BHP

A world-leading global resources company.

We are among the world’s top producers of major commodities, including iron ore, metallurgical coal and copper. We also have substantial interests in oil, gas, energy coal, nickel and potash.

Our corporate purpose is to create long-term shareholder value through the discovery, acquisition, development and marketing of natural resources. We do this through our strategy: managing a simple and diverse portfolio of 12 core operated assets around the world with low-cost options for future growth.

Our unique portfolio allows our diverse team of geoscientists the opportunity to apply unrivalled technical skills and technology to unlock further value from exploration through resource geology, and extraction. This places BHP at the front of the challenge to meet customer needs and resource demand globally.

We are committed to delivering a broader contribution through our social investments, environmental custodianship, and operating to the highest safety and health standards, thereby ensuring lasting economic and social benefits for the communities where we operate.

SEG 2018
For more information, visit www.bhp.com
**SUNDAY**

8:15am–10:05am  
Session 1: Technology and Energy Metals  
Session 2: Mineral Exploration Footprints Project

10:05am–10:35am  
Break and Posters

10:35am–11:00am  
Session 1 (cont.)

11:00am–12:30pm  
Session 3: Infrastructure Metals  
Session 4: Precious Metals

12:30pm–1:30pm  
Lunch and Posters

1:30pm–2:00pm  
Speed Talks 2: Metals and Processes in Basins

2:00pm–3:00pm  
Posters

3:00pm–3:30pm  
Break

3:30pm–5:30pm  
Session 11: Looking to the Future

5:30pm  
Closing Remarks  
Steve Enders, Conference Chair

---

**MONDAY**

8:15am–10:05am  
Session 7: Integrating Petroleum and Minerals Systems Approaches to Sedimentary Basins

10:05am–10:35am  
Break and Posters

10:35am–11:00am  
Session 1 (cont.)

11:00am–12:30pm  
Session 8: Base Metals  
Session 9: Integrating Geology, Geochemistry, and Geophysics

12:30pm–1:30pm  
Lunch and Posters

1:30pm–2:00pm  
Speed Talks 2: Metals and Processes in Basins

2:00pm–3:00pm  
Posters

3:00pm–3:30pm  
Break

3:30pm–5:30pm  
Session 11: Looking to the Future

5:30pm  
Closing Remarks  
Steve Enders, Conference Chair

---

**TUESDAY**

8:15am–10:25am  
Session 7: Integrating Petroleum and Minerals Systems Approaches to Sedimentary Basins

10:25am–10:55am  
Break and Posters

10:55am–12:30pm  
Session 9: Integrating Geology, Geochemistry, and Geophysics  
Session 10: Precious Metals

12:30pm–1:30pm  
Lunch and Posters

1:30pm–2:00pm  
Speed Talks 2: Metals and Processes in Basins

2:00pm–3:00pm  
Posters

3:00pm–3:30pm  
Break

3:30pm–5:30pm  
Session 11: Looking to the Future

5:30pm  
Closing Remarks  
Steve Enders, Conference Chair

---

**SATURDAY**

1:00pm–5:00pm  
Student and SEG Early Career Professionals Forum  
Castle Peak/Shavano Peak/Red Cloud Peak

5:00pm–5:30pm  
Presidential Address  
J. Bruce Gemmell, SEG President  
Shavano Peak/Red Cloud Peak

5:30pm–7:30pm  
Welcome Reception  
Columbine Ballroom

---

**REGISTRATION**

Main Lobby, Keystone Conference Center

- Saturday: 7:00am–7:00pm
- Sunday: 7:00am–6:30pm
- Monday: 7:30am–5:00pm
- Tuesday: 7:30am–12:00pm
- Wednesday: 7:00am–9:00am

---

**EXHIBITS and POSTERS**

Columbine Ballroom

- Saturday: 5:30pm–7:30pm
- Sunday: 10:00am–7:00pm
- Monday: 10:00am–7:00pm
- Tuesday: 2:00pm–3:00pm

---

**SPEAKER READY ROOM**

Crestone Peak Office

- Friday: 8:00am–5:00pm
- Saturday: 8:00am–5:00pm
- Sunday: 8:00am–5:00pm
- Monday: 8:00am–5:00pm
- Tuesday: 8:00am–1:30pm

---

**WIFI ACCESS**

Network: Keystone Conference Center  
Password: SEG2018

---

**CONFERENCE PROCEEDINGS**

Conference Abstracts and submitted presentations are available at www.segabstracts.org/schedule_public.php

All sessions and events are held at the Keystone Conference Center.

*Ticketed events
Welcome!

We welcome you to SEG 2018 at Keystone, SEG’s flagship international conference!

The SEG 2018 conference theme, “Metals, Minerals, and Society,” was chosen to showcase the latest developments across the breadth of our discipline, covering topics from advanced academic studies to practical case histories, and within a societal context. The conference focuses on precious and base metals that form the traditional backbone of our exploration and research projects, infrastructure metals needed for the urbanization of our modern world, and technology and energy minerals and metals used in fast-developing industries and markets.

This conference features an outstanding lineup of speakers, complemented by high-quality poster presentations and an exceptional group of topical pre- and post-meeting field trips and workshops. The technical program also features plenary sessions on recent breakthroughs in economic geology, integration of multidisciplinary geoscience, and the crossover between petroleum and ore deposit geoscience as applied to sedimentary basins. Students and early career professionals play a critical role as current innovators and future leaders in our society, and the conference builds on the SEG tradition of encouraging and sponsoring their participation with a series of integrated pre- and syn-conference events. In addition, we have included sessions with speed talks of five minutes each in this year’s conference.

We are most grateful to our conference sponsors, who will help make SEG 2018 a success. Their generosity directly facilitates student participation and programs.

On behalf of the Organizing Committee and all other volunteers, we welcome you to SEG 2018 in the heart of the spectacular Rocky Mountains. Enjoy the conference!

M. Stephen Enders, Chair, SEG 2018 Organizing Committee
David Broughton, SEG 2018 Technical Program Chair
Brian Hoal, Executive Director, Society of Economic Geologists
Table of Contents

1 Welcome
3 Conference Information
4 SEG Awardees
5 Pre-Conference Program
7 Program
  7 Sunday
10 Monday
18 Tuesday
24 Biographies of Invited Speakers
40 Post-Conference Program
41 Posters
72 Exhibitors/floor plan

Back cover flap  Thank you, Sponsors

Inside Back cover  Conference Center floor plan
Conference Information*

Conference Organizing Committee
• Conference Chair: M. Stephen Enders, Colorado School of Mines
• SEG Executive Director: Brian Hoal
• Technical Program: David W. Broughton, Ivanhoe Mines/Consultant
• Publications: Antonio Arribas, Akita University; Jeffrey L. Mauk, U.S. Geological Survey
• Field Trips: Nathan H. Brewer, Gold Fields Exploration, Inc.
• Workshops: Andrew T. Wurst, Barrick Gold Corporation
• Poster Sessions/Students: Regina M. Baumgartner, Teck
• Fundraising/Marketing: Nikki Morrison, SEG
• SEG Executive Assistant: Alison Cronk

SEG Contact Information
7811 Shaffer Parkway
Littleton, CO 80127-3732
Tel. 1.720.981.7882
E-mail: seg@segweb.org
Website: www.segweb.org

Conference Organizer
Kathy Basel
Basel Marketing and Events
Tel. 1.720.217.5692
E-mail: kathybasel@gmail.com

Exhibit Sales Manager
Darline Daley
Quality Business Services
Tel. 1.303.523.0806
E-mail: darline@qbsoffice.com

*For registration, exhibit, and speaker ready room hours, as well as an overview of schedules, please see the inside front cover of this program. A Conference Center floor plan is located inside the back cover. All events, except where attendees have been informed otherwise, will be held in the Center. For updates, please visit www.seg2018.org.
Awardees

Please be sure to join us Sunday, September 23, from 7:00 to 10:00pm in the Torreys Peak room at the Keystone Conference Center for the SEG Dinner and Awards Ceremony.

SEG R.A.F. Penrose Gold Medal for 2017

CHRISTOPH A. HEINRICH
ETH Zurich, Switzerland

SEG Silver Medal for 2017

KAREN D. KELLEY
U.S. Geological Survey, USA

SEG Ralph W. Marsden Award for 2017

FRANÇOIS ROBERT
Barrick Gold Corporation, Canada

SEG Waldemar Lindgren Award for 2017

PILAR LECUMBERRI SANCHEZ
University of Alberta, Canada

SEG Brian J. Skinner Award for 2017

DAOHAN ZHANG
China University of Geosciences

SEG Brian J. Skinner Honorable Mention for 2017

KEITH D. MORRISON
Arizona State University, USA

SEG Distinguished Lecturer for 2018

CHRISTOPH A. HEINRICH
ETH Zurich, Switzerland

SEG International Exchange Lecturer for 2018

ALAN J. WILSON
Antofagasta Minerals, Canada

SEG Thayer Lindsley Visiting Lecturer for 2018

JOHN H. DILLES
Oregon State University, USA

SEG Regional VP Lecturer for 2018

LENA VIRGINIA SOARES MONTEIRO
University of São Paulo, Brazil
Pre-Conference Program

Saturday, September 22, 2018

Student and SEG Early Career Professionals Forum

1:00pm–3:00pm
Roundtable Discussions
Student interactive roundtable sessions.
Open to students and young professionals.
*Castle Peak*

3:00pm–3:30pm
Coffee Break
*Shavano Peak/Red Cloud Peak*

3:30pm–5:00pm
Forum
Hosted by **BHP**
A wrap-up and panel discussion of the roundtable sessions.
Open to all conference attendees.
*Shavano Peak/Red Cloud Peak*

Panel members:
- John Thompson, Cornell University
- Libby Sharman, BHP
- Jesse Clark, BHP
- Fabien Rabayrol, UBC
- Regina Baumgartner, Teck

5:00pm–5:30pm
SEG Presidential Address
- J. Bruce Gemmell, SEG President
*Shavano Peak/Red Cloud Peak*

5:30pm–7:30pm
Welcome Reception
*Columbine Ballroom*
Pre-Conference Field Trips

Central and South Kamchatka Mining Districts, Far East of Russia
Leader: Daria S. Bukhanova
September 13–19

Rare Earth and Precious Metal Systems of the Mojave Desert Region
Leaders: William X. Chávez, Jr., Erich U. Petersen
September 17–22

Lithium and Gold Associated with Rhyolites
Leaders: Ruth A. Carraher, Jonathan G. Price, Ted Wilton
September 18–21

Uncovering the Bingham and Stockton Cu-Mo-Au Porphyries
Leaders: Rudy Ganske, Kitty Gundy, Ken Krahulec
September 20–22

Cripple Creek and Victor Mines
Leader: Douglas White
September 21

Pre-Conference Workshops

Applied Structural Geology of Precious Metal-Bearing Hydrothermal Mineralizing Systems
Presenters: Wayne Barnett, Stephen Cox, David Rhys, Julie Rowland, Blair Hrabi
September 21–22

Introduction to Geology-Driven Resource Domaining and Modeling
Sponsored by srk
Presenters: Matt Hastings, Anna Kutkiewicz
September 21–22

Geophysics for Geologists: Basic Principles and Case Histories
Presenter: Alan King
September 21–22

Mineral Vectoring in Hydrothermal Ore Deposits: A Multiscale Approach
Sponsored by corescan
Presenters: Cari Deyell-Wurst, Brigette Martini
September 21–22
### Technical Program

Talks for which the presenting author is a student can be identified by an asterisk (*) that follows the presenter. Posters can be viewed during all breaks.

**DAY 1 — Sunday, September 23, AM**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:15-8:30</td>
<td>Welcoming remarks</td>
<td>Steve Enders, Conference Chair</td>
</tr>
<tr>
<td>8:30-9:00</td>
<td>Plenary - Recent Breakthroughs in Economic Geology</td>
<td>Patrick Redmond, Teck</td>
</tr>
<tr>
<td>8:30-9:00</td>
<td>Nick Hayward (Invited)</td>
<td>Spatial periodicity in self-organized critical ore systems</td>
</tr>
<tr>
<td>9:00-9:30</td>
<td>John Ashton (SGA Invited Speaker)</td>
<td>Discovery of the Tara deep Zn-Pb mineralization at the Boliden Tara mine, Navan, Ireland</td>
</tr>
<tr>
<td>9:30-9:50</td>
<td>Aldo Vasquez</td>
<td>Application of zircons as a magmatic fertility proxy in global porphyry exploration</td>
</tr>
<tr>
<td>9:50-10:10</td>
<td>Don Pridmore</td>
<td>Alteration in gold systems and its significance in interpreting results from 3D seismic surveys</td>
</tr>
<tr>
<td>10:10-10:40</td>
<td>Break</td>
<td></td>
</tr>
</tbody>
</table>

**Plenary - Integrating Geology, Geochemistry, and Geophysics**

*Jon Woodhead, JAW Consulting*

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:40-11:10</td>
<td>3D uncertainty in contrasting geological scenarios</td>
<td>Mark Jessell (Invited)</td>
</tr>
<tr>
<td>11:10-11:35</td>
<td>Exploration success: Strategic elements, technology, and innovation</td>
<td>François Robert (Invited), Rob Krcmarov</td>
</tr>
</tbody>
</table>
### 11:35–12:00
*Julie Rowland*
**The making of a metal belt: Insights from New Zealand’s active accretionary orogen**

---

### SUNDAY

#### DAY 1 — Sunday, September 23, PM

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00–1:00</td>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>1:00–1:30</td>
<td>Cam McCuaig (Invited)</td>
<td>The power of a systems approach to minerals and petroleum exploration in sedimentary basins</td>
</tr>
<tr>
<td>1:30–1:55</td>
<td>Larry Cathles (Invited)</td>
<td>Processes controlling sedimentary basin resources</td>
</tr>
<tr>
<td>1:55–2:20</td>
<td>Michael Hudec (Invited)</td>
<td>Fluid flow around evolving salt structures and its influence on metal deposits</td>
</tr>
<tr>
<td>2:20–2:45</td>
<td>Poul Emsbo</td>
<td>Seawater evaporation and density-driven fluid flow: Fluid source and drive for the formation of sedex zinc-lead-silver deposits</td>
</tr>
<tr>
<td>2:45–3:10</td>
<td>John Walsh (Invited)</td>
<td>Fault-controlled fluid flow in sediment-hosted mineral deposits</td>
</tr>
<tr>
<td>3:10–3:40</td>
<td>Break</td>
<td></td>
</tr>
</tbody>
</table>

#### Plenary - Societal Implications

*Steve Enders, Colorado School of Mines*

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:40–4:05</td>
<td>Susan Lomas (Invited)</td>
<td>MeTooMining - It is time to start the conversation!</td>
</tr>
</tbody>
</table>
4:05–4:30  Ben Teschner
Proposed mercury abatement and disposal at Donlin gold, Western Alaska: Geology, stakeholders, and mine permitting

4:30–5:10  Christoph Heinrich, 2018 SEG Distinguished Lecturer
Fluid evolution and selective metal enrichment in magmatic-hydrothermal Cu-Au ore systems

5:15–7:00  Exhibit/Poster Reception

7:00  SEG Dinner and Awards Ceremony (ticketed event)
### SESSION ONE

#### Technology and Energy Metals

**Simon Jowitt, UNLV; Patrick Highsmith, Pure Energy Minerals**

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:15-8:40</td>
<td>Roderick Eggert (Invited)</td>
<td>Critical minerals and modern engineered materials</td>
</tr>
<tr>
<td>8:40-9:05</td>
<td>Simon Jowitt (Invited), Gavin Mudd</td>
<td>An overview of global critical metal resources: Current and future scenarios and implications for supply security</td>
</tr>
<tr>
<td>9:05-9:25</td>
<td>Isabel Barton</td>
<td>Iron deficiency and cobalt concentration in sediment-hosted copper deposits</td>
</tr>
<tr>
<td>9:25-9:45</td>
<td>Philip Verplanck</td>
<td>Isotopic constraints on ore-grade enrichment of rare earth elements in carbonatites: The Elk Creek carbonatite example</td>
</tr>
</tbody>
</table>

### SESSION TWO

#### Mineral Exploration Footprints Project

**Michael Lesher, Laurentian University**

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:15-8:40</td>
<td>Michael Lesher (Invited)</td>
<td>Mineral exploration footprints project - overview</td>
</tr>
<tr>
<td>8:40-9:05</td>
<td>Leonardo Feltrin (Invited)</td>
<td>Footprints: Data integration methodologies and workflows</td>
</tr>
<tr>
<td>9:05-9:25</td>
<td>Robert Lee (Invited)</td>
<td>Exploration footprint of the Highland Valley porphyry copper deposit</td>
</tr>
<tr>
<td>9:25-9:45</td>
<td>Kevin Ansdell (Invited)</td>
<td>Exploration footprint of the McArthur River and Millennium unconformity uranium deposits</td>
</tr>
<tr>
<td>Time</td>
<td>Session One</td>
<td>Session Two</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
</tbody>
</table>
| 9:45-10:05 | **Ben Cerlienco**  
The geology and petrogenesis of the Earl Grey albite-spodumene pegmatite: Implications for mineralogical and geochemical zonation in rare-element pegmatites | **Stéphane Perrouy** (Invited)  
Exploration footprint of the Canadian Malartic disseminated gold deposit |
| 10:05-10:35 | Break                                           | Break                                           |
| 10:35-11:00 | **Alexandre Aubin**  
Athabasca Basin uranium deposits – variations in footprints and exploration implications | **Christoph Heinrich** (2018 SEG Distinguished Lecturer)  
Archean gold: Lode deposits, silver isotopes, magmatic degassing, and early life on the Kaapvaal craton |
### DAY 2 — Monday, September 24, AM (continued)

#### SESSION THREE

**Infrastructure Metals**  
*Adam Simon, University of Michigan Ann Arbor; Caroline Perring, BHP*

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00–11:25</td>
<td><em>Caroline Perring</em></td>
<td>Discovery, geologic setting, and controls on iron mineralization, South Flank, Western Australia</td>
</tr>
<tr>
<td>11:25–11:50</td>
<td><em>Craig Scherba</em></td>
<td>The geology and economics of the giant Molo graphite deposit, southern Madagascar</td>
</tr>
<tr>
<td>11:50–12:10</td>
<td><em>Adam Simon (Invited)</em></td>
<td>A holistic model that combines igneous and magmatic-hydrothermal processes to explain Kiruna-type iron oxide-apatite deposits and iron-oxide-copper-gold deposits as products of a single evolving ore system</td>
</tr>
</tbody>
</table>

#### SESSION FOUR (cont.)

**Precious Metals**  
*Paul Bartos, AngloGold Ashanti*

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00–11:25</td>
<td><em>Carlos Vargas</em></td>
<td>The Archean Karagba-Chauffeur-Durba (KCD) gold deposit in the Kibali district, northeast Democratic Republic of Congo</td>
</tr>
<tr>
<td>11:25–11:50</td>
<td><em>Michael Tedeschi</em></td>
<td>Redefining the timing of orogenic gold mineralization in the Guiana Shield: New U-Pb evidence from the Karouni gold deposits</td>
</tr>
<tr>
<td>11:50–12:10</td>
<td><em>Ruben Padilla</em></td>
<td>Discovery and geology of the Windfall Lake gold project</td>
</tr>
</tbody>
</table>
### SESSION FIVE

**Precious Metals**

*Wolf Schuh, Freeport; Cathy Knight, Khoemacau*

**12:10–12:30**

*Maria Mustafa*

The chemistry and textures of magnetite from the Candelaria IOCG deposit and Quince IOA prospect in the Chilean iron belt

**12:30–1:30**

**Lunch**

**1:30–2:00**

*Poul Emsbo (Invited)*

Impact of exhalative hydrothermal systems on marine chemistry: Applications for ore genesis and mineral exploration

### SESSION SIX

**Precious Metals**

*Paul Bartos, AngloGold Ashanti*

**12:10–12:30**

*Kathryn MacWilliam*

Geology and genesis of the Coffee gold deposit, west-central Yukon Territory: Implications for the tectonic and metallogenic evolution of the North American Cordillera

**12:30–1:30**

**Lunch**

**1:30–2:00**

*Maria Mustafa*

The chemistry and textures of magnetite from the Candelaria IOCG deposit and Quince IOA prospect in the Chilean iron belt
### DAY 2 — Monday, September 24, PM (continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00-2:25</td>
<td><strong>David Selley</strong> (Invited)</td>
<td>Structural configuration of the Central African Copperbelt, with particular reference to the Congolese arm: Roles of evaporites in structural evolution, basin hydrology, and ore location</td>
</tr>
<tr>
<td>2:25-2:45</td>
<td><strong>Wesley Hall</strong> (Invited)</td>
<td>Regional- to deposit-scale controls on base metal mineralization in the Kalahari Copperbelt, Botswana, defined by detailed lithostratigraphy and magnetic lithostratigraphy</td>
</tr>
<tr>
<td>2:45-3:05</td>
<td><strong>Nicole Hurtig</strong></td>
<td>The importance of hydrocarbon-water interaction in sedimentary-hosted ore deposits</td>
</tr>
<tr>
<td>3:05-3:35</td>
<td><strong>Break</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00-2:25</td>
<td><strong>Marina Yudovskaya</strong> (Invited)</td>
<td>Anhydrite assimilation by Bushveld ultramafic melts and its ore-petrological consequences</td>
</tr>
<tr>
<td>2:25-2:45</td>
<td><strong>Nadezhda Krivolutskaya</strong> (Invited)</td>
<td>Magmatic and tectonic constraints on the formation of the unique PGE-Cu-Ni Norilsk deposits, Siberian Trap province</td>
</tr>
<tr>
<td>2:45-3:05</td>
<td><strong>Justin Milliard</strong>*</td>
<td>Genetic links between the development of extensional basins and the formation of low sulfidation epithermal deposits</td>
</tr>
<tr>
<td>3:05-3:35</td>
<td><strong>Break</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Justin Milliard* is acknowledged for his contribution to the session.
<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker 1</th>
<th>Title/Details</th>
<th>Speaker 2</th>
<th>Title/Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:35-3:55</td>
<td>John Guven</td>
<td>Segmented fault arrays and their control on Irish Zn-Pb deposits</td>
<td>Jeffrey Edelen</td>
<td>Geology of the Esperanza gold skarn deposit, Morelos, Mexico</td>
</tr>
<tr>
<td>3:55-4:00</td>
<td><strong>See Speed Talks on the following page</strong></td>
<td></td>
<td>Vicki McConnell, GSA</td>
<td>Geoscience Education Forum - Introduction</td>
</tr>
<tr>
<td>4:00-4:15</td>
<td>Heather Houlton</td>
<td></td>
<td></td>
<td>The pipeline problem</td>
</tr>
<tr>
<td>4:15-4:30</td>
<td>David Thesenga</td>
<td></td>
<td></td>
<td>MGSS standards: Challenge/opportunity</td>
</tr>
<tr>
<td>4:30-4:45</td>
<td>Samuel Moore</td>
<td></td>
<td></td>
<td>Industry solutions</td>
</tr>
<tr>
<td>4:45-5:00</td>
<td>Dean Moosavi</td>
<td></td>
<td></td>
<td>Professional society solutions</td>
</tr>
<tr>
<td>5:00-5:15</td>
<td>Panel discussion</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SPEED TALKS ONE

**Magmatic-Associated BM, IOCG, G3, David Broughton, Steve Enders**

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:55</td>
<td>Jamie Wilkinson</td>
<td>From arc magmas to ores (FAMOS): A multidisciplinary research project investigating porphyry ore genesis in subduction zones</td>
</tr>
<tr>
<td>4:00</td>
<td>Oliver Higgins*</td>
<td>Metals and volatiles partitioning during protracted magma differentiation from the deep to upper crust</td>
</tr>
<tr>
<td>4:05</td>
<td>Michael Calder*</td>
<td>Porphyry-style alteration and vein types of the Far Southeast porphyry Cu-Au deposit, Mankanyan district, Philippines</td>
</tr>
<tr>
<td>4:10</td>
<td>Ken Witherly</td>
<td>What lies beneath: Mapping conductive zones within porphyry copper systems</td>
</tr>
<tr>
<td>4:15</td>
<td>Camilo Uribe Mogollon</td>
<td>White mica geochemistry of the Copper Cliff porphyry Cu deposit: Insights from a vectoring tool applied to exploration</td>
</tr>
<tr>
<td>4:20</td>
<td>Marta Codeço*</td>
<td>Using geochemistry and B-isotopes of hydrothermal tourmaline and mica to trace metals and fluid sources in the world-class Panasqueira W-Sn-Cu deposit (Portugal)</td>
</tr>
<tr>
<td>4:25</td>
<td>TBA</td>
<td>TBA</td>
</tr>
<tr>
<td>4:30</td>
<td>Danielle Schmandt*</td>
<td>Rare earth element minerals and their compositional variation in the Olympic Dam deposit, South Australia</td>
</tr>
<tr>
<td>Time</td>
<td>Speaker</td>
<td>Title</td>
</tr>
<tr>
<td>-------</td>
<td>---------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>4:35</td>
<td>Jean-Luc Pilote</td>
<td>Controls on VMS ore-forming processes in ancient successions – a study of the Cambro-Ordovician Ming VMS deposit, Newfoundland Appalachians, Canada</td>
</tr>
<tr>
<td>4:40</td>
<td>Jessica Bogossian*</td>
<td>Structural controls and hydrothermal alteration of the Cascavel and Sertão gold deposits, Goiás, central Brazil</td>
</tr>
<tr>
<td>4:45</td>
<td>Mark Barton</td>
<td>Integrated approaches to the temporal, spatial, thermal, and geochemical evolution of the Chilean iron belt</td>
</tr>
<tr>
<td>4:50</td>
<td>Irene del Real Contreras*</td>
<td>Iron oxide copper-gold mineralization formed during transpression, Candelaria-Punta del Cobre district, northern Chile</td>
</tr>
<tr>
<td>4:55</td>
<td>Sarah Hayes</td>
<td>Elemental trends in criticality studies</td>
</tr>
<tr>
<td>5:00</td>
<td>Greg Turner</td>
<td>Seismic exploration for orogenic gold in Western Australia: Identifying midcrustal controls through to drill targeting with 3D seismic</td>
</tr>
<tr>
<td>5:05</td>
<td>Dan Hollis</td>
<td>Use of ambient noise surface wave tomography in mineral resource exploration and evaluation</td>
</tr>
<tr>
<td>5:10</td>
<td>Benjamin Murphy*</td>
<td>Lithospheric magnetotelluric imaging for regional mineral resource exploration</td>
</tr>
<tr>
<td>5:15-7:00</td>
<td>Exhibit/Poster Reception</td>
<td></td>
</tr>
<tr>
<td>7:00</td>
<td>Mark Bristow, CEO, Randgold</td>
<td>Industry Outlook Dinner — The global mining industry through the eyes of a gold miner – how do we stay relevant in a modern, dynamic, and populist world? (ticketed event)</td>
</tr>
</tbody>
</table>
# DAY 3 — Tuesday, September 25, AM

## SESSION SEVEN

**Integrating Petroleum and Minerals Systems Approaches to Sedimentary Basins**

*Richard Chuchla, University of Texas at Austin; Cam McCuaig, BHP*

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s) &amp; Title</th>
</tr>
</thead>
</table>
| 8:15-8:40 | Richard Chuchla (Invited), Kevin Bohacs  
Carlin-type mineralization in a sequence stratigraphic context |
| 8:40-9:05 | Quinn Passey (Invited)  
Yikes, my source rock is now my reservoir - the strange underworld of unconventional hydrocarbons |
| 9:05-9:25 | Elizabeth Turner  
Basin dynamics and geochemistry during deposition of the Neoproterozoic Rapitan iron formation (northwestern Canada) |

## SESSION EIGHT

**Base Metals**

*Wolf Schuh, Freeport-McMoRan; Cathy Knight, Khoemacau*

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s) &amp; Title</th>
</tr>
</thead>
</table>
| 8:15-8:40 | Ralph Stegen (Invited), Mark Barton  
Cerro Verde-Santa Rosa porphyry copper-molybdenum deposits, Peru: Magmatic and hydrothermal evolution of adjacent systems |
| 8:40-9:05 | José Perelló (Invited)  
Geologic controls on hypogene mineralization at the Zaldivar porphyry copper-gold deposit, Escondida district, northern Chile |
| 9:05-9:25 | Douglas Kirwin  
Characteristics of intrusion-related copper-bearing tourmaline breccia pipes |
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:25-9:45</td>
<td>Helen Twigg*</td>
<td>Geology of the Kakanda deposits, DRC</td>
<td>Keiko Hattori Use and limitations of zircon compositions during exploration for intrusion-centered deposits</td>
</tr>
<tr>
<td>9:45-10:05</td>
<td>Jeff Mauk</td>
<td>Geochemistry of fluid inclusions, sequence stratigraphy, and geophysics refine exploration priorities for sediment-hosted copper deposits in the 1.1 Ga Midcontinent Rift</td>
<td>John Dreier The exploration and evaluation of copper heap leach-SXEW deposits: Why geologists should manage the process</td>
</tr>
<tr>
<td>10:05-10:25</td>
<td>Simon Jones*</td>
<td>Basin-scale fluid flow and alteration associated with the White Pine Cu-Ag deposit, Michigan, USA</td>
<td>Don Taylor Arizona Mining’s Taylor deposit – a world-class zinc, lead, and silver discovery</td>
</tr>
<tr>
<td>10:25-10:55</td>
<td>Break</td>
<td></td>
<td>Break</td>
</tr>
</tbody>
</table>
### SESSION NINE

#### Integrating Geology, Geochemistry and Geophysics

**Jon Woodhead, JAW Consulting**

**10:55-11:20**  
Albert Hofstra  
Integration of regional to deposit-scale geological, geochemical, and geophysical data from Mesoproterozoic IOA-IOCG systems on the SE margin of Laurentia

**11:20-11:45**  
Rebecca Montsion  
Dismantling geo-silos: An integrated model for Cu porphyry in the Quesnel terrane, British Columbia

**11:45-12:10**  
Melissa Anderson  
Integrating geophysical and geochemical data to understand the relationships between geodynamics, volcanism, and massive sulfide formation in back-arc basins

### SESSION TEN

#### Precious Metals

**Paul Bartos, AngloGold Ashanti**

**10:55-11:20**  
Jean Cline  
Core and rim textures of Carlin-type pyrite – key discriminators of a new discovery?

**11:20-11:45**  
Elizabeth Hollingsworth*  
Gold mineralization in the Rain-Railroad district, southern Carlin trend, Nevada: Investigation into shallow Carlin-type and intrusion-related gold deposits

**11:45-12:10**  
Karl Jabagat  
Ore-forming mechanisms at the Sangilo epithermal deposit, Baguio mineral district, Philippines: Insights from paragenetic and fluid inclusion studies of the Taka Barr vein
<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:10-12:30</td>
<td>Jean-Marc Lulin</td>
<td>Predictive modelling applied to country-scale mineral exploration: From theory to practice</td>
</tr>
<tr>
<td></td>
<td>Armelle Kloppenburg</td>
<td>A relay ramp extensional structural style for the Paleozoic epithermal Bayan Khundii gold project, Gobi Desert, Mongolia</td>
</tr>
<tr>
<td>12:30-1:30</td>
<td>Lunch</td>
<td>Lunch</td>
</tr>
<tr>
<td>1:30</td>
<td>Joseph Armstrong*</td>
<td>Critical element accumulations within black shales: Selenium, tellurium, and cobalt enrichment during the Neoproterozoic atmospheric oxygenation event</td>
</tr>
<tr>
<td></td>
<td>Christopher Herron*</td>
<td>Defining the carbonate alteration footprint of the Cortez Hills Carlin-type gold deposit, Nevada, using $^{13}$C and $^{18}$O stable isotopes and geochemistry as an exploration tool</td>
</tr>
<tr>
<td>1:35</td>
<td>Elizabeth Turner</td>
<td>Architecture of Neoproterozoic carbonate host rocks underlies the distribution of Zn and Cu ore at Kipushi (DRC) and Gayna River (Canada)</td>
</tr>
<tr>
<td></td>
<td>Carson Richardson</td>
<td>Palinspastic restoration of the dismembered Roberts Mountains thrust, northern Shoshone Range, Nevada: Implications for exploration of concealed Carlin-type deposits</td>
</tr>
<tr>
<td>12:10-1:35</td>
<td>Lunch</td>
<td>Lunch</td>
</tr>
<tr>
<td>Time</td>
<td>SPEED TALKS TWO (cont.)</td>
<td>SPEED TALKS THREE (cont.)</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1:40</td>
<td><em>Timothy MacIntyre</em> Structural geology of the Kansanshi Cu-Au deposit, Northwestern Province, Zambia</td>
<td><em>Ajeet Milliard</em> Temporal and spatial constraints on Carlin-type gold deposits at the Pequop Mountains, Nevada</td>
</tr>
<tr>
<td>1:45</td>
<td><em>Andrea Herazo</em> Bitumen-bearing stratabound Cu-(Ag) deposits in northern-central Chile: An active role for liquid hydrocarbons?</td>
<td><em>Robert Johnson</em> Hydrothermal features in siliciclastic-volcanic rocks above carbonate-hosted high-grade ore at the Turquoise Ridge Carlin-type gold deposit</td>
</tr>
<tr>
<td>1:50</td>
<td><em>Heta Lampinen</em> 3D mineral footprints of an undercover sediment-hosted polymetallic Abra ore system, Western Australia</td>
<td><em>Halley Keevil</em> Distal disseminated gold mineralization in the Hunjiang basin, Jilin Province, China: The White Mountain sediment-hosted gold deposit</td>
</tr>
<tr>
<td>1:55</td>
<td><em>Raúl Berrospi</em> Role of Jurassic salt tectonics in the structural shaping of MVT Pb-Zn deposits and hydrocarbon traps in Peru, and implications for exploration</td>
<td><em>Nicholas Hillemeyer</em> Controls on epithermal gold-silver mineralization and alteration at the Gravel Creek deposit, Elko County, Nevada</td>
</tr>
<tr>
<td>2:00-3:00</td>
<td>Posters</td>
<td></td>
</tr>
<tr>
<td>3:00-3:30</td>
<td>Break (coffee)</td>
<td></td>
</tr>
</tbody>
</table>
**SESSION ELEVEN**

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:30-3:45</td>
<td>John Thompson, Regina Baumgartner</td>
<td>Introduction and presentation of awards for student presenters</td>
</tr>
<tr>
<td>3:45-4:05</td>
<td>Charles Funk (Invited)</td>
<td>Who will be doing grassroots exploration and what will they be doing?</td>
</tr>
<tr>
<td>4:05-4:25</td>
<td>Pablo Mejia (Invited)</td>
<td>How far can we go to maximize value thought mine/project exploration?</td>
</tr>
<tr>
<td>4:25-4:45</td>
<td>Regina Baumgartner (Invited)</td>
<td>How will we characterize orebodies from day one and deliver value?</td>
</tr>
<tr>
<td>4:45-5:05</td>
<td>Elizabeth Sharman</td>
<td>The future of geoscience in exploration? Holistic skills to harness the rising technological tide</td>
</tr>
<tr>
<td>5:05-5:25</td>
<td>Murray Hitzman (Invited)</td>
<td>What will academic and government research look like and how will it benefit exploration?</td>
</tr>
<tr>
<td>5:25-5:30</td>
<td>Lluís Fontboté</td>
<td>Closing comments</td>
</tr>
<tr>
<td>5:30</td>
<td>Steve Enders, SEG 2018 Conference Chair</td>
<td>Conference closing remarks</td>
</tr>
</tbody>
</table>
Kevin Ansdell is a professor of geology at the University of Saskatchewan. He obtained a bachelor’s degree in geology from Oxford University in 1982, prior to earning an M.Sc. degree from the University of Alberta and a Ph.D. degree from University of Saskatchewan. He has been a faculty member since completing a postdoctoral fellowship with the Geological Survey of Canada in 1993 and has been actively involved in the teaching and supervision of undergraduate and graduate students in the areas of petrology, Precambrian geology, and mineral deposits. Kevin is a professional geoscientist with the Association of Professional Engineers and Geoscientists of Saskatchewan, a Fellow of the SEG, Geoscientists Canada, and the Geological Association of Canada, and academic advisor to the University of Saskatchewan SEG Student Chapter.

John Ashton graduated from the Royal School of Mines, London, in 1975 with a B.Sc. degree in mining geology. He undertook Ph.D. research focusing on ore geology and wall-rock geochemistry of Pb/Zn and Au veins in Wales at the University of Aberystwyth until 1978. After working for Mogul of Ireland Ltd, Silvermines, as a mine and senior mine geologist, he joined Tara Mines Ltd, Navan, in 1980. John held several positions, including chief mine geologist, with involvement in computer systems, resource estimation, delineation, and exploration drilling, and he became chief exploration geologist for Boliden Tara Mines in 2005. His experience and interests include 3D geologic modeling, resource estimation, the genesis of carbonate-hosted Zn/Pb deposits, and exploration for base metal deposits.
Kevin Ansdell is a professor of geology at the University of Saskatchewan. He obtained a bachelor’s degree in geology from Oxford University in 1982, prior to earning an M.Sc. degree from the University of Alberta and a Ph.D. degree from University of Saskatchewan. He has been a faculty member since completing a postdoctoral fellowship with the Geological Survey of Canada in 1993 and has been actively involved in the teaching and supervision of undergraduate and graduate students in the areas of petrology, Precambrian geology, and mineral deposits. Kevin is a professional geoscientist with the Association of Professional Engineers and Geoscientists of Saskatchewan, a Fellow of the SEG, Geoscientists Canada, and the Geological Association of Canada, and academic advisor to the University of Saskatchewan SEG Student Chapter.

John Ashton graduated from the Royal School of Mines, London, in 1975 with a B.Sc. degree in mining geology. He undertook Ph.D. research focusing on ore geology and wall-rock geochemistry of Pb/Zn and Au veins in Wales at the University of Aberystwyth until 1978. After working for Mogul of Ireland Ltd, Silvermines, as a mine and senior mine geologist, he joined Tara Mines Ltd, Navan, in 1980. John held several positions, including chief mine geologist, with involvement in computer systems, resource estimation, delineation, and exploration drilling, and he became chief exploration geologist for Boliden Tara Mines in 2005. His experience and interests include 3D geologic modeling, resource estimation, the genesis of carbonate-hosted Zn/Pb deposits, and exploration for base metal deposits.

Larry M. Cathles performed doctoral research on the viscosity of the Earth’s mantle at Princeton University, then spent seven years at Kennecott Copper Corporation’s Ledgemont Laboratory. After joining the faculty of the Pennsylvania State University in 1978, he investigated the formation of massive sulfide deposits newly discovered at mid-ocean ridges. At the Chevron Oil Field Research Company (1982–1986), he developed genetic and exploration models for gold and sulfide deposits and investigated CO₂ generation during steam flooding. He has been at Cornell University since 1986, where he has undertaken a wide variety of scientific investigations. Recently, his research has involved the impact of natural gas emissions on climate change, separating natural and anthropogenic drivers of global warming, and glacial isostatic calculations of sea-level change.

Richard J. Chuchla was born and raised in the shadow of the El Salvador porphyry copper deposit in Chile. He received his undergraduate degree in geology from Cornell University and his master’s degree from the University of Texas at Austin. He retired as an executive from ExxonMobil in 2015 after a 35-year career with the company. Richard has had broad experience in minerals (base and precious metals), coal, oil, and gas exploration, development, research, and management, including a corporate assignment as upstream strategic advisor to ExxonMobil’s Management Committee and CEO. Richard has worked in basins and has participated in discoveries around the world. He was appointed as the Director of the Energy and Earth Sciences (EER) Graduate Program and the Leslie Bowling Professor in Geological Sciences at the University of Texas-Austin in 2016.
Roderick G. Eggert is the Viola Vestal Coulter Foundation Chair in Mineral Economics at the Colorado School of Mines, where he has taught since 1986. He also is deputy director of the Critical Materials Institute, an energy innovation hub (research consortium, led by the Ames Laboratory) established by the U.S. Department of Energy in 2013, to accelerate innovation in energy materials. He has a B.A. degree in earth sciences from Dartmouth College, an M.S. degree in geochemistry and mineralogy from Pennsylvania State University, and a Ph.D. degree in mineral economics, also from Penn State.

Poul Emsbo is a research geologist with the U.S. Geological Survey (USGS) in Denver, Colorado. He received his B.S. degree in biology and chemistry from Union College (1986) and earned his M.Sc. (1993) and Ph.D. degrees (1999) in economic geology and geochemistry from the Colorado School of Mines. Since arriving at the USGS in 1989, Poul has investigated the genesis of Carlin Au, MVT, SEDEX, and sedimentary copper deposits, as well as high-salinity brines. For the past several years, he has explored the interplay between ocean chemistry, seafloor hydrothermal deposits, marine sediment-hosted deposits, and metalliferous black shales using high-resolution bio-, chemo-, and sequence stratigraphy, high-resolution chronostratigraphy, and chemical tracers (e.g., Sr, δ⁸⁸Sr, Pb, Nd, C, O, and S isotopes, REEs, and trace metals).
Leonardo Feltrin recently joined the Harquail School of Earth Sciences at Laurentian University as an associate professor of earth systems modeling. He received a Ph.D. degree in economic geology with emphasis on 3D modeling and GIS mineral prospectivity mapping from James Cook University and gained extensive experience in ore deposit-related science through his work in industry and academia. His research considers the use of computational geoscience, artificial intelligence (AI), and data analytics in ore deposit exploration. An overarching objective is to generate workflows that promote the informatization process of exploration data. These tools are applicable in three connected areas of research: (1) geochemical and geophysical ore deposit mapping in 3D, (2) multivariate analysis, and (3) development of AI tools and their application to mineral exploration.

Wesley S. Hall earned his bachelor’s degree in geology from Colorado State University, followed by his master’s and doctorate degrees in economic geology from the Colorado School of Mines after a short period working in industry. His specialties include sedimentary rock-hosted copper systems, sedimentology and stratigraphy, regional-scale structural geology and tectonics, mineral systems analysis, and geophysical interpretation. Wesley has worked as a geologist on greenfield exploration programs covering porphyry copper in Alaska, breccia pipe uranium in Arizona, alkaline porphyry gold in northwestern Ontario, and sedimentary rock-hosted copper deposits in southern Africa. His most recent work has helped elucidate the geologic framework and geochronology of the Kalahari Copperbelt in Botswana and Namibia. Currently, he is operating as an independent consultant to the mineral exploration industry.
Nick Hayward is currently the director of Global Project Generation with Teck Resources, principally focused on driving major copper, zinc, and gold discoveries. Previously, he held roles in the Teck Exploration Group as their global zinc specialist and chief geoscientist for Asia-Pacific and Africa, following five years with BHP Billiton as the global practice leader in structural geology and resource targeting, and 20 years with WMC Resources. Nick has extensive technical leadership, project generation, and project management experience for base metals and bulk commodities across the globe, as well as a Ph.D. degree in structural geology and tectonics. His current career passions include making greenfield discoveries, predictive structural geology, mineral system modeling, research and innovation, coaching, and mentoring.

Christoph (Chris) A. Heinrich studied Alpine geology and high-pressure metamorphic petrology at ETH Zurich (Switzerland). He then moved to Australia to develop his interests in economic geology with Comalco, CSIRO, and Geoscience Australia. At the Department of Scientific and Industrial Research in New Zealand, he completed a project in experimental hydrothermal geochemistry. In 1994, Chris was appointed professor of mineral resources at ETH Zurich, where he has since built a teaching and research group investigating processes of hydrothermal ore formation (www.geopetro.ethz.ch/research/orefluids). Chris was the first recipient of the Paul Niggi Medal (1988) and has served as an associate editor for Economic Geology and other journals, and as a Council member for the SEG and SGA. In 2006, he was awarded the SEG Silver Medal and, in 2017, the R.A.F. Penrose Gold Medal.
Nick Hayward is currently the director of Global Project Generation with Teck Resources, principally focused on driving major copper, zinc, and gold discoveries. Previously, he held roles in the Teck Exploration Group as their global zinc specialist and chief geoscientist for Asia-Pacific and Africa, following five years with BHP Billiton as the global practice leader in structural geology and resource targeting, and 20 years with WMC Resources. Nick has extensive technical leadership, project generation, and project management experience for base metals and bulk commodities across the globe, as well as a Ph.D. degree in structural geology and tectonics. His current career passions include making greenfield discoveries, predictive structural geology, mineral system modeling, research and innovation, coaching, and mentoring.

Christoph (Chris) A. Heinrich studied Alpine geology and high-pressure metamorphic petrology at ETH Zurich (Switzerland). He then moved to Australia to develop his interests in economic geology with Comalco, CSIRO, and Geoscience Australia. At the Department of Scientific and Industrial Research in New Zealand, he completed a project in experimental hydrothermal geochemistry. In 1994, Chris was appointed professor of mineral resources at ETH Zurich, where he has since built a teaching and research group investigating processes of hydrothermal ore formation (www.geopetro.ethz.ch/research/orefluids). Chris was the first recipient of the Paul Niggi Medal (1988) and has served as an associate editor for Economic Geology and other journals, and as a Council member for the SEG and SGA. In 2006, he was awarded the SEG Silver Medal and, in 2017, the R.A.F. Penrose Gold Medal.

Mike Hudec is a senior research scientist at the Bureau of Economic Geology and directs the Applied Geodynamics Laboratory (AGL), an industry-sponsored research consortium studying salt tectonics. He received his Ph.D. degree from the University of Wyoming in 1990 and spent the next eight years at Exxon Production Research, where he specialized in salt tectonics, extensional tectonics, and seismic interpretation. His current research interests include palinspastic restoration of salt structures, deepwater structural styles, and the evolution of the Gulf of Mexico Basin.

Mark Jessell is a professor and Western Australian Fellow at the Centre for Exploration Targeting, University of Western Australia, and was previously based in Toulouse, France, where he was a directeur de recherche with the Institut de recherche pour le développement, and where he started the West African Exploration Initiative (WAXI). His scientific interests include microstructure studies (the Elle platform), integration of geology and geophysics in 2D and 3D (the WA_In3D project), and the tectonics and metallogenesis of the West African craton. His recently completed Western Australian Fellowship is focused on improving the links between geologic and geophysical data analysis in 3D via analysis of the geologic and topological uncertainty. In 2013 he was awarded the Geological Society of Australia Hobbs Medal for major contributions in structural geology.
Simon Jowitt is an assistant professor in economic geology at the University of Las Vegas, Nevada. He has B.Sc. (Hons.), M.Sc., and Ph.D. degrees from the University of Edinburgh, Camborne School of Mines, and the University of Leicester, respectively, all in the U.K. He spent several years at Monash University in Australia working on various aspects of economic geology and igneous petrology, including the supply of critical metals. Simon’s current research focuses on the use of geochemistry to unravel geologic processes in a variety of settings. Several of his recent publications have focused on global Cu, Ni, Co, Pb-Zn, PGE, REE, and In resources. He was awarded the SEG Lindgren Award in 2014 and Institute of Materials, Minerals and Mining (IoM3) Mann Redmayne Medals in 2013 and 2016.

Judith Kinnaird is the director of the Economic Geology Research Institute at the University of the Witwatersrand, Johannesburg, South Africa, where she leads research on the Northern limb of the Bushveld Complex and works on various projects related to critical metals. She is also co-director of the National Centre of Excellence for Minerals and Energy Research Analysis (CIMERA). She has a B.Sc. (Hons.) degree from the University of London and M.Sc. and Ph.D. degrees from the University of St. Andrews in Scotland. She has worked on the tin-bearing granites in Nigeria and South Africa, Li-Be-Sn-Nb-Ta and gem-bearing pegmatites in Namibia, Nigeria, and Somaliland, and uraniferous deposits in Namibia, South Africa, and Malawi. Judith has served as SEG president and as an SEG Council member.
Simon Jowitt is an assistant professor in economic geology at the University of Las Vegas, Nevada. He has B.Sc. (Hons.), M.Sc., and Ph.D. degrees from the University of Edinburgh, Camborne School of Mines, and the University of Leicester, respectively, all in the U.K. He spent several years at Monash University in Australia working on various aspects of economic geology and igneous petrology, including the supply of critical metals. Simon's current research focuses on the use of geochemistry to unravel geologic processes in a variety of settings. Several of his recent publications have focused on global Cu, Ni, Co, Pb-Zn, PGE, REE, and In resources. He was awarded the SEG Lindgren Award in 2014 and Institute of Materials, Minerals and Mining (IoM3) Mann Redmayne Medals in 2013 and 2016.

Judith Kinnaird is the director of the Economic Geology Research Institute at the University of the Witwatersrand, Johannesburg, South Africa, where she leads research on the Northern limb of the Bushveld Complex and works on various projects related to critical metals. She is also co-director of the National Centre of Excellence for Minerals and Energy Research Analysis (CIMERA). She has a B.Sc. (Hons.) degree from the University of London and M.Sc. and Ph.D. degrees from the University of St. Andrews in Scotland. She has worked on the tin-bearing granites in Nigeria and South Africa, Li-Be-Sn-Ta and gem-bearing pegmatites in Namibia, Nigeria, and Somaliland, and uraniferous deposits in Namibia, South Africa, and Malawi. Judith has served as SEG president and as an SEG Council member.

Joe Knight has degrees in geology from the University of Nottingham and Camborne School of Mines and a Ph.D. degree from the University of Western Australia. He has 25 years of global experience in minerals exploration and resource development across multiple commodities and mineralization styles. Joe is currently the general manager resource development for Rio Tinto Iron Ore.

Nadezhda A. Krivolutskaya graduated from Moscow State University in 1976 with a degree in economic geology. Since 1977, she has worked at the Russian Academy of Sciences (RAS), including its Siberian Branch, and Analytical Chemistry, RAS (Moscow, Russia). She studies the geology, geochemistry, mineralogy of the Pt-Cu-Ni deposits of Russia, mainly the Norilsk deposits. Nadezhda is the author or co-author of five books and many articles. She was awarded the prize of the RAS (2015) and the Ministry of Natural Resources (2009) for studying the deposits of eastern Siberia.
Robert Lee received his Ph.D. degree at Oregon State University in 2008, where he focused on the formation and mineral chemistry of the El Salvador porphyry copper deposit in northern Chile. Upon completion of his dissertation, he worked in industry with the major mining company Freeport-McMoran, where he was part of the greenfields exploration team working on projects in North America, the Philippines, and Europe. Since 2014, he has been at the University of British Columbia as the lead researcher for the Canada Mining Innovation Council (CMIC)-Footprints Cu-site subproject, where he oversaw the multicollaborative endeavor to define new innovative methods toward the distal expression and vectoring toward economic ore deposits. Additionally, Robert is working on the Western Tethyan II project as the lead geochronologist.

Michael Lesher is a professor of economic geology and research chair in mineral exploration in the Mineral Exploration Research Centre, Harquail School of Earth Sciences, and Goodman School of Mines at Laurentian University. He has worked on iron deposits in Labrador and Quebec, gold deposits in Western Australia and the southern Appalachians, chromite deposits in northern Ontario, and nickel-copper-PGE deposits in Brazil, China, Western Australia, Manitoba, Ontario, northern Quebec, and Russia. He is presently the principal investigator and director of the Natural Sciences and Engineering Research Council of Canada (NSERC)-Canada Mining Innovation Council (CMIC) Mineral Exploration Footprints project, and a co-investigator on the Canada First Research Excellence Fund (CFREF) Metal Earth project.
Robert Lee received his Ph.D. degree at Oregon State University in 2008, where he focused on the formation and mineral chemistry of the El Salvador porphyry copper deposit in northern Chile. Upon completion of his dissertation, he worked in industry with the major mining company Freeport-McMoran, where he was part of the greenfields exploration team working on projects in North America, the Philippines, and Europe. Since 2014, he has been at the University of British Columbia as the lead researcher for the Canada Mining Innovation Council (CMIC)-Footprints Cu-site subproject, where he oversaw the multicollaborative endeavor to define new innovative methods toward the distal expression and vectoring toward economic ore deposits. Additionally, Robert is working on the Western Tethyan II project as the lead geochronologist.

Michael Lesher is a professor of economic geology and research chair in mineral exploration in the Mineral Exploration Research Centre, Harquail School of Earth Sciences, and Goodman School of Mines at Laurentian University. He has worked on iron deposits in Labrador and Quebec, gold deposits in Western Australia and the southern Appalachians, chromite deposits in northern Ontario, and nickel-copper-PGE deposits in Brazil, China, Western Australia, Manitoba, Ontario, northern Quebec, and Russia. He is presently the principal investigator and director of the Natural Sciences and Engineering Research Council of Canada (NSERC)-Canada Mining Innovation Council (CMIC) Mineral Exploration Footprints project, and a co-investigator on the Canada First Research Excellence Fund (CFREF) Metal Earth project.

Susan Lomas has over 30 years of experience in the exploration and mining industry and is a professional geoscientist in British Columbia (Engineers and Geoscientists BC), Canada. Her wide range of experience includes grassroots exploration programs to feasibility-stage studies and work in operating mines. Susan started Lions Gate Geological Consulting Inc. (LGGC) in 2006 with her husband and has completed work for clients around the globe on projects concerning gold, copper, silver, lead, zinc, uranium, and potash. In February 2018, Susan founded the Me Too Mining Association to launch a conversation in the mining industry about sexual assault, sexual harassment, intimidation, and discrimination. MeTooMining recognizes that, to change the culture in mining, men also need to be welcomed and actively engaged in the conversation.

Cam McCuaig graduated with honors in geology energy and fuel science from Lakehead University, then obtained a Ph.D. degree in geology from the University of Saskatchewan. He enjoyed 10 years with SRK Consulting, becoming a director of the Australasian practice. In 2005, he became the inaugural director of the Centre for Exploration Targeting at the University of Western Australia, leading a team focused on applied research with the minerals industry. In August 2016, Cam joined BHP as a principal geoscientist in their internal Geoscience Centre of Excellence. Cam’s career has taken him to 41 countries on six continents, working in a wide variety of mineral systems from Archean to Neogene in age.
Quinn R. Passey graduated with honors from Brigham Young University (1978) with a B.S. degree in geology, then obtained M.S. (1979) and Ph.D. (1982) degrees in planetary science and geology from the California Institute of Technology. He worked for ExxonMobil Upstream Research Company until his retirement in April 2015. Quinn has authored numerous publications and taught many short courses on topics ranging from planetary geology to meteoroid breakup, Earth-crossing asteroids, isostatic rebound, and various aspects of petrophysics. He was the recipient of the 2011 Society of Petrophysicists and Well Log Analysts Distinguished Technical Achievement Award, 2011 American Association of Petroleum Geologists (AAPG) Energy Minerals Division Best Paper, 2012 AAPG Distinguished Lecturer for Europe, and 2015 AAPG Robert R. Berg Outstanding Research Award.

José (Pepe) Perelló completed his undergraduate studies at the Universidad de Chile and his graduate studies at Queen’s University. Pepe has 36 years of experience in exploration in over 40 countries, beginning at the Escondida project as a junior geologist in January 1982. He worked with BHP from 1982 to mid-1999 and with Antofagasta Minerals from mid-1999 to the present. Pepe has published extensively on the topics of economic geology and copper metallogeny, mainly porphyry and sediment-hosted copper. He has served on the editorial boards for both Economic Geology and Mineralium Deposita, and as the SEG Regional Vice President of South America. Pepe was awarded the SEG Silver Medal in 2012. He currently works for Antofagasta Minerals as an exploration manager, based in Santiago, Chile.
**Caroline Perring** was educated at Cambridge University and the Royal School of Mines but has spent most of her career working in the Archean Yilgarn craton of Western Australia. She completed a Ph.D. degree at the University of Western Australia in the field of mesothermal Au mineralization before joining the Commonwealth Scientific and Industrial Research Organisation. Apart from a brief stint as a research fellow at James Cook University, working on Fe oxide Cu-Au deposits, she spent the next 25 years studying magmatic Ni-Cu sulfide mineralization and komatiite volcanism, latterly with Western Mining Corporation and then BHP Billiton Nickel West. Since 2015, she has been a principal geologist with BHP’s WA Iron Ore division.

**Stéphane Perrouty** is an assistant professor of Precambrian geology in the Mineral Exploration Research Center and the Harquail School of Earth Sciences at Laurentian University, Canada. He completed a Ph.D. degree at the University of Toulouse, France, a postdoctoral fellowship at the Institute of Research for the Development, France, and a postdoctoral fellowship at the University of Western Ontario, Canada. He is currently involved in several collaborative research programs, including the AMIRA West African Exploration Initiative, the Natural Sciences and Engineering Research Council of Canada-Canada Mining Innovation Council Exploration Footprints project, and the Canada First Research Excellence Fund Metal Earth project. His research integrates structural geology, mineralogy, lithogeochemistry, applied geophysics, and three-dimensional modeling to understand tectonic processes associated with Precambrian ore deposits.
François Robert holds a degree in geological engineering from Ecole Polytechnique in Montreal, where he also obtained his M.Sc. (1980) and Ph.D. (1983) degrees in economic geology. This was followed by post-doctoral work at the University of Michigan (1984). He joined the Geological Survey of Canada in 1985 as a research scientist with the Mineral Deposits Division. In 1997, he joined Barrick Gold Corporation, where he occupied various positions in Canada, Australia, and South America. He is currently vice president and chief geologist for global exploration. François has published numerous papers in scientific journals and served on several committees of scientific organizations. He was president of SEG in 2015 and has been the recipient of the SEG Ralph W. Marsden Award, Silver Medal, and Waldemar Lindgren Award.

David Selley is an explorer and researcher with expertise in structural geology and basin analysis. He has experience in a diverse range of commodity types and deposit styles, including orogenic Au, magmatic-hydrothermal Cu-Mo-Au, IOCG, magmatic Ni-Cu sulfide, and VHMS, but his passion lies with sediment-hosted ore systems. Over the past 25 years, David has worked on potash, U, SEDEX Pb-Zn, and sediment-hosted Cu systems across four continents. The highlight of his career has been his work on the Central African Copperbelt, the world’s premier sediment-hosted Cu province. The province boasts superb datasets, generated over nearly 100 years of systematic exploration and mining. Due to the scale and complexity of the mineralizing system, each new discovery emphasizes the need to continually develop and refine our exploration models.
François Robert holds a degree in geological engineering from Ecole Polytechnique in Montreal, where he also obtained his M.Sc. (1980) and Ph.D. (1983) degrees in economic geology. This was followed by postdoctoral work at the University of Michigan (1984). He joined the Geological Survey of Canada in 1985 as a research scientist with the Mineral Deposits Division. In 1997, he joined Barrick Gold Corporation, where he occupied various positions in Canada, Australia, and South America. He is currently vice president and chief geologist for global exploration. François has published numerous papers in scientific journals and served on several committees of scientific organizations. He was president of SEG in 2015 and has been the recipient of the SEG Ralph W. Marsden Award, Silver Medal, and Waldemar Lindgren Award.

David Selley is an explorer and researcher with expertise in structural geology and basin analysis. He has experience in a diverse range of commodity types and deposit styles, including orogenic Au, magmatic-hydrothermal Cu-Mo-Au, IOCG, magmatic Ni-Cu sulphide, and VHMS, but his passion lies with sediment-hosted ore systems. Over the past 25 years, David has worked on potash, U, SEDEX Pb-Zn, and sediment-hosted Cu systems across four continents. The highlight of his career has been his work on the Central African Copperbelt, the world’s premier sediment-hosted Cu province. The province boasts superb datasets, generated over nearly 100 years of systematic exploration and mining. Due to the scale and complexity of the mineralizing system, each new discovery emphasizes the need to continually develop and refine our exploration models.

Adam Simon earned his B.S. degree from the University of Maryland, his M.S. degree from Stony Brook University, and his Ph.D. degree in geology from the University of Maryland. He was a postdoctoral fellow at Johns Hopkins University for two years, where he investigated the formation of volcanic rocks in the Dry Valleys of Antarctica. Adam then spent seven years as a faculty member of the University of Nevada Las Vegas. In 2012 he joined the faculty of the University of Michigan, where he is currently a professor of geology. Adam’s research combines field, analytical, and experimental work designed to unravel the genesis of mineral systems. Adam co-authored the textbook *Mineral Resources, Economics and the Environment* and has published 50 papers in the mineral resource field.

Ralph J. Stegen is vice president of mine site exploration for Freeport-McMoRan based in Tucson, Arizona. He is responsible for exploration and resource modeling functions at Freeport’s operating and closed properties in North and South America. Prior to this role, he was chief geologist at Morenci and Tyrone for Phelps Dodge and previously worked on various base and precious metal exploration programs in Utah, Colorado, Nevada, and New Mexico.
Carlos Vargas is an exploration geologist with over eight years of experience in mineral exploration and ore deposit research, with expertise in orogenic Au and Au skarn deposits in West and Central Africa and Ag-Pb-Zn (Au) epithermal, porphyry, and Carlin deposits in North, Central, and South America. His work has ranged from detailed deposit analysis to near-mine and regional greenfield analysis as well as craton-scale studies in over 10 different countries. Carlos has extensive experience in the integration of structural geology with alteration, lithological, geochemical, and geophysical datasets to define the 3D geometry and geologic control of ore deposits. He holds a B.Sc. degree from the Universidad de Costa Rica and a master’s degree in mining and mineral exploration from the New Mexico Institute of Mining and Technology.

John Walsh was a co-founder of the Fault Analysis Group at the University of Liverpool in 1985 and oversaw its relocation to University College Dublin (UCD) in 2000. Currently, he is a professor of structural geology at UCD and co-principal investigator and founding director of the Irish Centre for Research in Applied Geosciences. His group has conducted basic research on all aspects of faults and fractures and applied their results to practical problems within several industries. John has published more than 150 scientific papers and received a selection of awards for his work, including an Honorary Fellowship (2015) and the William Smith Medal (2017) from the Geological Society of London, and the Royal Irish Academy Gold Medal for Environmental Sciences and Geosciences (2018).
Carlos Vargas is an exploration geologist with over eight years of experience in mineral exploration and ore deposit research, with expertise in orogenic Au and Au skarn deposits in West and Central Africa and Ag-Pb-Zn (Au) epithermal, porphyry, and Carlin deposits in North, Central, and South America. His work has ranged from detailed deposit analysis to near-mine and regional greenfield analysis as well as craton-scale studies in over 10 different countries. Carlos has extensive experience in the integration of structural geology with alteration, lithological, geochemical, and geophysical datasets to define the 3D geometry and geologic control of ore deposits. He holds a B.Sc. degree from the Universidad de Costa Rica and a master’s degree in mining and mineral exploration from the New Mexico Institute of Mining and Technology.

John Walsh was a co-founder of the Fault Analysis Group at the University of Liverpool in 1985 and oversaw its relocation to University College Dublin (UCD) in 2000. Currently, he is a professor of structural geology at UCD and co-principal investigator and founding director of the Irish Centre for Research in Applied Geosciences. His group has conducted basic research on all aspects of faults and fractures and applied their results to practical problems within several industries. John has published more than 150 scientific papers and received a selection of awards for his work, including an Honorary Fellowship (2015) and the William Smith Medal (2017) from the Geological Society of London, and the Royal Irish Academy Gold Medal for Environmental Sciences and Geosciences (2018).

Marina Yudovskaya is a researcher at the Institute of Geology of Ore Deposits, Mineralogy, Petrography and Geochemistry, Russian Academy of Sciences, in Moscow, Russia. She graduated from Lomonosov Moscow State University with a Ph.D. in geology of ore deposits. Her earlier research interests centered on orogenic gold deposits in black shales, metal transport in volcanic fluids, Cu-Ni-PGE magmatic sulfides, and nontraditional PGE sources. Since 2007, Marina has been involved in various projects focusing on the different aspects of PGE mineralization in the Bushveld Complex as a postdoc and a visiting researcher at the University of the Witwatersrand (Johannesburg, South Africa).
Post-Conference Program

Post-Conference Field Trips

Paradox Basin Fluids and Colorado Plateau Copper, Uranium, and Vanadium Deposits
Leaders: Isabel Barton, Mark Barton, Jon P. Thorson
September 25–28

Colorado Porphyry-Molybdenum Deposits and Leadville District
Leaders: Eric Seedorff, Ralph Stegen, Tommy Thompson
September 26–28

Post-Conference Workshops

Exploration Geochemistry: From Fundamentals to the Field
Presenter: Peter Winterburn
September 26–27

Cu-Mo Porphyry Deposits: Multiscale Approach from Magmas to Minerals
Presenters: John Dilles, Kalin Kouzmanov
September 26–27
Posters

Posters will be on display during regular conference hours on the ground level of the venue in the Columbine Ballroom.

Titles and authors of posters are listed below. Posters for which the senior author is a student can be identified by an asterisk (*) following the poster title.

For schedule updates, please go to www.seg2018.org.

Base Metals: Cu, Zn, Ni, Pb

P.001 Linking Structural and Stratigraphic Controls on Cu-Ag Mineralization at the Zone 5 Deposit in the Kalahari Cu Belt, Botswana
Clemens Augenstein, Catherine Knight, David J. Catterall, David Martin, Wesley S. Hall, Batanani Muyoba, Oarabile Disang, Murray W. Hitzman, Stephen M. Enders

P.002 Impacts of Cation Substitution on the Geometallurgical Response of Sphalerite from Low-Grade Ores: An Experimental Perspective*
Lebogang Babedi, Bjorn von der Heyden, Margreth Tadie

P.003 Introduction to Paleozoic Metallogeny of Mongolia
Delgertsogt Baljinnyam, Bat-Ireedui Yandag

P.004 Characterization of Sericitic Alteration at the Taca Taca Bajo Porphyry Cu Deposit, Argentina
Sebastian B. Benavides

P.005 The Correlation Between the Contents of Cu, Pb, Fe, Zn, and Sb with S in Sulfide Partial Melts at 600°C*
Govindarao Boddepalli, Kamal L. Pruseth, Biswajit Mishra
P.006 Zircon U-Pb and Molybdenite Re-Os Age Constraints on Formation of the Malmyzh Porphyry Cu-Au Deposit, Far East of Russia
Daria S. Bukhanova, Gregory Collins

P.007 Evidence for Rapid Multistage Construction of the Spence Porphyry Copper Deposit, Northern Chile: Implications for Mineralization*
Edward G. Bunker, Jon Blundy, Simon Tapster, Frances Cooper

P.008 Zn-Pb Exploration in the Lismore Block, County Waterford, Ireland: Preliminary Data*
Amedeo Cauceglia, Nicola Mondillo, Maria Boni

P.009 Identification of the Anomaly Component Using BEMD Combined with PCA from Element Concentrations in the Tengchong Sn-Pb-Zn Polymetallic Belt, SW China
Yongqing Chen, Lina Zhang, Binbin Zhao

P.010 Syn- to Postmineralization Structural Dismemberment of the Olympic Dam Fe-Cu-U-Au-Ag Deposit, Gawler Craton
Jesse M. Clark, Nicholas Poznik, Kathy Ehrig, Alex Cherry, Jocelyn McPhie, Vadim S. Kamenetsky

P.011 Mineralizing Fluids of the Kamoa-Kakula Sedimentary Rock-Hosted Copper Deposit, Democratic Republic of Congo*
Sarah E. Clay, Elizabeth C. Turner, Daniel J. Kontak

Marta S. Codeço, António Mateus, Jorge Figueiras, Pedro Rodrigues, Luís Gonçalves
<table>
<thead>
<tr>
<th>Poster Number</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.013</td>
<td>The Effects of Amphibolite Facies Metamorphism on the Trace Element Content of Pyrite and Pyrrhotite*</td>
<td>Calvin D. Conn, Paul G. Spry, Alan E. Koenig</td>
</tr>
<tr>
<td>P.014</td>
<td>Evolution of Host-Rock Diamictite Matrix at the High-Grade Kakula Copper Deposit, Democratic Republic of Congo*</td>
<td>Quinn Dabros, Elizabeth Turner</td>
</tr>
<tr>
<td>P.015</td>
<td>Exhumation of Granites in the Central Andes: Implications for Porphyry Copper Enrichment and Preservation*</td>
<td>Simon Dahlström, Frances Cooper, Jon Blundy, Simon Tapster, Daniel Condon, Jaime Cortes Yañez, Matthijs van Soest</td>
</tr>
<tr>
<td>P.018</td>
<td>Ore Petrography of the World-Class Cerro Lindo Volcanic-Hosted Massive Sulfide Deposit, Perú</td>
<td>Thomas Dols, Thomas Monecke</td>
</tr>
<tr>
<td>P.019</td>
<td>An Assessment of Metal Release Potential During the Mining of SMS Deposits from the Central Indian Ridge</td>
<td>Emily Fallon</td>
</tr>
<tr>
<td>P.020</td>
<td>Contrasting Igneous-Related Hydrothermal Systems of the Laramide Porphyry Cu Province, Tucson Mountains, Arizona*</td>
<td>Roy Greig, Mark Barton, Isabel Barton</td>
</tr>
<tr>
<td>P.022</td>
<td>Re-Os and U-Th-Pb Age Constraints on Host Rocks and Mineralizing Events in the Kalahari Copperbelt, Botswana</td>
<td>Wesley S. Hall, Holly J. Stein, Andrew R. Kylander-Clark, Catherine Knight, Yvette D. Kuiper, M. Stephen Enders, Murray W. Hitzman</td>
</tr>
</tbody>
</table>
P.023  **New Insights into Zircon Fertility Indicators for Porphyry Copper Deposits: Deciphering the Adakitic Signatures in Patagonia***
Gonzalo J. Henriquez, Robert R. Loucks, Marco L. Fiorentini, Charlotte M. Allen

P.024  **A Genetic Link Between Late Cretaceous Granitic Magmatism and Sn Mineralization in the SW South China Block: A Case Study of the Dulong Sn-Dominant Polymetallic Deposit**
Lin Hou, Zhenyu Zhao, Shusheng Liu, Qiming Zhang, Songyang Wu

P.025  **Interaction Between Hydrocarbon Fluids and Host Rocks/Evaporite in the Jinding World-Class Zn-Pb Deposit: Implication for Ore Genesis***
Shiqiang Huang, Yucai Song, David Leach, Zengqian Hou

P.026  **Carboniferous-Early Permian Pb-Zn-Ag Skarn and Au-Cu Skarn-Porphyry Deposits in Chillagoe, North Queensland, Australia, and Their Implications to Geodynamic Evolution***
Peter E. Illig, Zhaoshan Chang, Jeff Benowitz

P.027  **Petrogenesis of Volcanic Assemblages Hosting the Flambeau Cu-Zn Massive Sulfide Deposit, Northwestern Wisconsin, USA***
Regan E. Jacobson, Robert W. Lodge, Zachary A. Zens

P.028  **Trace Elements in Cu-Fe Sulfides from the Mantoverde IOCG Deposit, Northern Chile***
Cinthia Johansson, Fernando Barra, Martin Reich, Artur Deditius, Adam Simon, Paula Rojas

P.029  **The Origin of Inclusions in the Contact Sublayer of the Sudbury Igneous Complex, Ontario, Canada**
Taus R. C. Jørgensen, Douglas K. Tinkham, C. Michael Lesher
P.030  **U-Pb Zircon Geochronology and Geochemistry of Volcanic Rocks in the Deguisier Formation, Abitibi Greenstone Belt, Quebec: Implications for Gold and VMS Mineralization**
*Taus R. C. Jørgensen, Harold L. Gibson, Michael A. Hamilton*

P.031  **Apatite as a Tool for Quantifying the Magmatic Volatile Budget of Arc Magmas**
*Lillian Kendall-Langley, Anthony Kemp, Steffen Hagemann*

P.032  **Zircon from the Granite Mountain Batholith, a Host of the Gibraltar Porphyry Cu-Mo Deposit, in the Canadian Cordillera**
*Christopher H. Kobylniski, Keiko Hattori, Alain Plouffe, Scott Smith*
P.033 Trace Element Chemistry, Polytypes, Isotopic Composition, and Re-Os Ages of Molybdenite from the Bingham Canyon Cu-Au-Mo Porphyry Deposit, Utah
Simon Kocher, Jamie J. Wilkinson, Robin N. Armstrong, Iain McDonald, Mark Rehkaemper, Robert A. Creaser, Jens Najorka

P.035 Quantitative Mineralogy, Textural Analysis and Trace Element Signatures of a Distal Skarn Body (Gyudyurska Pb-Zn Deposit, Madan District, Bulgaria)
Kalin Kouzmanov, Thomas Bovay, Andrea Dini, Rossitsa Vassileva

P.036 Relationship Between Magmatism and Mineralization of Late Cretaceous to Early Paleocene Porphyry Systems in the Yukon-Tanana Upland, Eastern Alaska
Douglas C. Kreiner, Erin Todd, James V. Jones III, George Case, Chris Holm-Denoma, Jeff Benowitz

P.037 The Geology and Genesis of the Wolfram Camp Mine W-Mo Deposit, Queensland, Australia: Fluid Inclusion and Stable Isotope Studies*
Kairan Liu, Zhaoshan Chang, Yanbo Cheng

P.038 3D Constraints of Intrusion on Localization of Skarn Orebodies: Examples from the Tongling District, China
Liangming Liu

P.039 Isotopic Geochemistry of the Barite in the World-Class Mehdi abad Zn-Pb Deposit, Iran, and Implication for the Ore Genesis
Yingchao Liu, Yucai Song

P.041 Elemental Geochemistry of Metasediments from the Aljustrel Area, Iberian Pyrite Belt (IPB), Portugal: Implications for Mineral Exploration*
Filipa Luz, António Mateus, Jorge Figueiras
Upper Devonian Felsic Volcanism at the Kudz Ze Kayah Zn-Pb-Cu VMS Deposit, Finlayson Lake District, Yukon: Insights from High-Precision CA-ID-TIMS U-Pb Zircon Geochronology*
Matthew J. Manor, Stephen J. Piercey, Corey J. Wall, Neil Martin, Robin Black

Characteristics of Local and Regional Mineralizing Fluids in the Cornwallis Zn-Pb District, Arctic Canada*
Jordan Mathieu, Elizabeth C. Turner, Daniel J. Kontak

Base Metal Sulfide Mineralization Above a Concealed Porphyry Molybdenum Deposit, Mt. Emmons Area, Colorado, USA
Jeffrey L. Mauk, Molly Baron, Robert Charnock, Thomas Monecke, Yvette D. Kuiper, Craig Johnson

The Punt Hill Cu-Au-Zn Prospect, Gawler Craton, South Australia
Craig McEwan, Greg Swain, Gary Ferris, Giuseppe LoGrasso, Sebastien Meffre, Robert Creaser, Rosendo Puig, Richard Sillitoe, Alan Wilson, Jose Perello

The Tongkuangyu Copper Deposit, Northern Zhongtiaoshan Region, Trans-North China Orogen: A Metamorphosed Paleoproterozoic Porphyry System?*
Xuyang Meng, Jeremy Richards, Jingwen Mao, Huishou Ye, Andrew DuFrane, Robert Creaser

The Gorno Zn Project, Bergamo, Italy: New Data on the Pian Bracca Exploration Area
Nicola Mondillo, Maria Boni, Federica Lupone, Fabio Granitzio, Marcello De Angelis

*Presented in Part (Poster Session)
P.048 Neoarchean to Paleoproterozoic Copper Metallogenic Epochs in the Carajás Province, NW Brazil
Carolina P. Moreto, Roberto P. Xavier, Lena V. Monteiro, Gustavo H. Melo, Poliana I. Toledo, Raphael B. Hunger, Ananda M. Lopes, Marco A. Delinardo-Silva, Rafaela S. Campos, Jackeline Faustinoni, Raul Arquaz

P.049 Textural and Geochemical Evidence for Assimilation of S-Bearing Sedimentary Assemblages by Komatiites in the Shebandowan Greenstone Belt, ON, Canada*
Maile J. Olson, Robert W. Lodge

P.050 Hydrothermal Fluid Evolution of the Encuentro Porphyry Cu-Au-Mo Deposit, Northern Chile
Jaime I. Osorio, John H. Dilles, Santiago O. Collao

P.051 The Watershed Shear-Vein Tungsten Deposit, Far North Queensland, Australia: A Metamorphic Fluid Origin*
Jaime A. Poblete, Zhaoshan Chang, Paul Dirks, Jan M. Huizenga

P.052 Permian Magmatism in an Early Andean Metallogenic Belt, Cordillera Frontal, Argentina
Gregory H. Poole, Steffen G. Hagemann, Anthony I. Kemp, Marco L. Fiorentini, Eduardo O. Zappettini

P.053 Mineralization of the Canrash’s Skarn Occurrence of the Miocene Belt, Central Peru*
Miguel H. Quintana Hernandez

P.054 Coarse Muscovite Alteration in the Roots of Laramide Porphyry Copper Systems
Simone E. Runyon, Eric Seedorff, Mark D. Barton, Pilar Lecumberri-Sanchez, Matthew Steele-MacInnis, Frank K. Mazdab
P.055 NIR Mineralogical Analysis in Oyu Tolgoi Open Pit Cut Mine, Southern Mongolia and Its Implication for the Geometallurgical Basis of the Production Planning
Amar-Amgalan Serjlkhumbe, Otgonbayar Togtokhbayar, Jargaljav Gombojav, Oyunchimeg Renchin, Delgerdalai Myagmar

P.057 The Sossego IOCG Deposit, Carajás Mineral Province, Brazil: Two Mineralization Ages, One Archean Source*
Eliza Smith, Anthony Kemp, Steffen Hagemann, Roberto Xavier, Carolina Moreto

P.059 A Sulfur Isotope Study of the Duobuza Porphyry Copper-Gold Deposit, Central Tibet, China
Jia Sun, Jingwen Mao, Georges Beaudoin

P.060 Geology of the Giant Porphyry Copper Deposit at Yulong in Eastern Tibet*
Maoyu Sun, Zhiming Yang

P.062 Provenance and Depositional Age of the Grand Conglomérat, Host of the Kamoa Cu Deposit, Democratic Republic of Congo*
Philippe Trudel, Elizabeth Turner

P.065 Textural and Chemical Variations of Sphalerite in the Shuangjianzishan Zn-Pb-Ag Deposit, South Great Xing’an Range, NE China: Implications for Ore-Forming Processes*
Wei Wei, Xinhiao Lv

ANTOFAGASTA MINERALS
Discovering the next generation of copper mines in the Americas...

Contact Alan Wilson
International Exploration Manager
awilson@aminerals.cl
POSTERS

P.067  Magmatic Hydrothermal Origin of the Wenyu Copper Polymetallic Deposit, Southern Lancangjiang Zone, SW China
Yong-Fei Yang, Wenyu Fan, Maojin Luo, Hong-Zhao Shi

P.068  Origin of the Newly Discovered Jiang Junmu Porphyry Cu-Au Deposit in the East KunLun Orogenic Belt, North China: Constraints from Geochronology, Chemistry, and Isotopes
Junzhen Yu, Youye Zheng

P.069  Geochronology and Geochemistry of the Contact Copper Porphyry Prospect, Contact, Nevada*
Zacharie A. Zens, Kierran Maher

P.071  Hydrothermal Remobilization of REEs in an IOCG System: Implications for Geochronological Studies and Ore Genesis
Xin-Fu Zhao, Zhi-Kun Su, Wang Liao

P.072  Practical application of Mineral Systems Targeting for Base Metals in Sedimentary Basins
Neal Reynolds, Peter Muhling

Breakthroughs in Economic Geology

P.073  Validation of Hyperspectral Mineral Identification Using Mineral Chemistry and Machine Learning: Applications to Carlin-Type Gold Deposits*
Rocky D. Barker, Shaun Barker, Geoff Holmes, Peter Reutemann, Dale Fletcher

P.074  Laramide Shortening and Its Relationship to Porphyry Copper Systems in the Northern San Pedro Valley, Southeastern Arizona*
Daniel A. Favorito, Eric Seedorff

P.075  Unconventional Trace Elements in Sphalerite - Clues to Fluid Origin?
Max Frenzel, Ashley Slattery, Benjamin Wade, Sarah Gilbert, Cristiana C. Ciobanu, Nigel J. Cook, Panagiotis Voudouris
P.077 3D Mineral Footprints of an Undercover Sediment-Hosted Polymetallic Abra Ore System, Western Australia*
Heta M. Lampinen, Carsten Laukamp, Sandra A. Occhipinti, Lyndon Hardy

P.078 The Penetrating Geochemical Exploration in the Past 30 Years in China*
Mei Lu, Rong Ye

P.079 Re-Os, U-Pb Geochronology in Cu-Au Mineralization at the San Matias Project, Northern Colombia*
Julian D. Manco Parra, Hildebrando Leal-Mejía, Craig J. Hart

P.081 Tracing Redox Reactions in Sn Mineral Deposits with Sn Isotopes
Ryan Mathur, Wayne Powell, Yao Junming

P.082 Whole-Rock and Zircon Fertility Indicator of Archean Granites
Yong-Jun Lu, Hugh Smithies, Michael Wingate, Noreen Evans, David Champion, T. Campbell McCuaig

---

**POWERED BY COPPER**

We are a leading international mining company with headquarters in Phoenix, Arizona. We are providing resources essential to our daily lives and expanding global infrastructure.

As our resources expand, so do the opportunities for people and local communities around the world.

[Freeport-McMoRan](https://fcx.com) | Find out more by visiting fcx.com
P.083  **Apatite Chemistry as an Igneous Fertility Indicator for Porphyry Copper Deposit Formation: Preliminary Study from Central Chilean Volcanics**
*Chetan Nathwani, Jamie Wilkinson, Robert Sievwright*

P.085  **Hydrothermal Gold in Permian Black Shale Kupferschiefer - A Paradigm Change in Science, Exploration, and Mining**
*Volker Spieth*

P.088  **The Natural History Museum’s Ore Collection: A Unique Sample Repository for Ore Deposits Research**
*Simon Kocher*

**Infrastructure Metals: Fe, Al, Mn**

P.091  **Mineral Paragenesis and Fluid Inclusion Evidence of Magmatic Fluid Cooling, Decompression, and Influx of Evaporated Lake/Seawater in the Bourbon IOA Deposit, SE Missouri USA**
*Mitchell M. Bennett, Albert H. Hofstra, Corey J. Meighan, Poul Emsbo*

P.092  **Geological Features, Mineralization Types, and Metallogenic Setting of the Phlaythong Large Iron Deposit, Southern Laos**
*Shusheng Liu, Wenyu Fan, Maojin Luo, Yongfei Yang*

P.093  **Typology and Hydrothermal Alteration of the Montaña de Manganeso Mn Deposit, San Luis Potosi, Mexico**
*Joseph Madondo, Carles Canet, Eduardo Gonzalez Partida, Augusto Rodriguez Diaz, Andrea Hernandez Cervantes*

P.094  **Multiple Origins of Iron and Titanium Oxides in Mesoproterozoic IOA-IOCG Systems, SE Missouri, USA**
*Corey J. Meighan, Albert H. Hofstra, Erin E. Marsh, Heather A. Lowers, Alan E. Koenig*
P.096 Structure and Petrochemistry of Amphibolitic Rocks Associated With Magnetite-Bearing Lithologies at the Akom-II Aeromagnetic Anomaly, Southern Cameroon
Eben Robinson

P.098 Igneous Geology of the Keystone Project, Battle Mountain-Eureka Mineral Belt, North-Central Nevada: Age, Distribution and Relationship to Carlin-Type Gold Mineralization*
Gabriel E. Aliaga, Michael W. Ressel, Tom Chapin, David C. Mathewson, Neil Whitmer, Brion Theriault

P.099 2008-2018 – “The Portable XRF Decade”
Aaron T. Baensch

P.100 Imaging Links Between Magnetic Discontinuity and Surface Geology to Understand Regional Structural Control on Epithermal Deposits in Coromandel Volcanic Zone, New Zealand*
Engdawork A. Bahiru, Julie V. Rowland, Jennifer D. Eccles, Richard Kellett

P.102 Integrating Geologic and Geophysical Data to Extend Mineral Terranes Under Basin Fill
Mak W. Bultman

P.103 Geo-Interp Assessment of an Orogenic Au Prospective Area, Medicine Bow Mountains, Wyoming*
Robert D. Charnock, Nicole Pendrigh, Harry Noyes

P.104 Magnetic Petrology Applied to the Characterization of Pegmatite Dikes from the Eastern Colombia*
Carlos J. Charry
POSTERS

P.106 Geochemical Exploration in the Atacama Desert: Two Contrasting Case Studies in the Chilean Cretaceous Coastal Belt
Giancarlo A. Daroch, Chris Benn, Paul Lhotka

P.108 Ore Classification of Tourmaline Breccia Pipes at the Giant Copper Property, Southern B.C.: A Comparison with the Tourmaline Breccias of the Rio Blanco-Los Bronces District*
Bill T. Fischer, Daniel D. Marshall, Jim Miller-Tait

P.110 Detailed Petrology and Geochemistry of the Apache Leap Tuff of the Superstition Mountains, AZ, with Implications for Origins of Related Epithermal Gold Deposits*
Anne Fulton, Benjamin Murphy

P.111 Extending Proterozoic Terranes Beneath Cover Using Potential Fields
Mark E. Gettings

P.113 Caldera/Graben-Hosted Miocene Epithermal Precious Metal Mineralization in Western Chihuahua, Mexico
Philip C. Goodell, Mohammad A. Mahar, Castulo Molina

P.114 Evidence for Lithocaps Associated with Silica Saturated Alkalic Porphyry Systems in the Northparkes District, NSW
Jonathon L. Hoye, Corey M. Jago, T. J. Wells

P.115 Chemical Controls on the Paragenetic Evolution at Panasqueira, Portugal
Pilar Lecumberri-Sanchez, Christoph A. Heinrich, Markus Wälle, Marta Codeço, Philipp Weis, Marta Sośnicka, Filipe Pinto

P.116 Application of Pyrite Mineralogy and Chemistry to Target Vectoring in the MacMillan Pass SEDEX District, Yukon, Canada*
Claire Leighton, Daniel Layton-Matthews, Michael Gadd, Jan Peter
P.117  Geology, Ore-Forming Process of Tiegelongnan Giant Porphyry-Epithermal Copper Deposit, Tibet*
Bin Lin

P.118  A New Geophysical View of the Crust and Controls on Critical Mineral Systems, Southern Midcontinent, USA

P.119  Mine Life Cycle Optimization Using Machine Learning
Tom Meuzelaar, Morgan Warren, Thomas Monecke, Erik Tharalson

P.120  Zircon Trace Element Transects as a Recorder of Magmatic Processes Related to Porphyry Copper Formation*
Nansen H. Olson, John H. Dilles, Michelle Campbell, Jaime Osario

P.122  Geochemical Controls on the Composition of Midocean Ridge Hydrothermal Vent Fluids: A Numerical Modeling Approach*
Samuel Pierre, Alexander P. Gysi, Thomas Monecke

P.123  Geophysical Imaging of REE-Bearing Iron Oxide Apatite Deposits in the Eastern Adirondacks, New York State
Anjana Shah, Ryan Taylor, Gregory Walsh, Cliff Taylor
Integrating Mineral and Petroleum Systems Approaches to Sedimentary Basins

P.124 Geologic and Geophysical Expression of Variably Metal Endowed Fault Systems in the Larder Lake Area of the Southern Abitibi: Preliminary Results of the Metal Earth Project
Ross L. Sherlock

P.125 Integration of Physical Properties and Petrologic Data of Crystalline Rocks: Implications for Geophysical Anomaly Interpretations in the Cripple Creek Mining District

P.127 Tracking Fluid Migration Using Hyperspectral Reflectance at the World-Class White Pine Copper Deposit, Michigan, USA
Jonathan Cloutier, Simon Jones, Tony Prave, Tim Raub, Emily Madoff

P.129 Basement Architecture Controls for Sediment-Hosted Base-Metal Mineral Systems in the Mesoproterozoic Edmund Basin, Western Australia*
Heta M. Lampinen, Sandra A. Occhipinti, Mark D. Lindsay, Marco Fiorentini

P.130 Deeply Covered Hydrothermal Mineralization in Permian Strata of the North German Basin: A Mineral System Scale Perspective
Patrick Nadoll, Marta Sośnicka, Florian Duschl, Dennis Kraemer, Reiner Klemd

P.131 Sedimentary and Geochemical Analysis of the Gypsum Unit in the Boleo Copper Deposit, Santa Rosália Basin, Mexico*
Valente O. Salgado Munoz, Tina Niemi, James B. Murowchick, Gabrielle Penafior
POSTERS

P.132 **An Integrated Tectono-Stratigraphic Basin Evolution Approach to Understanding the Irish Orefield**
Koen Torremans, John Güven, John Conneally, Roisin Kyne, Robert Doyle, Steve Hollis, Murray Hitzman, John Walsh

P.134 **Looking to the Future: What’s Next?**

P.134 **Improved Mineral Exploration, Processing, and Production using Synchrotron Spectroscopy: Examples from Canadian Orogenic Gold Deposits**
Neil R. Banerjee and Lisa L. Van Loon

P.135 **Vanadium: A New Star in the Group of Critical Metals: Conventional and Unconventional Resources for the European Union**
Maria Boni, Beate Orberger, Flavien Choulet, Herman Wotruba, Bernd Friedrich, Jason Yang, Eckart Freyer

P.136 **Stable Isotopes as an Exploration Tool: Tracking Cryptic Alteration Surrounding the Iscaycruz Zn (Pb-Cu-Ag) Skarn-CRD Deposit, Central Peru**
Samuel Cantor, Gregory Dipple, Craig J. Hart, James Mortensen, Abraham Escalante

P.137 **Mapping Hydrothermal Alterations in the Belt Supergroup Using pXRF**
Philip Dalhof, John Ridley

P.138 **A Business Case for Gold Exploration: Combining Geoscientific, Economic, and Financial Analysis to Develop an Exploration Targeting Model for the Sandstone Greenstone Belt**
Rhys S. Davies, David I. Groves, Allan Trench, Michael Dentith, John P. Sykes

P.139 **Numerical Modeling of Hydrothermal Ore-Forming Processes and the Link to Lithogeochemical Vectors for Exploration**
Alexander P. Gysi, Nicole C. Hurtig, Thomas Monecke
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.140</td>
<td>Development of a Plate Margin Database for Use in Plate Reconstruction Modeling*</td>
<td>Peter R. Hone, Bruce Eglington</td>
</tr>
<tr>
<td>P.142</td>
<td>The Australian National Exploration Undercover School: NExUS*</td>
<td>Richard M. Lilly, Graham Heinson, Danielle S. Schmandt</td>
</tr>
<tr>
<td>P.143</td>
<td>Paleosurface Exploration on Emergent Volcanoes*</td>
<td>Amy-Jo P. Miles, Stephen Grebby, Jonathan Naden, Graham Ferrier</td>
</tr>
<tr>
<td>P.144</td>
<td>Data-Driven Discovery in Earth Materials Research</td>
<td>Chao Liu, Simone Runyon, Shaunna Morrison, Richard Wendlandt, Robert Hazen, Ahmed Eleish, Anirudh Prabhu</td>
</tr>
<tr>
<td>P.145</td>
<td>How Can Mineral Exploration Projects Be Evaluated Differently?*</td>
<td>Ahmad Saleem</td>
</tr>
<tr>
<td>P.146</td>
<td>Dark Mica Composition as Mineralization Vector: Examples from Hyperspectral Core Imaging at the Cebolla Creek Titaniferous Magnetite Deposit, Gunnison County, CO, USA</td>
<td>Ekaterina Savinova, Ronell Carey, Brigette Martini</td>
</tr>
<tr>
<td>P.147</td>
<td>Silica Caps Potentially Preserve Modern-Day Extinct Seafloor Massive Sulfide (eSMS) Deposits: Examples from the TAG Hydrothermal Field, 26°N, Mid-Atlantic Ridge*</td>
<td>Iain J. Stobbs, Paul A. Lusty, Sven Petersen, Bramley J. Murton</td>
</tr>
</tbody>
</table>

**Precious Metals: Au, Ag, PGE**

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
</table>
P.149 Hydrothermal Evolution of Au-Bearing Pyrite Veins and Their Association With Base Metal Veins in the Central City District, CO, USA*
Lee Alford, Alexander Gysi, Thomas Monecke, Katharina Pfaff, Nicole Hurtig

P.151 The Geochemical Characteristics and Age Constraints of Cu-Au-Bi Mineralization in Balya Skarn Deposit (Balikesir, Turkey)*
Arif Aydar, İlkay Kuşcu, Irena Peytcheva, Zeynep Aydar, Kamen Bogdanov

P.152 Combined Low- and High-Temperature Multistage Gold Mineralization at the Skarnlike BIF-Hosted São Sebastião Deposit, Pitangui Greenstone Belt, Minas Gerais, Brazil*
P.153  Delineating the Extent of Early Jurassic Intrusion-Related Mineralization in the Yukon-Tanana Terrane, Eastern Alaska
George N. Case, Doug C. Kreiner, James V. Jones, Erin Todd, Jeff A. Benowitz

P.154  Deducing Source Lithology and Nature of Gold Mineralization within the Archean-Proterozoic Quartz Pebble Conglomerates from the Singhbhum Craton, Eastern India*
Rajarshi Chakravarti, Sahendra Singh, Akella S. Venkatesh, Anmol Barla

P.158  PGE-Au Signature of Alkaline Magmas from the Yilgarn Craton: Insights into the Metallogenic Architecture of the Lithospheric Mantle*
Eunjoo Choi, Marco Fiorentini, Andrea Giuliani, Stephen Foley

P.159  Late Cretaceous Orogenic Gold in the Miocene Silver Peak-Lone Mountain Extensional Complex at Mineral Ridge, Nevada*
Micah Claypoole, Michael W. Ressel

P.160  Fluid Inclusion Analysis and Isotopic Investigation of Gold-Transporting Fluids: Sheba-Fairview Gold Mining District, South Africa*
Christina M. Comuso, Matthew Severs, Bjorn Von der Heyden

P.161  Critical Metal Particles in Ore Sulfides from the World-Class Rio Blanco Porphyry Cu-Mo Deposit, Chile*
Jorge Crespo, Martin Reich, Fernando Barra, Juan J. Verdugo, Claudio Martinez

P.164  The Magmatic Evolution of Postsubduction Suites: The Metaliferi Mountains, Romania*
Vlad V. Ene, Daniel Smith, Emilian Rosu, Marian Munteanu
Gold and Base Metal Mineralization of the Kay Tanda Epithermal Gold Deposit, Philippines: Insights from Ore Mineralogy, Microthermometry and Sulfur Isotope Systematics*
Sofia Marah P. Frias, Ryohei Takahashi, Akira Imai

Stratigraphy of La Preciosa Mining Project: Zircon U-Pb Geochronology and Hf Isotope Constraints*
Jose A. Garcia, Munazzam A. Mahar, Philip C. Goodell, Castulo Molina

SWIR Characteristics and S Isotopes of the Archean Hemlo Au Deposit, N. Ontario; Implications for Mineralization*
Emily Gorner, Peter Hollings, David R. Cooke, Cari Deyell-Wurst, Brigette Martini, Pamela Fox

A Comparison of Jiaojia- and Linglong-Type Gold Deposit Ore-Forming Fluids: Do They Differ?
Linnan Guo, Richard J. Goldfarb

Mineralogy, Petrography and Mineral Chemistry of the North Amethyst Epithermal (Au-Ag) Deposit, Creede, Colorado: Insights into Precious and Base Metal Mineralization*
Mario Guzman, Thomas Monecke

Metallogeny and Geological Setting of the Pierre Showing in the La Grande Subprovince, Superior Craton, Quebec*
Maxym-Karl Hamel-Hébert, Stéphane DeSouza, François Goulet

Detailed Analysis of Siliceous Sinters to Assess Epithermal Mineralization Potential*
Ayrton Hamilton, Kathleen Campbell, Julie Rowland, Shaun Barker

The Nature and Provenance of the Sedimentary Basins of the Swayze Area, Abitibi Greenstone Belt
Rasmus Haugaard, Thomas Gemmell, John Ayer, Phil Thurston
Describing the Plumbing System of the Cortez Hills Carlin-Type Gold Deposit Using Calcite Veins*
Christopher Herron, Gregory M. Dipple, Kenneth A. Hickey, Andreas Beinlich

Hypogene and Supergene Alteration at the Farallón Negro Intermediate-Sulfidation Epithermal Au-Ag Deposit, NW Argentina*
Michael Herzog, Steffen Hagemann, Albert Gilg, Ana Fogliata, Nicolás Montenegro

Controls on Epithermal Gold-Silver Mineralization and Alteration at the Gravel Creek Deposit, Elko County, Nevada*
Nicholas G. Hillemeyer, Odin D. Christensen, John L. Muntean

"Distal-Disseminated" Deposits in the Battle Mountain Mining District: Possible Expressions of a Porphyry-Carlin Continuum?*
Dante E. Huff, Elizabeth Holley, Justin Lowe, Matthew Fithian, William Guenther, Jenna M. Kaempfer

Structural Evolution of the El Indio Belt (Chile-Argentina): From Zircons to Gold*
Constanza Jara, Marco Fiorentini, Heejin Jeon, Mark Fanning, John Miller, Diego Winocur

Ore Mineral Assemblage and Textures of Mineralized Quartz Veins from the Orogenic Hog Mt. Gold Prospect, SW Appalachians, USA*
Anabelle K. Kline, Stefanie M. Brueckner, Josh Poole, Mark Whitney, Jody East

Mineralogy of Precious Metal, Sulfides and Related Phases Within the Hera Au-Pb-Zn-Ag Deposit, Cobar Basin, New South Wales, Australia*
Angela Lay, Ian T. Graham, Lachlan Burrows, Adam McKinnon, Karen Privat
P.183 **Gold Mineralization at the Snowfield Porphyry Deposit, NW British Columbia*** Emily C. Laycock, Anthony Williams-Jones, Jim Clark

P.187 **Two-Phase Magmatic Hydrothermal Alteration at the Monzonite-Diorite Tower Mountain Intrusive Complex Au Deposit, Ontario, Canada*** Robert W. Lodge, William Fitzpatrick, Robert Hooper, Brigitte Gélinas

P.188 **Distinctive Chemical Characteristics, Geodynamic Settings, and Petrogenesis of Gold Ore-Forming Arc Magmas*** Robert R. Loucks

P.189 **Stratigraphic and Alteration Vectors Toward the Gold-Rich Petiknäs North VMS Deposit, Skellefte District, Sweden*** Georgian Manuc, Jeff Steadman, Roger Nordin, Rodney Allen
P.191 **Volcanogenic Gold in the Upper Eastmain Greenstone Belt, Quebec, Canada***
Jonathan Marleau, Stéphane De Souza, Anne-Marie Beauchamp, Frédéric Massei

P.192 **The Role of Semi-Metals (Te, Bi, Se) in Precious Metal (Au, Ag, Pd) Transport in Porphyry Cu Deposits**
Katie A. McFall, Iain McDonald

P.193 **Hydrothermal Modification in the Aurora Cu-Ni-PGE Prospect, Northern Bushveld Complex, South Africa**
Katie A. McFall, Iain McDonald, Dominque Tanner

P.194 **The Genesis of Early Neoproterozoic Orogenic Gold Deposits in the SW of the Amazon Craton in Western Brazil**

P.195 **The Implication of Early Architecture for Gold Endowment in a Low Strain Environment; The Yaouré Gold Deposit, Côte d’Ivoire***
Nicolas Mériaud, Nicolas Thébaud, Quentin Masurel

P.196 **Structural Controls on the IOCG-Style, Shear Zone-Hosted, Kiskamavaara Cu-Co-Au Deposit, Northern Norrbotten, Sweden***
Nicolai Metzger, Tobias Bauer

P.197 **Precious Metals in the Arrow Uranium Deposit, Patterson Lake Corridor, Southwestern Athabasca Basin, Saskatchewan, Canada***
Robert Mohrbutter, Sean Hillacre, Kevin Ansdell, Matthew Batty, Galen McNamara

P.198 **The Mustajärvi Orogenic Gold Deposit, Central Lapland Greenstone Belt, Finland***
Matthias Müller, Tero Niiranen, Pasi Eilu, Richard Goldfarb, Petri Peltonen
P.199 Structural Controls on High-Grade Zones at the Castle Mountain Low-Sulfidation Epithermal Deposit, San Bernardino County, California
Sergio Cattalani, Owen Nicholls, Wiley Skewes, Tim Howell

P.200 Geological Characteristics and Re-Os Dating of Auriferous Pyrite of Muli Suoluoogou Gold Deposit, West Sichuan Province
Fei Nie, Shu-Sheng Liu, Yong-Fei Yang

P.201 Paragenesis and Structural Controls of the Gold Mineralisation of Cumeral Property, Sonora, Cumeral; a Proposed Model for Epithermal System Related to Metamorphic Core Complex
Jocelyn J. Pelletier, Michel Gauthier

P.202 Cracking Under Pressure: The Lode-Gold Bearing Mougooderra Shear Zone, Western Australia
Jamie Price, Thomas Blenkinsop, Andrew Kerr, Clinton Kuehnapfel, Kathryn Goodenough

P.203 Post-Subduction Porphyry and Epithermal Gold Deposits Along the Late Cenozoic Anatolian Metallogenic Trend, Turkey*
Fabien Rabayrol, Craig Hart

P.204 Insights into the Development of the Phoenix-Fortitude Au-Cu Porphyry-Skarn System, Nevada
Curtis L. Johnson, Michael W. Ressel

P.205 Geochemical and Textural Features of Pyrite in the Cerro Pabellón Geothermal System as a Tracer of Boiling in Epithermal Au-Ag Deposits*
Nelson Román, Martin Reich, Mathieu Leisen, Diego Morata, Fernando Barra, Artur Deditius

P.206 Pilot Application of Computed Tomography to Rushan Gold Deposit, Jiaodong Peninsula, China*
Shengxun Sai
Gold Mineralization at the Florida Canyon Deposit and Humboldt House Geothermal Field, NV: Results of Episodic Range-Front Faulting and Hydrothermal Activity over 5 m.y. Abani R. Samal, Richard H. Fifarek

Low to Intermediate Sulfidation Epithermal and Mesothermal Vein System at the Marmato Gold Deposit, Colombia* Leonardo Santacruz, Steward Redwood, Juan C. Molano, Massimo Matteini, Nilson Botelho, Alessandro Cecchi, Julian Ceballos

Preliminary Results from Detailed Geological Mapping of the Powell Block, Rouyn-Noranda Area, Quebec* Marina Schofield, Harold Gibson, Bruno Lafrance, Howard Poulsen

The Multivariate Analysis of Regional Surface Geochemistry, Northern Nye County, Nevada: Assessing the Potential for Carlin-Type Gold* Robert D. Selwood, John L. Muntean

Host-Rock Effects on Epithermal Au-Te Mineralization Daniel J. Smith, Jon Naden, Gawen R. Jenkin, Manuel Keith

Volcanic Stratigraphy and Structural Framework of the Kerr–Addison Deposit: Implications for Gold Mineralization* Nadia St-Jean, Ross Sherlock, Bruno Lafrance

Ag/Au Ratios in the Epithermal Sirawai Au-Ag Deposit in Mindanao, Philippines Hiroshi Takahashi

Textural Evidence for the Occurrence of Flashing During the Formation of Bonanza-Type Low-Sulfidation Epithermal Veins* Tadsuda Taksavasu, Thomas Monecke, James Reynolds, James A. Saunders, Barry Devlin
P.216 Volcanic Facies Architecture of the Castle Mountain Low-Sulfidation Epithermal Deposit, San Bernardino County, California*
Erik R. Tharalson, Thomas Monecke, Sergio Cattalani, Owen Nicholls, Wiley Skewes

P.218 Oxidized, Water-Rich Magmatism in the Hualgayoc Au-Cu Mining Camp, Northern Peruvian Cordillera*
Martin Viala, Keiko Hattori, Paul Gomez

P.221 Formation of High-Grade Low-Sulfidation Epithermal Veins of the Omu District, Hokkaido, Japan*
Lauren Zeeck, Thomas Monecke, T. J. Reynolds, Quinton Hennigh

POSTERS

Let's make discoveries into mines together

Exploration Partner of Choice

Let's make discoveries into mines together
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.225</td>
<td><strong>Geodynamics and Genesis of Mesozoic Mineral Deposits in Mongolia</strong></td>
<td>Delgertsogt Baljinnyam</td>
</tr>
<tr>
<td>P.226</td>
<td><strong>Initial Emplacement and Subsequent Redistribution of Critical Elements in a Hydrothermally Altered Rhyolite System</strong></td>
<td>Drew W. Barkoff, Simon M. Jowitt</td>
</tr>
<tr>
<td>P.229</td>
<td><strong>Pb Isotopic Evolution of the Supergiant Olympic Dam Deposit, Gawler Craton, South Australia</strong></td>
<td>Nathan D. Chapman, Sebastien Meffre, Roland Maas, Vadim Kamenetsky, Kathy Ehrig</td>
</tr>
<tr>
<td>P.230</td>
<td><strong>Chlorite Alteration of Preore Pyrite at the McArthur River Uranium Deposit, Athabasca Basin: Paragenesis and Possible Implications to Ore Deposition</strong></td>
<td>John DeDecker, Thomas Monecke, Gerard Zaluski</td>
</tr>
<tr>
<td>P.231</td>
<td><strong>The Fox Lake Unconformity-Related Uranium Deposit, Athabasca Basin: Paragenesis of Alteration Minerals and Possible Implications to Ore Deposition</strong></td>
<td>John DeDecker, Thomas Monecke</td>
</tr>
</tbody>
</table>
P.233 **Structural Analysis and Mineral Paragenesis of the Arrow Uranium Deposit, Athabasca Basin, Saskatchewan: Controls on Mineralization in the Patterson Lake Corridor***
Sean Hillacre, Brian McEwan, Galen McNamara, Kevin Ansdell

P.235 **Luminescence as a Smart Sorting Tool for REE Minerals***
Nicola J. Horsburgh, Adrian A. Finch

P.236 **Uranium Deposits in South China: Contributions of Mantle-Derived Gaseous Components**
Rui-Zhong Hu, Jin-Cheng Luo, You-Wei Chen, Xian-Wu Bi

P.237 **An Early Magmatic Fluid Pulse at Cononish Gold Deposit? Tellurium Enrichment and Implications for the Genesis of Gold Veins in Orogenic Belts**
Carl Spence-Jones, Gawen R. Jenkin, Adrian J. Boyce, Nyree J. Hill, Christopher J. Sangster

P.238 **A Suprasubduction Signature in Troodos VMS? Implications for Trace Element Systematics***
Andrew J. Martin, Iain McDonald, Manuel Keith, Adrian J. Boyce, Christopher J. MacLeod, Katie McFall, Hazel M. Prichard

P.239 **Characterization and Origin of the REE-Bearing Cambrian-Ordovician Episyenites and Carbonatites in Southern and Central New Mexico, USA**
Virginia T. McLemore, Adam Smith, Annelise M. Riggins, Nelia Dunbar, Matthew T. Heizler, O T. Rämö
P.240 Geochemistry of Rare Earth Elements (REEs) in Bauxites of Southern France: Is There Anything New for a Possible Recovery of REEs as By-Products of Al from Bauxite Mining? 
Nicola Mondillo, Maria Boni, Giuseppina Balassone, Salvatore Cretella, Gennaro Scognamiglio, Marcella Tarallo

P.241 Petrography and Geochemistry of Li-Bearing Pegmatites in the Misaw Lake Area, Northeastern Saskatchewan, and Comparison with Granitoid Suites in Nunavut* 
Courtney Onstad, Kevin Ansdell, David Turner, Paul Ramaekers, Shaun Spelliscy

P.242 Rare Earth Element Partitioning in Calcite as a Vector in Critical Metal Deposits* 
Emily P. Perry, Alexander P. Gysi

P.243 The Wingellina Laterite Project (Western Australia): Ni-Co, High-Tech Metals (REEs and Sc) Mineralogical Association and Geochemistry* 
Francesco Putzolu, Maria Boni, Nicola Mondillo, Max Maczurad, Franco Pirajno

P.244 Critical Minerals Geospatial Data by the USGS Mineral Deposit Database Project 
Carma A. San Juan, Jeffrey L. Mauk, Meredith H. Burger, Thomas R. Carroll, Stuart A. Giles, John D. Horton, Nicholas A. Karl, Keith R. Long, Tyler A. Reyes, Germán Schmeda, Bradley S. Van Gosen

P.245 Mineralogy and Geochemistry of the Loupian Bauxite Deposit, Languedoc, Southern France* 
Marcella Tarallo, Nicola Mondillo, Maria Boni, Giuseppina Balassone

P.246 Potential REE Resources in Mine Waste, Tailings Piles, and Iron Oxide-Apatite Deposits of the Eastern Adirondack Highlands, New York, USA 
Ryan D. Taylor, Gregory J. Walsh, Cliff D. Taylor, Anjana K. Shah
P.247  **Amarillo Grande, a New Uranium-Vanadium Discovery, Argentina**
Guillermo Pensado, Ariel Teste, Jon Thorson, Jorge Berizzo

P.248  **Fingerprinting the Hydrothermal Mobility of Rare Earth Elements (REEs) in Ore Deposits from the Stability of Monazite-(Ce)**
Christopher J. Van Hoozen, Alexander P. Gysi

P.249  **Contrasting Styles of Unconformity-Type Uranium Mineralization on the Wheeler River Project, Athabasca Basin, Canada**
Dale Verran

P.250  **Melt Inclusion Insights into the Formation of IOCG and IOA Deposits in the Mesoproterozoic St. Francois Mountains, Southeast Missouri, U.S.A.**
Kathryn E. Watts, Celestine N. Mercer

---

**RioTinto**

**Discover the job, our challenge**

For 140 years, we’ve been discovering safer, more effective and more sustainable ways to find mine and process the minerals and metals essential for everyday life.

Our vision is to be a company that is admired and respected for delivering superior value, as the industry’s most trusted partner. Our operations give us the opportunity to create mutual benefit with the communities, regions and countries in which we work.

Using the latest in technology and innovation, Rio Tinto Exploration is focused on smarter ways to find the mines of tomorrow.

We are currently seeking high quality opportunities to add to our growing exploration portfolio.

---

For more information please contact:

**Américas Region:**
Justin Quigley
General Manager Commercial
justin.quigley@riotinto.com

Russ Eley
Generative Manager
russell.eley@riotinto.com

---

seg2018.org 71
## Exhibitors

<table>
<thead>
<tr>
<th>Exhibitor</th>
<th>Booth no.</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activation Laboratories Ltd. (Actlabs)</td>
<td>20</td>
<td>actlabs.com</td>
</tr>
<tr>
<td>ALS Minerals - Geochemistry</td>
<td>12</td>
<td>alsoglobal.com</td>
</tr>
<tr>
<td>AMC USA LLC</td>
<td>42</td>
<td>amcmud.com</td>
</tr>
<tr>
<td>Anglo American</td>
<td>47</td>
<td>angloamerican.com</td>
</tr>
<tr>
<td>Barrick</td>
<td>49</td>
<td>barrick.com</td>
</tr>
<tr>
<td>BHP</td>
<td>37-38</td>
<td>bhp.com</td>
</tr>
<tr>
<td>Bureau Veritas</td>
<td>10</td>
<td>bureauveritas.com</td>
</tr>
<tr>
<td>Centre of Exploration Targeting</td>
<td>26</td>
<td>cet.edu.au</td>
</tr>
<tr>
<td>Colorado School of Mines</td>
<td>14</td>
<td>geology.mines.edu</td>
</tr>
<tr>
<td>Condor Consulting, Inc.</td>
<td>21</td>
<td>condorconsult.com</td>
</tr>
<tr>
<td>Corescan</td>
<td>17-19</td>
<td>corescan.com.au</td>
</tr>
<tr>
<td>DREGS</td>
<td>33</td>
<td>dregs.org</td>
</tr>
<tr>
<td>EMX Royalty Corp.</td>
<td>39</td>
<td>emxroyalty.com</td>
</tr>
<tr>
<td>Exploration Mapping Group Inc.</td>
<td>40</td>
<td>explorationmapping.com</td>
</tr>
<tr>
<td>Freeport-McMoRan</td>
<td>48</td>
<td>fcx.com</td>
</tr>
<tr>
<td>Geological Society of America (GSA)</td>
<td>16</td>
<td>geosociety.org</td>
</tr>
<tr>
<td>HiSeis</td>
<td>30</td>
<td>hiseis.com</td>
</tr>
<tr>
<td>IMDEX</td>
<td>43</td>
<td>reflexnow.com</td>
</tr>
<tr>
<td>Irish Centre for Research in Applied Geosciences (ICRAG)</td>
<td>22</td>
<td>icrag-centre.org</td>
</tr>
<tr>
<td>MERC/HES Laurentian University</td>
<td>13</td>
<td>hes.laurentian.ca</td>
</tr>
<tr>
<td>Midland Valley</td>
<td>41</td>
<td>mve.com</td>
</tr>
<tr>
<td>Mira Geoscience</td>
<td>15</td>
<td>mirageoscience.com</td>
</tr>
<tr>
<td>Exhibitor</td>
<td>Booth no.</td>
<td>Website</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>-----------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Mount Sopris Instruments</td>
<td>31</td>
<td>mountsopris.com</td>
</tr>
<tr>
<td>Newcrest</td>
<td>46</td>
<td>newcrest.com.au</td>
</tr>
<tr>
<td>Olympus America Inc.</td>
<td>24–25</td>
<td>olympus-ims.com</td>
</tr>
<tr>
<td>SciAps, Inc.</td>
<td>45</td>
<td>sciaps.com</td>
</tr>
<tr>
<td>SGS</td>
<td>28</td>
<td>sgs.com</td>
</tr>
<tr>
<td>Skyline Assayers &amp; Laboratories</td>
<td>23</td>
<td>skylinelabs.com</td>
</tr>
<tr>
<td>Society for Geology Applied to Mineral Deposits (SGA)</td>
<td>32</td>
<td>e-sga.org</td>
</tr>
<tr>
<td>Society of Economic Geologists (SEG)</td>
<td>35–36</td>
<td>segweb.org</td>
</tr>
<tr>
<td>Spectral Evolution</td>
<td>29</td>
<td>spectralevolution.com</td>
</tr>
<tr>
<td>Stone Quilt Design</td>
<td>34</td>
<td>stonequiltdesign.com</td>
</tr>
<tr>
<td>TerraCore</td>
<td>11</td>
<td>terracoregeo.com</td>
</tr>
<tr>
<td>Western Mining Services/Geologic Data Systems</td>
<td>27</td>
<td>wesminllc.com</td>
</tr>
</tbody>
</table>
SEG 2018 Conference Floor Plan

Conference Center

Ground Level
(Columbine Ballroom and Colorado Rockies Ballroom)

Second Level
(Castle Peak Meeting Rooms)

Third Level
(Boardroom/Rooftop Patio, Belvedere)
Thank You, Sponsors

PATRON

BHP

GOLD

SILVER

AngloAmerican  BARRICK

FREEPORT-MCMORAN

NEWCREST MINING LIMITED  NEWMONT

RioTinto

BRONZE

BOLIDEN  BUENAVENTURA

EMX ROYALTY CORP  esri

Gold Resource Corporation  NYSE MKT: GORO

newgold  PAN AMERICAN SILVER

srk  Dawn Zhou

SUPPORTERS

Daniel Brisbin  Corvus  David Thomas

SEG2019

South American Metallogeny: Sierra to Craton

Santiago, Chile

October 7-10, 2019

CALL FOR PAPERS

Abstracts Deadline: April 30, 2019

The focus of SEG 2019 will be on the metallogeny of deposits throughout South America, along with new discoveries and geometallurgy. A wide range of activities is planned to complement an excellent array of technical presentations.

Highlights:

- Principal sessions on copper, gold, and polymetallic deposits
- Field trips in Chile and to Peru, Argentina, and Brazil
- Workshops on major deposit styles, with case studies
- Focused student and early career professional activities

A regional Santiago-Mendoza transect to study classic Andean geologic locations and historic sites such as the Charles Darwin camp, as well as a visit to the Malbec vineyards near Mendoza, will contribute to making this conference truly memorable.

¡Bienvenidos!

We look forward to welcoming you to Santiago, Chile’s capital city—at the foothills of the Andes and host to important museums and colonial architecture, outstanding food, and renowned wines. Mark your calendars now!

José (Pepe) Perelló, Antofagasta Minerals SA
Conference and Technical Program Chair

SEG2019.org