**FINAL PROGRAM**

21 October 2013 (Monday)

**WELCOMING PARTY**
(ROOF TOP RECEPTION & REGISTRATION)
Windsor Plaza Hotel - Copacabana
Avenida Princesa Isabel
263 – Copacabana, Rio de Janeiro
Tel: +55 21 2195 5500
**19:00 – 21:00**
*UMI participants and guests are welcome.*

---

22 October 2013 (Tuesday)

**TECHNICAL SESSION I**
Windsor Plaza Hotel - Copacabana
Avenida Princesa Isabel
263 – Copacabana, Rio de Janeiro
Tel: +55 21 2195 5500
**08:30 – 17:30**
*Participants staying at the Windsor Plaza or Windsor Excelsior should enjoy breakfast before coming to the conference room.*

08:30 **INTRODUCTION**

Call to Order

*Charles L. Morgan*
*UMI Program Chair*

Welcome and Keynote Address (08:40)

*“The Brazilian Geological Program in the South Atlantic”*

*Roberto Ventura Santos*
*UMI Program Co-chair and Host*
*Director, Geology and Mineral Resources*
*Geological Survey of Brazil (CPRM)*
*Brasilia, Brazil*
Keynote Address (09:00)
“Deep-sea Mining Activities of the Republic of Korea: Recent Achievements and Future Challenges”
President Jung-Keuk Kang
Korea Institute of Ocean Science and Technology (KIOST)
Ansan, Korea

Presentations

Carl Kaiser
Woods Hole Oceanographic Institution, Massachusetts, United States

09:45 Deep Sea Mining Concept for Manganese Nodules
Steffen Knodt (alternate speaker, Annemiek Vink, BGR)
Aker Solutions Drilling Technologies, Erkelenz, Germany

10:05 Nodule Abundance Estimation – The Search for “Good Enough”
Laurie Meyer
Deep Reach Technology, Inc., Houston, Texas, United States

10:35 Break – 30 minutes

11:05 Pilot Mining Robot for Polymetallic Nodules
Sup Hong
Korea Institute of Ocean Science and Technology (KIOST), Ansan, Korea

11:30 A Study on Steering Characteristics of Pilot Mining Robot (MineRo II) on Extremely Cohesive Soft Soil
Hyung-Woo Kim
Korea Institute of Ocean Science and Technology (KIOST), Ansan, Korea

11:50 Control and Monitoring of Hydraulic System of Underwater Mining Robot
Tae-Kyeong Yeu
Korea Institute of Ocean Science and Technology (KIOST), Ansan, Korea

12:15 Lunch (1 hr 15 min)
13:30  Poster Session (45 minutes)

**Poster Presentations**

**Past, Present and Future of Mn-nodules Development of Korean the NE Equatorial Pacific**  
Sang Bum Chi  
*Korea Institute of Ocean Science and Technology (KIOST), Ansan, Korea*

**A Classification Society Experience with Subsea Mining**  
Marco Figoni  
*American Bureau of Shipping, Rio de Janeiro, Brazil*

**Hydrothermal Activity Along the Central Spreading Ridge of North Fiji Basin: Results from 2012-2013 Explorations**  
Jonguk Kim  
*Korea Institute of Ocean Science and Technology (KIOST), Ansan, Korea*

**Suitable Site Selection for Manganese Nodule Development in the Korea Licensed Area Using GIS Method**  
Young-Tak Ko  
*Korea Institute of Ocean Science and Technology (KIOST), Ansan, Korea*

**Geological Setting of an Off-axis Mafic-hosted Seafloor Hydrothermal Field (14° S, MAR) and Its Influence on Associated Deposits Formation**  
Bing Li  
*First Institute of Oceanography, State Oceanic Administration, Qingdao, China*

**From Exploration to Extraction: The Consequence of Resource Morphology for Mining Operations on the Chatham Rise**  
Campbell McKenzie  
*Kenex Limited, Eastbourne, Wellington, New Zealand*

**The Approach to Environmental Impact Assessment for Mining Seafloor Massive Sulfides in Japan - DNA Analysis for Biodiversity Conservation by the Genetic Connectivity Concepts**  
Narita Teruyoshi (alternate speaker: Nobuyuki Okamoto)  
*Japan Oil, Gas and Metals National Corporation, Tokyo, Japan*

**Sub-seafloor Replacement Mineralization: Lessons from the Neves Corvo VHMS Deposit**  
Jorge Relvas  
*University of Lisbon, Lisbon, Portugal*

**Managing Deep Sea Tailings Placement and the Environment: An Analogue for Deep Sea Mining**  
Tracy Shimmield  
*Scottish Association for Marine Science Research Services Limited (SRSL), Argyll, Scotland, United Kingdom*
Scientific Deep Water Drilling Results and Their Application for Underwater Mining
Giovanni Spagnoli
BAUER Maschinen GmbH, Schrobenhausen, Germany

The Mineralogy and Isotope Geochemistry of Active Hydrothermal Field at South Atlantic Mid-Ocean Ridge 15°S
Jun Ye
First Institute of Oceanography, State Oceanic Administration, Qingdao, China

Oral Presentations - continued

14:15 Estimating and Finding Seafloor and Sub-seafloor Sulfide Mineralization: Optimists Versus Pessimists
Fernando Barriga
University of Lisbon, Lisbon, Portugal

14:35 AUV-based Long-range Exploration for Hydrothermal Activity Between 13°- 33°S along the Southern Mid-Atlantic Ridge
Sven Petersen
GEOMAR, Helmholtz Centre for Ocean Research, Kiel, Germany

14:55 New Morphological Insights of the Fieberling Guyot, Northeast Pacific Ocean: Application of SeaBat 7150 for Underwater Mining
Brian Parsons
Odyssey Marine Exploration, Tampa, Florida, United States

Sung Rock Lee
Korea Institute of Geoscience & Mineral Resources (KIGAM), Daejeon, Korea

15:35 Break (30 minutes)

16:05 Preliminary Economic Evaluation of Deep-sea REE Mud Mining
Tetsuo Yamazaki
Osaka Prefecture University, Osaka, Japan

16:25 Waste Rejection on Seafloor by Slurry Flashing for Economic Seafloor Massive Sulfide Mining
Yuta Yamamoto
Osaka Prefecture University, Osaka, Japan

16:45 Electromagnetic Methods in Seafloor Mineral Exploration: Past Experiences, Present Technology and Future Directions
Andrei Swidinsky
Colorado School of Mines, Golden, Colorado, United States
17:05 The Application of Current Benthic Assessment Expertise to the Marine Mining - A Perspective on Best Practice from the UK
    Daniel Brutto
    Marine Ecological Surveys, Limited, United Kingdom

17:30 Technical Session I Closing Remarks
    Charles Morgan

22 October 2013 (Tuesday)
**EVENING ACTIVITIES**
The evening is free for participants to explore the Copacabana.

See the list of restaurants below for suggested dining locations.*

An optional activity for UMI participants is the **RIO SCENARIUM**—considered to be among the Best 10 Bars in the World and to have the Best Live Music in Rio.

Entry Fee: About USD 12.00 per person per show

Website: www.rioscenarium.com.br

**Address:**
**Rua do Lavradio, 20 – Old Town, Rio de Janeiro**
(near Praca Tiradentes)

Tel: +55 21 3147-9005

**Two Different Shows: 19:30 and 23:00**
We have reserved 40 seats for the 1st show. Please sign up with the UMI receptionist by 12:00 Noon on Tuesday, October 22. The first show features Ana Costa (singer) and musicians performing hits by Brazilian composers. Please take a taxi and **meet at 19:00** at the Rio Scenarium.

The 2nd show highlights Darcy Wonder, a champion in samba. Many talented musicians will be featured.

Please check with conference coordinators at the UMI in case there are any slight changes regarding this activity.
*Recommended Places to Eat* (close to hotel)

- Restaurant do Windsor Plaza Hotel – a la carte or buffet (*according to recent TripAdvisor review “service in this dining room is excellent and the buffet is quite good.”*)
- Cervantes, Tel: 21 2275-6147, Av. Prado do Junior no. 335B (*fresh and delicious sandwiches, salads, various meats, fish, beer, wine, desserts*)
- Brasileirinho, Tel: +55 21 2523-4994, R. Jangadeiros, 10 - Ipanema (*fine dining, “service was impeccable.”*)
- Shirleys, Tel: 21 2275-1398, Rua Gustavo Sampaio 620, RJ (*hole-in-the-wall Spanish seafood restaurant, quaint, “food is definitely worth the trip” according to Frommer’s review*)
- Cerretao, Tel: 21 2236-3435, Siqueira Campos Street, 23 (*modern, relaxed, close to the beach, carefully prepared cuisine “tasty and irresistible.”*)
- Martinez, Tel: 21 3215-7297, Loja B - Avenida Atlântica, 974 – Leme (*wide variety of appetizers, along with baked and grilled dishes, some original and some classic... “a great place to eat overlooking the beach” according to a TripAdvisor review.*)
23 October 2013 (Wednesday)

TECHNICAL SESSION II

Windsor Plaza Hotel - Copacabana
Avenida Princesa Isabel
263 – Copacabana, Rio de Janeiro
Tel: +55 21 2195 5500

08:30 – 17:00

Participants staying at the Windsor Plaza or Windsor Excelsior should enjoy breakfast before coming to the conference room.

Presentations

08:30 International Marine Minerals Society: Annual General Membership Meeting
James R. Hein, President

09:00 Toward Zero Impact: Assessment of Ecological Impact for Tailings Return
Wiebe Boomsma
IHC Mining BV, Kinderdijk, Netherlands

09:20 Tierra Del Fuego: A Southern Equivalent of Nome, Alaska
Richard Garnett
Minera Mares Australes, Santiago, Chile

09:40 Ultra-fast Segmentation and Quantification of Poly-metallic Nodule Coverage in High-resolution Digital Images
Tim Nattkemper
Biodata Mining Group, Biefeld University, Biefeld, Germany

10:00 Critical Metals in Manganese Nodules from the Cook Islands EEZ
James R. Hein
U.S. Geological Survey, Santa Cruz, California, United States

10:20 Break (30 minutes)
10:50 Fe-Mn Nodules of the Finnish Bay (Baltic Sea): Exploration and Exploitation Experience
George Cherkashov
VNIIOkeangeologica, St. Petersburg, Russia

11:10 Geoaoustic and Photo-Profiling as Remote Techniques of Choice in Nodule Field Exploration
Ivo Dreiseitl
Interoceanmetal Joint Organization, Szczecin, Poland

11:30 Methods of Manganese Nodule Exploration in the German License Area
Carsten Ruehlemann
Federal Institute for Geosciences and Natural Resources (BGR), Hannover, Germany

11:50 Geological Limitation on Distribution of Manganese Nodules in the South China Sea
Huaiyang Zhou
Tongji University, Tongji, China

12:10 Revisiting the DISCOL Area in the Peru Basin 25 Years After the Disturbance Experiment - A German/European Initiative to Prepare an Environmentally Sustainable Manganese Nodule Mining
Andrea Koschinsky-Fritsche
Jacobs University, Bremen, Germany

12:30 Lunch (1 hr 30 min)

14:00 Polymetallic Nodules in the Cook Islands EEZ - A Seabed Mineral Resource of World Class Significance - Progress Towards Ultimate Development
Darryl Thorburn
Seabed Minerals Authority, Rarotonga, Cook Islands

14:20 Distribution of Radionuclides During Weathering and Erosion in Saquarema (Rio de Janeiro): Implications for Submerged Monazite Deposits in Adjacent Offshore Area
Valiya Hamza
National Observatory of the Ministry of Science & Technology, Rio de Janeiro, Brazil

14:40 Nautilus Minerals Exploration and Development Update
John Parianos
Nautilus Minerals, Inc., Brisbane, Australia

15:00 Monitoring the Dynamics of Gas Hydrate Deposits and Hydrothermal Discharge using the NEPTUNE Undersea Observatory Network
S. Kim Juniper
Ocean Networks Canada, British Columbia, Canada

15:20 Break (30 minutes)
15:50  Seabed Classification at Seafloor Hydrothermal Sulfides Fields Using Multi-beam Sonar
       Chunhui Tao
       Second Institute of Oceanography, Hangzhou, China

16:10  A Review of Radiometric Dating Methods Used in Assessing Submarine Volcanic Arc-related Mineral Deposits
       Robert Ditchburn
       GNS Science, Lower Hutt, New Zealand

16:30  North Atlantic Marine Minerals and Ocean Mining Potential
       Fredrik Soreide
       Norwegian University of Science and Technology, Trondheim, Norway

16:50  Trace Elements in Massive Sulfides from the Semenov-2 Hydrothermal Field, 13°31' N, Central Atlantic: ICP-MS and LA-ICP-MS Data
       Irina Melekestseva
       Institute of Mineralogy, Ural Branch, Russian Academy of Sciences, Miass, Russia

17:10  Closing Remarks
       Roberto Ventura Santos and Charles Morgan

Invitation to UMI 2014 in Lisbon, Portugal
       Fernando Barriga and Jorge Relvas
       University of Lisbon, Portugal

End of Technical Sessions
       Charles Morgan
23 October 2013 (Wednesday)
UMI 2013 BANQUET
18:30
Fogo de Chao (fo-go-dee shoun) is an authentic Brazilian steakhouse showcasing the gaucho way of preparing meat in Southern Brazil. Sixteen cuts of meat are expertly grilled and offered continuously at your table. Graced with gourmet salads, imported cheeses and Brazilian side dishes, this will be a UMI banquet to savor for years to come. Your UMI registration includes the dinner. Wine and other specialty drinks are considered no-host cocktails.

Transport from your hotel to the restaurant is best by taxi (about Real$ 12 cash). If needed, please ask the hotel for assistance in selecting your taxi service.

Fogo de Chao
Rio De Janeiro
Av. Reporter Nestor Moreira, s/n – BotaFogo
Tel: +55 21-2279-7117
24-26 October 2013 (Thursday, Friday, and Saturday)

UMI Geotechnical Field Tour
Ouro Preto Area, Brazil

Director Roberto Ventura Santos and his staff from the Geological Survey of Brazil (CPRM) have arranged for a unique geotechnical tour to the Ouro Preto area, famous for mining and other geologically significant features. CPRM specialists will provide guidance and expertise on the activities of the area. Participants should wear outdoor attire (light trousers, light sweaters, and walking shoes). The temperature will be moderate with the possibility of rain.

Oct 24: Shuttle from hotel lobby to Santos Dumont Airport (SDU); depart SDU at 07:58 and arrive Belo Horizonte (CNF) at 09:11; technical tour group to iron mine and non-technical tour group to Ouro Preto town; check in at various hotels; dinner on your own.

Oct 25: Breakfast in the hotel. Technical members splits into 3 groups (Cuiaba, Passegem, Komatiite outcrops); non-technical group depart for Inhotim contemporary art museum; check in at hotel; dinner on your own.

Oct 26: Breakfast in the hotel. Various departures from CNF to SDU and from CNF to REC (Recife) for Industry Strategic Planning Meeting in Porto de Galinhas.

The most current and detailed information will be provided at the UMI for all participants on the Field Tour.
## Field Tour members as of 10/15/13: 52 persons

<table>
<thead>
<tr>
<th>Brad Baker</th>
<th>Jai-Woon Moon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fernando Barriga and Celia Lee</td>
<td>Charles and Karynne Morgan</td>
</tr>
<tr>
<td>Wiebe Boomsma</td>
<td>Mark Mussett</td>
</tr>
<tr>
<td>Craig Bryson</td>
<td>John Opperman and Susan Helms</td>
</tr>
<tr>
<td>Georgey Cherkashov</td>
<td>John and Nicola Parianos</td>
</tr>
<tr>
<td>Sang Bum Chi</td>
<td>Brian Parsons</td>
</tr>
<tr>
<td>Daniel De Narvaez &amp; Marisol Espinosa</td>
<td>Jorge Relvas</td>
</tr>
<tr>
<td>Tom Dettweiler</td>
<td>Carsten Ruehlemann</td>
</tr>
<tr>
<td>Robert Ditchburn</td>
<td>Caroline Scogna</td>
</tr>
<tr>
<td>Richard Garnett</td>
<td>Robina Sharpe</td>
</tr>
<tr>
<td>Robert Goodden &amp; Beatrice Brandt</td>
<td>Tracy Shimmield</td>
</tr>
<tr>
<td>James Hein</td>
<td>Chunhui Tao</td>
</tr>
<tr>
<td>Sup Hong</td>
<td>Satoshi Ueda</td>
</tr>
<tr>
<td>Jiancai Jin</td>
<td>Annemiek Vink</td>
</tr>
<tr>
<td>Jonguk Kim</td>
<td>John Wiltshire</td>
</tr>
<tr>
<td>Hyung Woo Kim</td>
<td>Changbin Wu</td>
</tr>
<tr>
<td>Young-Tak Ko</td>
<td>Xuewei Xu</td>
</tr>
<tr>
<td>David Kronenberg</td>
<td>Yuta Yamamoto</td>
</tr>
<tr>
<td>Sung Rock Lee</td>
<td>Tetsuo Yamazaki</td>
</tr>
<tr>
<td>Li Li</td>
<td>Ning Yang</td>
</tr>
<tr>
<td>Shaojun Liu</td>
<td>Jun Ye</td>
</tr>
<tr>
<td>Paul Lynch</td>
<td>Tae-Kyeong Yeu</td>
</tr>
<tr>
<td>Irina Melekestseva</td>
<td>Huaiyang Zhou</td>
</tr>
</tbody>
</table>
26-29 October 2013 (Saturday - Monday)
INDUSTRY STRATEGIC PLANNING MEETING
Porto de Galinhas

More details will be provided at the UMI.

Participants as of 10/15/13:

<table>
<thead>
<tr>
<th>Brad Baker</th>
<th>Jorge Relvas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fernando Barriga (Celia Lee)</td>
<td>Frederico Rodrigues</td>
</tr>
<tr>
<td>Tim Boyd</td>
<td>George Satander de Sa Freire</td>
</tr>
<tr>
<td>Craig Bryson</td>
<td>Caroline Scogna</td>
</tr>
<tr>
<td>Max Cohen (Lisa Cohen)</td>
<td>Robina Sharpe</td>
</tr>
<tr>
<td>Daniel De Narvaez (Marisol Espinosa)</td>
<td>Tracy Shimmield</td>
</tr>
<tr>
<td>Kaiser De Souza</td>
<td>Hans Smit (Andrea Smit)</td>
</tr>
<tr>
<td>Tom Dettweiler</td>
<td>Greg Stemm (Laurie Stemm)</td>
</tr>
<tr>
<td>Karsten Ewald</td>
<td>Nicholas Stemm</td>
</tr>
<tr>
<td>Robert Goodden (Beatrice Brandt)</td>
<td>Andrey Swidinsky (Viktorya Pavelko)</td>
</tr>
<tr>
<td>Chuck Drake</td>
<td>Chunnhi Tao</td>
</tr>
<tr>
<td>Jiancai Jin</td>
<td>Ernie Tapanes (Julie Tapanes)</td>
</tr>
<tr>
<td>Jeff Knight</td>
<td>Darryl Thorburn</td>
</tr>
<tr>
<td>David Kronenberg</td>
<td>Roy Truman</td>
</tr>
<tr>
<td>Shaojun Liu</td>
<td>John Wiltshire</td>
</tr>
<tr>
<td>Paul Lynch</td>
<td>Changbin Wu</td>
</tr>
<tr>
<td>Valdir Manso</td>
<td>Xuewei Xu</td>
</tr>
<tr>
<td>Laurie Meyer (Michael Meyer)</td>
<td>Yuta Yamamoto</td>
</tr>
<tr>
<td>Charles Morgan (Karyanne Morgan)</td>
<td>Tetsuo Yamazaki</td>
</tr>
<tr>
<td>Kris van Nijen</td>
<td>Jun Ye</td>
</tr>
<tr>
<td>John Opperman (Susan Helms)</td>
<td>Huaiyang Zhou</td>
</tr>
<tr>
<td>John Parianos (Nicola Parianos)</td>
<td></td>
</tr>
</tbody>
</table>
29 October 2013
Adjournment of UMI 2013

UMI Participant and Friend:

We hope you will enjoy yourself and benefit professionally and personally from your time with us at the 42nd Underwater Mining Institute in Brazil. Please join us in extending our appreciation to our host, Dr. Roberto Ventura Santos and his executive assistant, Michelle Araujo, and others on his technical and administrative team for their excellent hosting of the Institute. We would like to express our gratitude also to CEO Greg Stemm and his Odyssey Marine Exploration team for the their support of the UMI and for hosting our first Industry Strategic Planning Meeting. And to all of our Sponsors for their trust and support, we say Mahalo:

- Odyssey Marine Exploration
- Geological Survey of Brazil
- Technip-France
- IHC Mining BV
- Japan Oil, Gas and Metals National Corporation (JOGMEC)
- Korea Institute for Ocean Science & Technology (KIOST)
- International Marine Minerals Society
- Nautilus Minerals, Inc.
- James R. Hein
- Georgy Cherkashov
- Hawaii Undersea Research Laboratory, University of Hawaii
- Marine Technology Society

Charles L. Morgan
UMI Chair

James R. Hein
IMMS President