- Hawaii Undersea Research Laboratory, University of Hawaii
- Marine Technology Society

The program chairs are Dr. Charles L. Morgan, technical program chair, and co-chair and host Dr. Huaiyang Zhou, Tongji University, Shanghai.

For more information, please visit our website www.underwatermining.org or www.smenet.org/imms or contact the conference coordinator below: Karynne Morgan, University of Hawaii, 1000 Pope Road, MSB 303, Honolulu HI USA 96822, USA, phone +1 808.956.6036, fax +1 808.956.9772, e-mail: karynnem@hawaii.edu. ■

A Gold Rush in the Abyss

By William J. Broad

Editor's note: The following article was published in the *New York Times* on July 9, 2012. The article discusses how a deep sea treasure hunter is using his equipment to help locate underwater orebodies.

Tom Dettweiler makes his living miles down. He helped find the Titanic. After that, his teams located a lost submarine heavy with gold. In all, he has cast light on dozens of vanished ships.

Mr. Dettweiler has now turned from recovering lost treasures to prospecting for natural ones that litter the seabed: craggy deposits rich in gold and silver, copper and cobalt, lead and zinc. A new understanding of marine geology has led to the discovery of hundreds of these unexpected ore bodies, known as massive sulfides because of their sulfurous nature.

These finds are fueling a gold rush as nations, companies and entrepreneurs race to stake claims to the sulfide-rich areas, which dot the volcanic springs of the frigid seabed. The prospectors — motivated by dwindling resources on land as well as record prices for gold and other metals — are busy hauling up samples and assessing deposits valued at trillions of dollars.

“We’ve had extreme success,” Mr. Dettweiler said in a recent interview about the deepwater efforts of his company, Odyssey Marine Exploration of Tampa, Fla.

Skeptics once likened mining the deep to looking for riches on the moon. No more. Progress in marine geology, predictions of metal shortages in the decades ahead and improving access to the abyss are combining to make it real.

Environmentalists have expressed growing alarm, saying too little research has been done on the risks of seabed mining. The industry has responded with studies, reassurance and upbeat conferences.

The technological advances center on new robots, sensors and other equipment, some of it derived from the off-shore oil and gas industry. Ships lower exploratory gear on long tethers and send down sharp drills that gnaw into the rocky seabed. All of this underwater machinery is making it more and more feasible to find, map and recover seabed riches.

Industrial powers — including government-supported groups in China, Japan and South Korea — are hunting for sulfides in the Atlantic, Indian and Pacific Oceans. And private companies like Odyssey have made hundreds of deep assessments and claims in the volcanic zones around Pacific island nations: Fiji, Tonga, Vanuatu, New Zealand, the Solomon Islands and Papua New Guinea.

The International Seabed Authority, a sleepy United Nations body located in Jamaica that presides over mineral rights on the high seas, an area its officials like to characterize as 51 percent of the earth’s surface, has found itself besieged with sulfide queries.

“We are entering a new stage,” Nii Allotey Odunton of Ghana, secretary general of the authority, told a meeting in November.

Since the Pacific islands control mineral rights in their territorial waters, they can negotiate mining deals more easily than the seabed authority, which tends to plod along by international consensus.

Odyssey Marine Exploration, which recently expanded from shipwreck recovery into deep prospecting, began scouring the Pacific waters in 2010, discovering far more gold, silver and copper than expected.

“There’s a lot at stake,” Mr. Dettweiler said. If metal prices go up, he added, “a billion-dollar deposit can turn into a hundred billion.”

Scientists once thought the main source of wealth in the deep sea lay in beds of potato-size rocks that could be mined for such common metals as iron and nickel. In the 1960s and ’70s, entrepreneurs tried to scoop them up, but the rewards never offset the high cost of exploration, retrieval and transportation.

Things began to change in 1979 with the discovery of “black smokers”, sulfurous mounds and towers that gush blistering-hot water. The smokers turned out to dot the 46,000 miles of volcanic fissures that gird the global seabed like seams on a baseball.

Scientists found that the smokers formed as hot water rose through the volcanic rocks, hit icy seawater and shed a variety of minerals that slowly coalesced into eerie mounds and chimneys. One, found off Washington State and nicknamed Godzilla, stood more than 15 stories high.

The first wave of discovery showed that the volcanic springs harbored riots of bizarre creatures, including thickets

of tube worms. The second wave showed that the mounds and chimneys — hot and cold, new and old, active and inactive — were composed of complex minerals that contained surprising amounts of copper, silver and gold.

Today, increasingly, mines on land lack rich supplies of copper, a staple of modern life found in everything from pipes to computers. Many commercial ores have concentrations of only a half a percent. But seabed explorers have found purities of 10 percent and higher — turning the obscure deposits into potential bonanzas. The same turned out to be true of silver and gold.

Fifteen years ago, would-be underwater miners staked the world's first claim: Nautilus Minerals won title to about 2,000 square miles of the Papua New Guinea seabed rich in volcanic features. The company, based in Toronto, inched toward mining but quickly expanded its prospecting to hundreds of Pacific sites and has since identified dozens of areas as potential candidates for seabed mining.

Last year, Nautilus won a 20-year lease to mine a rich deposit in the Bismarck Sea, in the southwestern Pacific. The mounds are a mile down. The company says the site holds about 10 tons of gold and 125,000 tons of copper.

Nautilus plans to start mining next year but also cites possible delays. It is building robots up to 25 feet tall that are to collect sulfides and pump them to the surface. Barges are then to carry the seabed minerals to Rabaul, a Papua New Guinea port some 30 miles away.

“We’re making good progress,” Stephen Rogers, the company’s chief executive, recently told analysts.

Critics say the plan is potentially dangerous for fisheries, islanders and ecosystems. In a 32-page report, “Out of Our Depth,” an international group of environmentalists that calls itself the Deep Sea Mining Campaign noted that the volcanic sites shelter hundreds of species previously unknown to science. The group said information gaps should be filled and mitigation plans developed “before mining begins.”

In an interview, Mr. Rogers called the group’s analysis unfair. “We’re developing detailed environmental plans and have an obligation to do that,” he said. “We’re very proud of what we’ve done.” He added that his company was working closely with some of the world’s leading oceanographers and that its operations were shedding light on the sulfide mysteries. “We’re advancing the science,” he said.

Experts around the globe are watching Nautilus closely to see how it navigates the perils of environmental politics, novel technologies and unpredictable markets.

“Any success will work as a trigger for other mining companies,” said Georgy Cherkashov, a Russian marine geologist and president of the International Marine Minerals Society.

China, the world’s largest consumer of gold, copper and many other industrial metals, has shown little interest in waiting for declarations of success. When the seabed authority adopted rules for sulfide prospecting in May 2010, Beijing’s representative filed the country’s application on the same day.

China does its mineral hunting from ships. It is also developing a submersible known as Jiaolong, after a mythical sea dragon, that can carry three people down deep enough to investigate the sulfide areas.

Last year, it signed a contract with the authority for exclusive sulfide rights to 3,860 square miles, about the size of Puerto Rico, on a volcanic rift nearly two miles below the Indian Ocean. Jin Jiancai, secretary general of China’s ocean mineral resources agency, told reporters that such deposits “will help China meet the increasing demand” for refined metals.

Meanwhile, Tong Ling, China’s largest importer of copper concentrates and one of the world’s largest copper smelters, recently signed a deal with Nautilus for more than a million tons of Pacific sulfide ores per year — an amount equal to about 5 percent of the world’s copper production.

Russia joined the high-seas rush in 2011, and France and South Korea in May. Recently, Seoul also cut a deal for sulfide prospecting in the waters of Fiji, letting it tap the mineral bounty of Pacific volcanism.

John R. Delaney, an oceanographer at the University of Washington who has studied the volcanic springs for decades, said the threat of environmental harm from seabed mining probably centered less on the high-seas projects of developed states than those in the territorial waters of the Pacific islanders.

“They’re more worried about their economies than the environment,” he said in an interview.

Dr. Cherkashov of the minerals society played down the environmental concerns, saying one reason for the global rush is that seabed mining has a relatively low impact compared with land operations. “It’s first come, first get,” he said of the multiplying claims. The wide maneuvering for the most promising sites, he added, represents “the last redivision of the world.” ■

Offshore borehole mining of tin in South China Sea

Borehole Mining International Inc., of Denver, CO, has signed a Borehole Mining Demonstration Trial Agreement for mining of tin from below the seafloor in the South China Sea, approximately 500 km north of Jakarta, Indonesia. The ore zone is located some 45 to 60 m (and deeper) below the water surface, while the depth of the sea remains relatively shallow - some 4 to 6 m.

Mining of tin (cassiterite ore) is known in Indonesia – the world's second-largest (after China) producer of the metal since the early 1700s. After the nearly complete exhaustion of tin reserves onshore in the late 1990s, offshore tin dredging became the fastest growing sector of mining operations in this region. The problem, however, remains that the offshore reserves are buried below the overburden sediments. This forces dredgers to deal both with the removal of the overburden and the potential dilution of the ore. The other problem is that the reach-depth of the bucket-chain dredger is limited to a few tens of meters from the water surface. Also, cutting a narrow but deep trench in the soft and unstable rocks and ores leads to cave-ins and consequent damage to, and loss of, the equipment. And it can cause serious hazards to the vessel and personnel.

With its all-time depth mining record of more than 1 km, borehole mining (BHM) seems to be a perfect solution. The only difference from the onshore BHM operations is that the BHM tool operating equipment – a drill rig – will have to be mounted on a floating vessel. The rest – a water pump, the tool and the casing column – remain the same, plus plenty of water.

Preparations for the demonstration will take several months and serious investment in remodeling of the former dredger into a borehole-mining platform. The trial is scheduled for early 2013.

This project is expected to be a major breakthrough into the below-sea-floor mining operations where virtually no alternatives exist other than borehole mining. ■

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Invited speakers from Norway and abroad.
Round-table discussion.

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