



South American Metallogeny: Sierra to Craton

Santiago, Chile • October 7-10, 2019 • SEG2019.org



SEG 2019 Conference



ANTOFAGASTA
MINERALS



MÁS COBRE
MENOS EMISIONES

El cobre es indispensable para el desarrollo de energías limpias, vehículos eléctricos y nuevas tecnologías que no generan emisiones.

**EN ANTOFAGASTA MINERALS
ENFRENTAMOS EL CAMBIO CLIMÁTICO**

SÍGUENOS EN



MONDAY

1:30pm–4:30pm

Student and Early Career Professionals Roundtable

4:45pm–5:00pm

**Welcome and Introduction
Pepe Perelló, Conference and Technical Program Chair**

5:00pm–5:30pm

**Presidential Address
Doug Kirwin, SEG President**

5:30pm–7:30pm

Welcome Reception

REGISTRATION

Main Lobby, Sheraton Santiago Hotel

Sunday: 7:00am–7:00pm

Monday: 7:00am–6:00pm

Tuesday: 7:00am–6:00pm

Wednesday: 7:30am–5:00pm

Thursday: 7:30am–12:00pm

EXHIBITS and POSTERS

Levels 1 and -1

Tuesday: 8:30am–6:00pm

Wednesday: 8:30am–6:00pm

Thursday: 8:30am–4:00pm

SPEAKER READY ROOM

Cochrane Room

Tuesday–Thursday

7:30am–11:00am

1:30pm–5:00pm

Deliver flash drive to AV technician
10 minutes before session.

WIFI ACCESS



Network: Sheraton_Conference
Password: SEG2019

CORE SHACK - Quixote Room

Tuesday–Wednesday

8:30am–6:00pm

Thursday

8:30am–4:00pm

All sessions and events are at the Sheraton Santiago Hotel, except as noted for individual off-site events.

TUESDAY

8:15am–10:20am

Session 1:

Polymetallic Deposits and Metallogeny I

10:20am–11:00am

Break and Posters

11:00am–1:00pm

Session 1 (*cont.*)

1:00pm–2:20pm

Lunch

2:20pm–4:40pm

Session 2:

Polymetallic Deposits and Metallogeny II

Session 3:

New Discoveries in South America I

4:40pm–5:00pm

Break and Posters

5:00pm–6:10pm

ST1: Speed Talks

6:00pm–7:00pm

Reception and Poster Session

7:00pm–10:00pm

SEG Dinner and Awards Ceremony*
El Bohio Restaurant
Sheraton Santiago Hotel

WEDNESDAY

8:15am–10:20am

Session 4:

Copper Deposits and Metallogeny I

10:20am–11:00am

Break and Posters

11:00am–1:00pm

Session 4 (*cont.*)

1:00pm–2:20pm

Lunch

2:20pm–4:40pm

Session 5:

Copper Deposits and Metallogeny II

Session 6:

Applied Geomet

4:40pm–5:00pm

Break and Posters

5:00pm–6:10pm

ST2: Speed Talks

6:00pm–7:00pm

Reception and Poster Session

6:30pm–9:30pm

Industry Outlook Dinner*

Keynote Speaker:

John E. Black,
CEO and Director,
Regulus Resources, Inc.
Off-site at Restaurante
Vista Santiago, Cerro
San Cristobal

THURSDAY

8:15am–10:20am

Session 7:

Gold Deposits and Metallogeny I

10:20am–11:00am

Break and Posters

11:00am–1:00pm

Session 7 (*cont.*)

1:00pm–2:20pm

Lunch

2:20pm–4:40pm

Session 8:

Gold Deposits and Metallogeny II

Session 9:

New Discoveries in South America II

4:40pm–5:00pm

Break and Posters

5:00pm–6:00pm

Round Table

6:00pm–6:10pm

Introduction to SEG 2020

CONFERENCE ABSTRACTS

Available at www.segabstracts2019.org/schedule_public.php.

**PLEASE REFER TO THE ONLINE SCHEDULE OF EVENTS
FOR UPDATED INFORMATION!**

*Ticketed events

Bienvenidos! Welcome!

We welcome you to Santiago, Chile, and the SEG 2019 international conference!

This year's edition of SEG's international conference series is held for the second time in South America and the first time in Chile. The conference's broad theme, "**South American Metallogeny: Sierra to Craton,**" was conceived as an inclusive invitation to all explorers and researchers in the field of metallic mineral deposits of this rich and diverse continent. A wealth of studies on copper, gold, and polymetallic deposits, complemented by sessions on new discoveries and geomet, constitute the main thrust of the conference and, in conjunction with a team of expert colleagues from industry and academia, we have made sure that all regions of the continent are represented, together with studies from abroad. Other areas that impact exploration are included to showcase ongoing research and work on deposit types outside the main scope of the conference.

Although the focus on descriptive and conceptual geology exposes exploration practitioners to new and practical aspects of key deposit types of the continent and beyond, academic participants will benefit from cutting-edge talks by leading researchers in economic geology. The conference features an exceptional lineup of speakers, complemented by poster presentations, and an outstanding group of topical pre- and post-meeting field trips and workshops. In addition, we have included two sessions fully dedicated to students, with competitive speed talks selected from a wealth of geologic topics from most continents. Students, together with early-career professionals, will further participate in round table discussions with mentors to address key issues in managing a successful career in our occupation.

We thank our conference sponsors who have contributed greatly to making SEG 2019 a success. Their generosity especially facilitates student participation and programs.

On behalf of the Organizing Committee and all volunteers, we welcome you to Santiago's SEG 2019 conference. Enjoy it!

José Perelló, *SEG 2019 Conference and Technical Program Chair*
Brian Hoal, *Executive Director, Society of Economic Geologists*

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- Inside**
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Conference Information*

Conference Organizing Committee

- Conference and Technical Program Chair: José (Pepe) Perelló
- SEG Executive Director: Brian Hoal
- Field Trips: William X. Chávez, New Mexico Institute of Mining and Technology
- Workshops: Richard Tosdal, Consultant
- Poster Sessions: Lluís Fontboté, Université de Genève
- Students/Early Career Professionals: Alina Gaibor, BHP
- Fundraising/Marketing: Nikki Morrison
- SEG Executive Assistant: Alison Cronk
- SEG Managing Editor: Alice Bouley

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Conference Organizer

Chile Explore
 Iain Cassidy, Caitlin Wheat
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 Tel. +562 2 9550755

*For registration and exhibit hours, as well as an overview of schedules, please refer to the inside front cover. A conference center floor plan is located on the inside back cover. All events, except as otherwise noted, will be held at the center.

**For updates and latest information,
 visit www.seg2019.org.**



SEG Awardees

Be sure to join us on Tuesday, October 8, from 7:00 to 10:00pm in the El Bohio Restaurant at the Sheraton Santiago Hotel for the SEG Dinner and Awards Ceremony.

SEG R.A.F. Penrose Gold Medal for 2018

ANTHONY E. WILLIAMS-JONES

McGill University, Canada

SEG Silver Medal for 2018

ANDREAS AUDÉTAT

BGI, University of Beyreuth, Germany

SEG Ralph W. Marsden Award for 2018

STUART F. SIMMONS

Hot Solutions, New Zealand, USA

SEG Waldemar Lindgren Award for 2018

YONJUN LU

Geological Survey of Western Australia, Australia

SEG Brian J. Skinner Award for 2018

DAVID P. BRAXTON

Anglo American

SEG Distinguished Lecturer for 2019

JOHN M. PROFFETT

Proffett Exploration, Inc., USA

SEG International Exchange Lecturer for 2019

YASUSHI WATANABE

Akita University, Japan

SEG Thayer Lindsley Visiting Lecturer for 2019

SARAH A. GLEESON

GFZ German Research Centre for
Geosciences, Germany

Regional Vice President Lecturer for 2019

JUDITH A. KINNAIRD

University of the Witwatersrand, South Africa

Pre-Conference Program

San Cristobal Rooms A, B, C

Monday, October 7, 2019

Student and SEG Early Career Professionals Round Table

1:30pm-4:30pm

Round Table Discussions
Open to students and
early career professionals

4:45pm-5:00pm

Welcome and Introduction

José (Pepe) Perelló, Conference and
Technical Sessions Chair

5:00pm-5:30pm

SEG Presidential Address

Douglas J. Kirwin, SEG President

5:30pm-7:30pm

Welcome Reception

Pre-Conference Field Trips

- The IOCG Systems of the Carajás Province, Amazon Craton, Northern Brazil** September 29–October 4
 Leaders: Roberto Xavier, Gustavo Melo
- Porphyry-Epithermal Ore Deposits of Northern Chile** September 30–October 4
 William X. Chávez, Jr.
- Giant Porphyry Cu-Mo Deposits of the Miocene-Pliocene Age Farallon District: Examples from the Los Bronces, Andina (Rio Blanco), and Vizachitas Systems** October 5
 Tony Amberg, William X. Chávez, Jr.

Pre-Conference Workshops

- Epithermal Polymetallic Deposits in the Porphyry System** October 6
 Lluís Fontboté, Université de Genève
- Integrating Hyperspectral Technologies and Geochemistry Through the Mining Value Chain** October 6
 Sam Scher, Corescan; Federico Cernuschi, Eclectic Rock
 Solace Hotel
- Creation and Destruction of Permeability** October 6
 Richard Tosdal, Consultant
- Epithermal Gold and Silver Deposits—Geology and Exploration** October 7
 Antonio Arribas, University of Texas, El Paso
- Supergene Processes: Metals Mobility in the Weathering Environment** October 7
 William X. Chávez, Jr., New Mexico Institute of Mining and Technology
- Exploration for Skarn Deposits** October 7
 Larry Meinert, Consultant



In a world of rapid change, the future belongs to those who can redefine it: innovators who embrace disruptive technologies and collaborate with a broad range of partners to solve real industry challenges.

Today, building on 100 years of technology and innovation leadership, we are taking a fresh approach to innovation.

FutureSmart Mining™ applies cutting-edge technological advances and broad innovative thinking to find safer, more efficient and more sustainable ways to mine the metals and minerals that the world needs.

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TO IMPROVE PEOPLE'S LIVES**



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Technical Program

Day 1 — Tuesday, October 8, AM

Oral Session 1

Polymetallic I

Session Co-Chairs: *Lena Monteiro, Enrique Garay*

8:15am-8:30am	<p>Introduction <i>Lena V. Soares, Enrique Garay</i></p>
8:30am-9:00am	<p>Polymetallic (Pb-Zn-Ag-Sn) deposits in South America <i>Luis Fontboté (Invited Speaker)</i></p>
9:00am-9:20am	<p>The Paleoproterozoic Volcanogenic Massive Sulfide Deposit of Aripuanã, Amazonian Craton, Northern Brazil <i>Julio Souza Santos</i></p>
9:20am-9:40am	<p>New Exploration Ideas for the Ayawilca Zinc-Silver-Indium-Tin Property, Central Peru <i>Alvaro Fernandez Baca</i></p>
9:40am-10:00am	<p>The Zn-Pb Supergene Nonsulfide Ores in Peru: Examples from the Cuzco and Bongará Regions <i>Maria Boni</i></p>
10:00am-10:20am	<p>The Cerro Lindo VMS Deposit, Peru <i>Jonas Mota e Silva</i></p>

10:20am-11:00am Refreshment Break and Poster Viewing

11:00am-11:40am **What Can the Chemistry of Magnetite Tell Us About the Origin of Magnetite-Apatite Deposits?**
John Hanchar (SGA Lecturer)

11:40am-12:00pm **The Proterozoic Vazante-Paracatu Zinc (-Lead) District, Minas Gerais, Brazil: Basin Evolution, Fluid Flow, and Base Metal Sulfide and Silicate Deposits**
Gema Olivo

12:00pm-12:20pm **Exploration and Geology at the VMS Zn-Pb Deposit of Palma Within the Uppermost Cretaceous Volcano-Plutonic Arc in Central Peru**
César Farfán

12:20pm-12:40pm **Indium in Bolivian Polymetallic Vein Mineralizations: Mineralogical Expression and Distribution in the Huari Huari and Ánimas-Chocaya-Siete Suyos Deposits**
Lisard Torró

12:40pm-1:00pm **Age Constraints and Isotope Signature of the Ediacaran Pb-Zn and Cu-Epithermal Deposits, Minas do Camaquã, Brazil**
Lucy Takehara Chemale

LUNCH BREAK

1:00pm-2:20pm **Lunch, Networking, Poster Viewing**

Day 1 — Tuesday, October 8, PM

Oral Sessions 2 and 3

Oral Session 2

Polymetallic II

Session Co-Chairs: Lena Monteiro, Enrique Garay

2:20pm-2:40pm
Carbonatite-Related Ore Formation Processes in Central Brazil
Pedro Cordeiro

2:40pm-3:00pm
The Genesis of the El Laco Iron Oxide-Apatite (IOA) Deposit in the Chilean Altiplano: Evidence from Fe, H, and Triple O Stable Isotopes
Adam Simon

3:00pm-3:20pm
The Economic Geology of Cobalt
Anthony Williams-Jones

3:20pm-3:40pm
Tourmaline as a Monitor of Magmatic-Hydrothermal Transition Processes at the World-Class San Rafael Sn Deposit, Peru
Matthieu Harlaux

Oral Session 3

New Discoveries in South America I

Session Co-Chairs: Alan Wilson, Juan Carlos Toro

Controls on Mineralisation at the Aurora Gold Mine
Boaz Wade

The Discovery of Silica Cap Au-Ag Veins, Cerro Negro Operations, Santa Cruz Province, Argentina
German Escorza

Genesis of the Giant Serra Verde Ion Adsorption REE Deposit, Brazil
Richard Herrington

Soledad: An Emerging High-Grade Copper-Gold-Silver Discovery Hosted in Tourmaline Breccia Pipes, Peru
David Kelley

3:40pm-4:00pm	<p>Do Organic Matter and Arsenic Promote or Prevent Gold Precipitation at the Shahuindo Epithermal Deposit (Cajamarca, Peru)? <i>Jean Vallance</i></p>	<p>Discovery and Evolving Geological Understanding of the Unique Falchani Volcanogenic Lithium Deposit, Macusani Plateau Area, Puno, Southeastern Peru <i>Ted O'Connor</i></p>
4:00pm-4:20pm	<p>Hydrothermal Paragenesis and Lifespan of the Haquira East Porphyry Copper Deposit, Southern Peru <i>Federico Cernuschi</i></p>	<p>The Discovery History and Geology of the Cascabel Project in Northern Ecuador <i>Santiago Vaca</i></p>
4:20pm-4:40pm	<p>Defining Criteria for the Distinction of Hydrothermal Alteration Zones Associated with Shallow and Intermediate Crustal Levels in the Carajás IOCG Southern Copper Belt <i>Angela Santos Costa</i></p>	<p>Discovery History and Geology of the Merian Gold Deposits, Suriname, South America <i>Santjitsing Radjikoemar</i></p>
4:40pm-5:00pm Refreshment Break and Poster Viewing		

Day 1 — Tuesday, October 8, PM**Speed Talk 1****Speed Talk 1****Session Chairs: Lisard Torró, Darryl Lindsay**

Poster no.

5:00pm-5:10pm	Introduction — <i>Lisard Torró, Darryl Lindsay</i>	
5:10pm-5:15pm	The Formation of High-Grade Gold Polymetallic Intermediate-Sulfidation Epithermal Veins in Santander and Bolívar Provinces, Colombia <i>Jocelyn Pelletier</i>	P.024
5:15pm-5:20pm	Mineralising Fluid Exsolution and Migration in Porphyry Systems: New Perspectives from the Yerington District, Nevada <i>Lawrence Carter (Student)</i>	P.102
5:20pm-5:25pm	Gold Re Concentration by High-Temperature Sulfide Recrystallization Supported by Re-Os Reset Ages: A New Mineralization Style for the Quadrilátero Ferrífero Area, Brazil <i>Mariana Brando Soares (Student)</i>	P.007
5:25pm-5:30pm	Can Zircon Trace Elements Correlate Whole-Rock Fertility Indicators for Porphyry-Copper Deposits? Application of a New Zircon Oxybarometer at El Teniente District <i>Gonzalo Henriquez (Student)</i>	P.068
5:30pm-5:35pm	Geology, Geochemistry, and Origin of the Watershed Scheelite Skarn Deposit, Northeast Queensland, Australia <i>Jaime Poblete (Student)</i>	P.145

5:35pm-5:40pm	Ore and Breccia Classification of the GW Orebodies of the Balatoc Diatreme, Acupan Gold Deposit, Philippines <i>Acer Jian Figueroa (Student)</i>	P.038
5:40pm-5:45pm	Sulfides Geochemistry of the Tiegelongnan Porphyry-Epithermal Cu Deposit, Tibet, China <i>Chao Yang (Student)</i>	P.104
5:45pm-5:50pm	Automated Mineral Classification from Hyperspectral Data Through Semantic Segmentation <i>Angela Rodrigues (Student)</i>	P.051
5:50pm-5:55pm	Mineralogical Tracers to Constrain the Denudation of Porphyry Copper Deposits on Sedimentary Fill on Adjacent Basins, Northern Chile <i>Héctor Pizarro</i>	P.097
5:55pm-6:00pm	First U-Pb LA-ICP-MS In Situ Dating of Supergene Copper Mineralization: Case Study in Chuquicamata Mining District, Atacama Desert, Chile <i>Zia Steven Kahou (Student)</i>	P.096
6:00pm-6:05pm	Geology, Geochemistry, and Geochronology of the Contact Copper Prospect: An Investigation of a Potential Porphyry Root, Nevada, USA <i>Zacharie Zens (Student)</i>	P.105
6:05pm-6:10pm	Tourmaline Breccia Pipes of the Giant Copper Property, Southern BC: Discerning the Significance of Tourmaline and Breccia Pipes as Vectoring Tools in Porphyry Copper Deposits <i>Bill Fischer (Student)</i>	P.103
6:00pm-7:00pm	Reception and Poster Session	

Day 2 — Wednesday, October 9, AM**Oral Session 4****Copper I****Session Chairs: Craig McEwan, Ricardo Gonzalez**8:15am-8:30am **Introduction***Ricardo Gonzalez, Craig McEwan*8:30am-9:00am **Tops and Bottoms of Porphyry Copper Deposits, Revisited***John Dilles (Invited Speaker)*9:00am-9:20am **Geochronology and Igneous Geochemistry of the Ferrobamba Porphyry-Skarn Deposit,****Las Bambas, Southern Peru***James Cannell*9:20am-9:40am **Characterising the Eocene-Oligocene Magmatic-Hydrothermal Evolution of the Quebrada Blanca
Cu-Mo Porphyry, Collahuasi District, Chile***Regina Baumgartner*9:40am-10:00am **The Carajás IOCG Mineral System: Diversity and Evolution Through the Archean to Paleoproterozoic***Lena Soares Monteiro*10:00am-10:20am **Geology and Evolution of the Candelaria-Punta Del Cobre IOCG District***Irene del Real (Student)*

10:20am-11:00am Refreshment Break and Poster Viewing

11:00am-11:40am Early Mineralization with High Copper Grades in Porphyry Copper Deposits: Characteristics and Genetic and Economic Significance
John Proffett (2019 SEG Distinguished Lecturer)

11:40am-12:00pm Evolving Active Margin Magmatism, Tectonics, and Mineralization in the Northern Chilean Andes: A Short Review
Constantino Mpodozis (Invited Speaker)

12:00pm-12:20pm Regional Structural Controls on Localizing the Eocene-Oligocene Chuquicamata-El Abra-Toki Porphyry Copper Cluster, Northern Chile
Andrew Tomlinson

12:20pm-12:40pm Geological Update of the Cobre Panama Porphyry Cu-Mo-Au Project, Panama
Michael Sepp (Student)

12:40pm-1:00pm Multiphase Copper and Nickel Mineralization in the Curaçá Valley, Bahia State, Brazil
Filipe Porto

LUNCH BREAK

1:00pm-2:20pm Lunch, Networking, Poster Viewing

Day 2 — Wednesday, October 9, PM

Oral Sessions 5 and 6

Oral Session 5

Copper II

Session Chairs: Craig McEwan, Ricardo Gonzalez

2:20pm-2:40pm Zircon Petrochronology as a Recorder of the Magmatic Evolution Culminating in Porphyry Copper Formation at Rio Blanco-Los Bronces
Simon J. Large

2:40pm-3:00pm Role of Intraplate Coupling and Ridge Subduction in the Temporal and Spatial Distribution of Au-Cu Deposits in the Chilean Flatslab Region
Suzanne Kay

3:00pm-3:20pm Timescales of Crustal Magmatism and Porphyry Copper Mineralization: Large Magma Chambers Are Essential for Massive Ore Fluid Extraction
Christoph Heinrich

Oral Session 6

Geomet

Session Chairs: Regina Baumgartner, Karin Olson Hoal

Economic Geology, Geomet, and Changing the Industry
Karin Olson Hoal

Predictive Models of Mineralogy from Whole-Rock Assay Data: Case Study from Productora Cu-Au-Mo Deposit, Chile
Angela Escolme

Linking Geological and Mineralogical Characteristics to Metallurgical Recoveries: A Case Study from the Vazante Nonsulfide Zn Deposit, Central Brazil
Fernando Fontana

Sampling Methodology for Geometallurgical Characterization: Porphyry Copper Deposits
Marcela Oyarzun

Machine Learning for Geometallurgical Data Mining: Getting Insights from Multivariate Data
Carlos Prades

Quantitative Textural Assessment for Sample Selection Guided by Drill Core Hyperspectral Imagery
Javier Merrill Cifuentes

Preservation of Subeconomic Permian-Triassic Porphyry Cu and Epithermal Deposits in Central Andes Contradict Exhumation Models for Temporal Distribution of Ore Deposits
Paula Cornejo

Relationships between Vein Abundance and Distribution, Timing of Mineralization, and Ore Shell Geometry, Encuentro Porphyry Cu-Au-Mo Deposit, Northern Chile
Jaime Osorio

The Productora Cu-Au-Mo Deposit: An Example of Spatially Associated Magnetite-Apatite, Tourmaline-Cemented Breccias and Porphyry Mineralization
Angela Escolme

The Josemaría and Los Helados Porphyry Cu-Au Deposits: The Timing of Porphyry Emplacement, Uplift, and Erosion in the El Potro Region of Chile and Argentina
Fionnuala Devine

3:20pm-3:40pm

3:40pm-4:00pm

4:00pm-4:20pm

4:20pm-4:40pm

4:40pm-5:00pm

Refreshment Break and Poster Viewing

Day 2 — Wednesday, October 9, PM**Speed Talk 2****Speed Talk 2****Session Chairs: Lisard Torró, Darryl Lindsay**

Poster no.

5:00pm-5:10pm	Introduction — <i>Lisard Torró, Darryl Lindsay</i>	
5:10pm-5:15pm	Boiling Horizon Determination at Dios Protege Vein, Castaño Nuevo Mining District, Cordillera Frontal, Argentina <i>María Cocola (Student)</i>	P.008
5:15pm-5:20pm	The Iron Cap Porphyry Cu-Au-Mo Deposit, NW British Columbia, Canada <i>Michelle Campbell (Student)</i>	P.101
5:20pm-5:25pm	Marmato Gold Deposit, Colombia: A Hybrid Between a Porphyry and a Reduced Intrusion-Related Gold System <i>Leonardo Santacruz (Student)</i>	P.025
5:25pm-5:30pm	Platinum Group Elements as a Fertility Indicator in the Supergiant Rio Blanco Cu Porphyry Deposit, Central Chile <i>Yamila Cajal (Student)</i>	P.067
5:30pm-5:35pm	Magnetite Geochemistry Reveals a Continuum between IOCG and IOA Mineralization <i>Maria Rodriguez Mustafa (Student)</i>	P.155

5:35pm-5:40pm	The Cu-Au Furnas Deposit Metallogeny and Ore Typology, Carajás Province, Pará, Brazil <i>Maira Alves</i>	P.153
5:40pm-5:45pm	The Giant Metamorphosed IOGC Salobo Deposit, Carajás Mineral Province: Magnetite Trace Element Constraints and Implications for a Multistage Evolutionary Model <i>Larissa Valadão (Student), Yuri Campo (Student)</i>	P.154
5:45pm-5:50pm	A New Magmatic-Hydrothermal Genetic Model for the World-Class El Laco Magnetite-Apatite Deposit, Chile <i>J. Tomás Ovalle (Student)</i>	P.151
5:50pm-5:55pm	Pyrophyllite Deposits of the Dominion Group (South Africa): Hydrothermal Activity versus Paleoweathering in a Mesoproterozoic Felsic Volcanic Province <i>Dóra Paprika (Student)</i>	P.167
5:55pm-6:00pm	The Genesis of Regolith-Hosted HREE Deposits: Insights from the World-Class Zudong Deposit in South China <i>Martin Yan Hei Li</i>	P.165
6:00pm-6:05pm	The Emigrant Pass Volcanic Field: Petrologic Constraints on Magmas That May Have Contributed to Eocene Mineralization along the Carlin Trend <i>Nansen Olson (Student)</i>	P.037
6:05pm-6:10pm	Sulfur-Rich Ore Forming Magmas: Evidence from Anhydrite and High-Sulfur Apatite Inclusions <i>Michael Hutchinson</i>	P.069
6:00pm-7:00pm	Reception and Poster Session	

Day 3 — Thursday, October 10, AM**Oral Session 7****Gold I****Session Co-Chairs: Thomas Bissig, Marc Bardoux**

8:15am-8:30am

Introduction*Thomas Bissig, Marc Bardoux*

8:30am-9:00am

Gold in South America*François Robert (Invited Speaker)*

9:00am-9:20am

Geological and Structural Evolution of the Epithermal Au-Ag Metallogenic Province Deseado Massif, Patagonia, Argentina*Andreas Dietrich*

9:20am-9:40am

Key Learnings from West Africa to Find Gold in NE South America (SAXI)*Mark Jessell*

9:40am-10:00am

Geochemical Characterization of K-Free Hydrothermal Alteration and Gold Mineralization at the Karouni Orogenic Gold Deposits, Guyana, South America*Michael Tedeschi*

10:00am-10:20am

The Rhyacian Nivré Gold Deposit, Dorlin Project, French Guiana*Dominique Fournier*

10:20am-11:00am Refreshment Break and Poster Viewing

11:00am-11:40am The Business of Mineral Exploration, Challenges, and Future Trends
Douglas Kirwin (Invited Speaker)

11:40am-12:00pm Epithermal and Porphyry Mineralization Potential in Well-Preserved Paleoproterozoic (ca. 2.0 to 1.78 Ga) Continental Magmatic Arcs in the Amazonian Craton, Brazil
Caetano Juliani

12:00pm-12:20pm Proterozoic Porphyry-Type Versus Oxidized Intrusion-Related Gold Systems in Brazil: Some Insights Relevant to a New Exploration Frontier
Eugenio Espada

12:20pm-12:40pm Mechanisms of Hydrothermal Gold Deposition in Epithermal, Carlin, and Orogenic Deposits
Stuart Simmons

12:40pm-1:00pm Multiple-Staged Rhyacian Gold of the Guiana Shield
Marc Bardoux

LUNCH BREAK

1:00pm-2:20pm Lunch, Networking, Poster Viewing

Day 3 — Thursday, October 10, PM

Oral Sessions 8 and 9

Oral Session 8

Gold II

Session Co-Chairs: Thomas Bissig, Marc Bardoux

2:20pm-2:40pm

Gold Metallogeny in the Colombian Andes: Recent Advances and Future Perspectives

Hildebrando Leal-Mejía

2:40pm-3:00pm

Structural Evolution of the El Indio Belt (Chile-Argentina): Mineralisation Events

Constanza Jara (Student)

3:00pm-3:20pm

Metallogenic Evolution of the Maricunga Belt and Adjacent Andean Arc Segments: A Case for Tectonic Domains Controlling Distribution of Epithermal Versus Porphyry Deposits

Sergio Gamonal

3:20pm-3:40pm

Volcano-Tectonic Paleoenvironmental Evolution of the Southern Maricunga Belt

José Naranjo

Oral Session 9

New Discoveries in South America II

Session Co-Chairs: Alan Wilson, Juan Carlos Toro

The AntaKori Cu-Au-Ag Project, Northern Peru: New Eyes, New Discovery!

Kevin Heather

Filo Del Sol Project, the Discovery of an Intricate Miocene Porphyry/Epithermal System in the Argentina Chile Andes

Diego Charchaflie

Discovery History of RT Norte, Chuquicamata Cluster, Chile

Alfonso Calderon

Geology of Marimaca, Coastal Cordillera, Northern Chile: An Unconventional Copper Deposit in a Very Conventional Place

Sergio Rivera

3:40pm-4:00pm **An Updated Geological Model for High-**

Sulphidation Epithermal Ag-Au Mineralization, Huantajaya-Chimberos Sector, Nueva Esperanza Project, Maricunga District, N. Chile
Nick Callan

The Cerro Bufalo Project, on the Way to a New Discovery in Chile
Patricio Fernandez Mackenzie

4:00pm-4:20pm

Multistage Gold System Formation During Tectonic Regime Switch at the Carboniferous Gondwana Margin, Northern Peru: A New Hallmark for Intrusion-Related Orogenic Gold?
Daniel Wiemer

The Geology of Atacocha and El Porvenir Mines Understood as One Single Polymetallic District: The Pasco Complex
Mervin Tapia

4:20pm-4:40pm

Geodynamic Setting and Origins of the Giant Porphyry Cu-Au Deposits of the East Sunda Arc, Indonesia
David Cooke

Mocha Porphyry Copper Deposit: An Update
Edwin Churata

4:40pm-5:00pm

Refreshment Break and Poster Viewing

5:00pm-6:00pm

Round Table
Lluís Fontboté, François Robert, and Doug Kirwin

6:00pm-6:10pm

Introduction to SEG 2020
Murray Allan and Craig Hart

INVITED SPEAKERS

John E. Black, chief executive officer and director of Regulus Resources Inc., is an economic geologist with 35-plus years of exploration experience in the Americas, Central Asia, the Southwest Pacific, and Eastern Europe/Asia. His professional credentials include a B.Sc. degree in geology (1983) and an M.S. degree in geology/ore deposits exploration (1988), both from Stanford University. John was the founding president of Antares Minerals Inc. and was instrumental in acquiring the Haquira project in Peru for Antares. He was the key driver in negotiating the sale of Antares to First Quantum Minerals for C\$650 million. John's early career included work with Bear Creek Mining Company, Kennecott Minerals Corporation, Rio Tinto, and Western Mining Corporation, and he currently serves as the chief executive officer and director of Aldebaran Resources Inc.



Lluís Fontboté is a professor of economic geology at the University of Geneva, Switzerland, where he has been since 1990. He studied at the universities of Granada, Spain (M.Sc.), and Heidelberg, Germany (Ph.D.). His main area of expertise is epithermal polymetallic deposits linked to porphyry systems, iron oxide copper-gold deposits, and Mississippi Valley-type zinc-lead deposits. In collaboration with his students and coworkers, Lluís has also published work focusing on volcanic-hosted massive sulfide and orogenic gold deposits, on acid mining drainage, and on the future of global mineral resources. He works on mineral exploration for several commodities, mainly in the Andes.



He was the key driver in negotiating the sale of Antares to First Quantum Minerals for C\$650 million. John's early career included work with Bear Creek Mining Company, Kennecott Minerals Corporation, Rio Tinto, and Western Mining Corporation, and he currently serves as the chief executive officer and director of Aldebaran Resources Inc.

John M. Hanchar is a full professor, university research professor, and former head of the Department of Earth Sciences and director of the Centre for Earth Resources Research (from 2005–2012) at Memorial University of Newfoundland, St. John's, Newfoundland, Canada. His research interests are in geochemistry and include the origin, tectonic controls,



and fluid-rock alteration history of magmatic-hydrothermal low Ti magnetite-apatite (MtAp) Kiruna-type and iron oxide copper-gold (IOCG) mineral deposits and the related metamorphic alteration of their host rocks, as well as the origin and evolution of the continental crust, understood through studying granites and lower crust granulite xenoliths. To address these problems, he uses a combination of complementary analytical tools including U-Pb geochronology, tracer radiogenic isotopes (Sr, Nd, Hf, and Pb), and trace elements in accessory minerals. He is the author of over 90 papers in international peer-reviewed publications, has co-edited two books and co-authored one book, and has been an associate editor of *American Mineralogist* and *Chemical Geology*.

Doug Kirwin is an Australian geologist with 48 years of international experience. His exploration teams have been responsible for several well-known mineral discoveries, which are now being mined, the most notable being the giant Hugo Dummett gold copper deposit in Mongolia developed by Rio Tinto. He was executive vice president of



Ivanhoe Mines from 1996 to 2012. Since then Doug went back to being an independent consulting geologist. He is chairman of TSX listed Chakana Copper Corp., which is currently exploring the Soledad project in Peru, and he is a founding director of Realgold, a private Canadian company exploring the potential for Carlin-type gold deposits in the Kyrgyz Republic in central Asia. Doug has an M.Sc. degree in mineral exploration from James Cook University, where he is currently an adjunct professor of geology. He is the 2019 president for the Society of Economic Geologists.

INVITED SPEAKERS (cont.)



Constantino Mpodozis, SEG Fellow and 2000 SEG International Exchange Lecturer, obtained a B.Sc. degree at the University of Chile, Santiago, in 1974 and a Ph.D. degree in France (Paris VI University, 1977). He is a specialist in Andean tectonics and metallogenesis who worked for almost 20 years in the Chilean Geological Survey, where he

became director of geology. Following a period in the oil industry, he is currently with Antofagasta Minerals (senior exploration geologist). He is the author of more than 200 publications and conference presentations that are frequently cited in the mainstream geologic literature. He has also been a professor of structural geology, Andean geodynamics, and metallogenesis at several Chilean universities. A Guggenheim Fellow and Visiting Scientist at Cornell University, he is also a member of the Chilean Academy of Sciences and Honorary Fellow of the Geological Society of America.



John Proffett received a B.A. degree in geology from the University of California, Berkeley, and a Ph.D., also at Berkeley, working on the Yerington porphyry copper district. He worked for The Anaconda Co. for 14 years, first in the Yerington district, then in the mines at Butte, Montana, followed by exploration in Alaska, focusing on volcanic

massive sulfide deposits. Since 1981 he has been a consulting geologist, based in Alaska, working on a variety of ore deposits and districts worldwide. This has included porphyry deposits in Chile, Peru, Argentina, Indonesia, Namibia, Alaska, and Canada, Mt. Isa-type deposits in Australia, and massive sulfide deposits in Alaska. In 2003 he received the SEG Silver Medal and the SEG Brian Skinner Award, for a paper on the geology of the Bajo de la Alumbrera porphyry copper-gold deposit, Argentina. In 2015 he received the first Geological Mapping Award of the Geological Society of America, and he is the SEG Distinguished Lecturer for 2019.

François Robert holds a degree in geological engineering from Ecole Polytechnique in Montreal, where he also obtained M.Sc. and Ph.D. degrees. His Ph.D. studies focused on the classic orogenic Sigma gold-quartz vein system at Val d'Or, Quebec. This was followed by a postdoctorate at the University of Michigan. He joined the Geological



Survey of Canada in 1985 as a research scientist, and he carried out applied research on gold deposits in Canada and abroad. In late 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. He has published numerous papers in scientific journals and served on several committees of scientific organizations, including presidency of SEG in 2015. He has received several awards, including the Lindgren, Silver Medal, and Ralph Marsden Awards from the SEG.

Richard Sillitoe graduated from the University of London, England, where he went on to obtain a Ph.D. degree. After working for the Instituto de Investigaciones Geológicas (Geological Survey of Chile) and then returning to the Royal School of Mines at the University of London as a Shell postdoctoral research fellow,



he has operated for more than 45 years as an independent consultant to more than 300 mining companies, international agencies, and foreign governments. He has worked on a wide variety of precious, base, and lithophile metal deposits and prospects in 100 countries worldwide, but he focuses primarily on the epithermal gold and porphyry copper environments. His specialty is deposit modeling using field observations and drill core. Published research has earned him awards in Europe, Australia, and North and South America, including the SGA-Newmont Gold Medal and the SEG Penrose Gold Medal. He was President of the SEG in 1999 to 2000.

Post-Conference Program

Post-Conference Field Trips

**Domeyko Fault Zone Transect:
Structural Controls of Giant
Porphyry Systems** October 11-13

Leaders: Andrew Tomlinson,
John Dilles, Nicolas Blanco

**Ore Deposits of the Maricunga Region,
Chile: From Near-Paleosurface to
Epithermal Porphyry Depths** October 11-14

Antonio Arribas, Andreas Dietrich

**A Transect Across the Andes Between
Santiago, Chile and Mendoza,
Argentina** October 12-15

Constantino Mpodozis

**Andean IOCG Deposits in the
Atacama Region** October 11-15

Irene del Real, John Thompson,
Paula Brunetto

Post-Conference Workshops

**Porphyry Copper Systems—
From Bottom to Top** October 11

Richard Sillitoe

**Orogenic Gold: Metallogeny
to Exploration** October 11

Bob Foster

**Hydrothermal Alteration Patterns in
Iron Oxide Copper-Gold Systems:
Recognition, Interpretation, and
Implications for Exploration** October 11

Robert Xavier

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Posters

Posters will be on display during regular conference hours in the Pedro de Valdivia A, O'Higgins, and Prat Rooms.

Poster sessions will be held from 6 to 7pm Tuesday and Wednesday, during the evening receptions.

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 number.

For schedule updates, please go to www.seg2019.org.

New Discoveries in South America

- P.001* **Geology of the Recently Discovered Piripiri Magmatic-Hydrothermal Iron Occurrences, Eastern of Paleozoic Parnaíba Basin, Piauí, Brazil**
Jamille V L Freire, Maria Emilia Schutesky Della Giustina, Clóvis Vaz Parente
- P.002 **New Porphyry and Skarn Discoveries in the Americas Utilising New Deep-Penetrating Imaging Technologies for Targeting under Cover**
Robert Gordon, Leduar Ramayo, Alonso Lujan
- P.003 **Characterisation and Vein Paragenesis of the Panteria Porphyry Prospect, Huancavelica, Peru**
Marco Augusto Misael Robles Ancajima, Latin American Exploration Team-First Quantum Minerals LTD.
- P.004* **Mineralogy and Geochemistry of Wolframites and Fluid Inclusion Petrography in Quartz from the Vein-Like Deposit of W-Au from Tairira, Vaupés Colombian Amazony**
Milton Alfonso Santos, Thomas Cramer, Ivan Felipe Pacheco

- P.005 **Rare Earth Mineral Occurrences in Uranium-Barren Albitites in Center of the Lagoa Real Uranium Province, Brazil**
Jefferson Ferreira da Silva, Frederico Sousa Guimarães, Lucilia Aparecida Ramos de Oliveira, Lucas Eustáquio Dias Amorim, Tiago Henrique Ferreira de Jesus, Camila Marques dos Santos, Tércio Assunção Pedrosa, Mônica Elizetti Freitas, Evandro Carele de Matos, Francisco Javier Rios
- P.006 **Discovering Mineralization below the Atacama Gravels with Strategic Sampling of Discrete Salt-Rich Pockets along Structures**
Peter A Winterburn, *Alexandra E Brown*

Gold Deposits – South America

- P.007* **Gold Re Concentration by High-Temperature Sulfide Recrystallization Supported by Re-Os Reset Ages: A New Mineralization Style for the Quadrilátero Ferrífero Area, Brazil**
Mariana Brando Soares, Atlas Vasconcelos Corrêa Neto, Wendell Fabricio-Silva, Felipe Emerson André Alves
- P.008* **Boiling Horizon Determination at Dios Protege Vein, Castaño Nuevo Mining District, Cordillera Frontal, Argentina**
María Agustina Cocola, María Celeste D'Annunzio, Leonardo Strazzere, Diego Guido
- P.009 **Gold Resource Distribution of South America**
Emily M Beard, Simon Jowitt
- P.010* **Structural and Lithological Controls and Mineralization of the Carbon-Rich Sedimentary Rock-Hosted Epithermal Shahuindo Deposit (Cajamarca, Peru)**
Brigitte Berna Rumiche, Jean Vallance, Macneill Balboa, Omar Cabrera, Camille Baya, Patrice Baby, Gleb S. Pokrovski

- P.011 **La Falda Project: Northern Extension of the Middle Miocene Au-Cu Porphyry Subbelt, Maricunga Belt, Chile**
Luciano Maias Bocanegra, Juan Francisco Burlando
- P.012* **Crustal Evolution in the Southern Goiás Archean Block: Evidence from In Situ U-Pb and Hf-O Isotopes**
Jessica Bogossian, Anthony Kemp, Steffen Gerd Hagemann
- P.013* **High-Resolution X-Ray Computed Tomography Studies of Gold-Bearing Quartz-Carbonate Veins Hosted in the Lower Metamafic Unit at the World-Class Cuiabá Deposit, Brazil**
Marília Ferraz, J. Richard Kyle, Lydia M. Lobato, Richard A. Ketcham, André L.A. Vitorino, Rosaline C. Figueiredo e Silva
- P.014 **Cerro Choique: A Multiepisodic Shallow Epithermal System, Somún Curá Massif, Patagonia, Argentina**
Daniel Hughes, Sebastian M Jovic, Diego M Guido
- P.015 **Geology, Geochemistry, and Mineralogy of the Overman Gold Deposit in the Paleoproterozoic Greenstone Belt of Suriname, South America**
Nicole M.E. Kioe-A-Sen, Manfred J. van Bergen, Ravi Schreefel, Pieter Z. Vroon, Paul Mason
- P.016 **Structural Controls on Gold Mineralization in the San Ramon Shear Zone, Antioquia, Colombia**
Stefan Kruse
- P.017* **Fluid Inclusion Studies in Quartz-Calcite Veins Hosted in Metamafic Dikes from Laranjeiras, Córrego do Sítio Gold Lineament, Quadrilátero Ferrífero, Minas Gerais, Brazil**
Júlia Mattioli Rolim, Rosaline C. Figueiredo e Silva, Matheus Luís de Sales Oliveira, Yuri Ribeiro, Lydia M. Lobato

- P.018 **Distribution of the Hydrothermal Alteration at the Guanaco Au-Cu District Mine, Northern Chile**
Conrado Permuy Vidal, Gerardo Nestor Páez, Matías Galina, Sebastián Miguel Jovic, Diego Martín Guido, Pilar Moreira, Luciano López
- P.019* **The Historical Veloso Gold Mine, Quadrilátero Ferrífero, Minas Gerais, Brazil**
Júlia Souza Pimenta, Alexandre Raphael Cabral, Gláucia Nascimento Queiroga
- P.020 **Using Pyrite to Fingerprint Ore-Forming Processes and Vector Toward Mineralization**
Martin Reich
- P.021 **Geology of the Calcatreu Low-Sulfidation Gold Deposit, Patagonia, Argentina**
Walter Soechting



- P.022* **Mineral Chemistry of Hydrothermal Rutile from Basilio and Pe Quente Gold Deposits, Eastern Sector of Alta Floresta Gold Province (Mt), South of Amazon Craton**
Ivan Roberto de Souza, Rafael Rodrigues de Assis, George Luiz Luvizotto
- P.023* **Multielement Analyses of Mineralized Samples from the Turmalina Gold Deposit: General Trends Between Gold and Trace Elements as a Tool for Prospectivity and Geometallurgy**
Felipe Emerson Alves, Atlas Vasconcelos Corrêa Neto, Mariana Brando Soares, *Ana Clara Varca Pinheiro*, Guido Monteiro de Albuquerque, Piero A. Berquó de Sampaio, Victor Diniz Silveira
- P.024 **The Formation of High-Grade Gold Polymetallic Intermediate-Sulfidation Epithermal Veins in Santander and Bolivar Provinces, Colombia**
Jocelyn Josh Pelletier
- P.025 **Marmato Gold Deposit, Colombia: A Hybrid Between a Porphyry and a Reduced Intrusion-Related Gold System**
Leonardo Santacruz, Stewart Redwood, Julian Ceballos, Massimo Matteini, Nilson Botelho, Alessandro Cecchi, Juan Carlos Molano

Gold Deposits – Other Regions

- P.026* **Preliminary Results on Primary Gold Deposition in Pan-African Rocks of Central Africa (Eastern Cameroon)**
Kevin Igor Azeuda Ndonfack, Yuling Xie
- P.027* **Trace Element Composition Variation in Pyrite from Carlin-Type, Epithermal, Orogenic, and Porphyry Deposits: A Review from Recent Publications >2007**
Lebogang Babedi, Bjorn von der Heyden

- P.028 **Fluid Geochemistry of the Bangbu Orogenic Gold Deposit, Southern Tibet, China: Constraints from Microthermometry and LA-ICP-MS Fluid Inclusion Microanalysis**
Hongjun Chen, Xiaoming Sun, Dengfeng Li, Qiaofen Liu
- P.029 **Petrographic and Fluid Inclusion Studies of the Dongping Gold Deposit in Hebei Province, China, and a Comparison with Orogenic Gold Deposits**
Haixia Chu, Jiuhua Xu, Chunji Xue, Guorui Zhang
- P.030* **Trace Element and Multiple Sulfur Isotope Signatures of Pyrite Reveal Mantle and Crustal Source Interaction in the Golden Mile-Mt. Charlotte Deposit, Western Australia**
Marcelo Godefroy Rodriguez, Steffen Hagemann
- P.031* **Short-Wave Infrared (SWIR) Hyperspectral Characterization of Alteration at the Sadiola Hill Gold Deposit, Mali, Western Africa**
Semyon Martynenko, Frank van Ruitenbeek, Pekka Tuisku, Kim Hein
- P.032 **Colloidal Transport: A Solution to the High-Grade Gold Ore Paradox?**
Duncan F. McLeish, Anthony E. Williams-Jones, Olga V. Vasyukova, James R. Clark, Warwick S. Board



- P.033 **Birimian Gold Mineralization and the Occurrence of Tarkwaian Rocks from the Julie Belt, NW Ghana**
Samuel Nunoo, Jan Kramers, Axel Hofmann
- P.034* **The Giant Zaozigou Au-Sb Deposit, West Qinling Gold Province, China: Intrusion-Related or Orogenic?**
Kunfeng Qiu, Jun Deng, Haocheng Yu, Duncan McIntire, Zhaoshan Chang, Richard J. Goldfarb
- P.035 **High- and Intermediate-Sulfidation Mineralization in the Carmen Quartz-Pyrite-Gold (QPG) Deposit, Mankayan District, Northern Luzon, Philippines**
Yi Sun, Leonardo L. Subang, Lejun Zhang, Angela Escolme, David R. Cooke, Jing Chen
- P.036 **Ages and Sources of the Shear Zone-Hosted Taldybulak Levoberezhny Gold Deposit, Tien Shan, Kyrgyzstan**
Xiaobo Zhao, Chunji Xue, Nikolay Pak
- P.037* **The Emigrant Pass Volcanic Field: Petrologic Constraints on Magmas That May Have Contributed to Eocene Mineralization along the Carlin Trend**
Nansen Herman Olson, John H Dilles, Christopher D Henry
- P.038* **Ore and Breccia Classification of the GW Orebodies of the Balatoc Diatreme, Acupan Gold Deposit, Philippines**
Acer Jian Figueroa, Jillian Aira Gabo-Ratio, Ryohei Takahashi, Aljess Ramos

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Methods and General Metallogenic Concepts for PCD and Other Deposits

- P.039 **Rhenium and Osmium Isotope Zoning: Implications for the Use of Molybdenite as a Single Mineral Geochronometer**
Fernando Barra, Artur Deditius, Martin Reich, Matt R Kilburn, Paul Guagliardo, Malcolm P Roberts
- P.040 **Developing the Structural Model: A New Approach to an Age-Old Problem**
Cameron Bartsch, Tony Gilman
- P.041 **Apatite and Titanite Characteristics of Porphyry Fertile Plutons**
Farhad Bouzari, Craig J.R. Hart, Thomas Bissig, Guillaume Lesage
- P.042* **Geochemical Discrimination of Igneous Zircon Associated with Iron Oxide Copper-Gold Alteration**
Adrienne Brotodewo, Caroline Tiddy, Diana Plavsá, Adrian Fabris, David Giles
- P.043 **Application of Singular Value Decomposition (SVD) to the Extraction of Gravity Anomalies Associated with Mineralisation Within the Bozhushan Ore Field, Southwestern China**
Yongqing Chen, Lingfen Guo, Binbin Zhao



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Freeport-McMoRan Exploration

- P.044 **Multielement Geochemical Data Missing Value and Below Detection Limit Imputation**
Matthew J. Cracknell, Michael J. Baker, David R. Cooke, Angela Escolme
- P.045 **Creation of Mobile Computing Tool for Geology Exploration**
Juan Pablo Elliott, Anell Greysy Burga
- P.046* **Machine-Learning Applications for Cluster Analysis of Bushveld Granites and Targeting of Associated Mineralisation**
John Paul Hunt
- P.047 **Lumping Geology Units in Drill Holes for Simplified 3-D Modeling: Case Studies from Ni-Cu-(PGE)-Hosting Layered Intrusions**
Margaux Le Vaillant, E. June Hill, Stephen J. Barnes
- P.048 **Spatial and Temporal Controls on Mineral Systems**
Sandra Occhipinti, Vaclav Metelka, Mark Lindsay, Fariba Kohanpour, Alan Aitken
- P.049 **Detail and Context: Value from Core-Scale Micro-XRF Mapping**
Mark Pearce, Louise Fisher, Chris Ryan, Gareth Moorhead, Robin Kirkham
- P.050 **Combined Potential Field and Airborne Electromagnetic Interpretation to Unravel the Geological History of the Curaçá Valley Region, Bahia, Brazil**
Pablo A Letelier Meza, Scott Napier, James Reid, Glenn Pears, Pablo Mejia-Herrera, *Jean-Philippe Paiement*
- P.051* **Automated Mineral Classification from Hyperspectral Data Through Semantic Segmentation**
Angela Afonso Rodrigues, Laurent Ailleres, Robin Armit, Matthew Cracknell, Peter Betts, Evan Orovan, Anthony Harris, Mary Harris, David Cooke, Cassady Harraden

- P.052 **Loop: The Next Generation 3-D Geological and Geophysical Modeling Platform**
Laurent Ailleres, Mark W. Jessell, Eric de Kemp, Guillaume Caumon, Florian Wellmann, Lachlan Grose, Robin Armit, Mark Lindsay, Jeremie Giraud, Boyan Brodaric, Matthew Harrison, Gabriel Courrioux
- P.053 **Use of Ambient Noise Surface Wave Tomography in Mineral Exploration**
Dan Hollis, John McBride, Richard Lynch, *Nicholas Arndt*, Florent Brenguier, Sophie Beaupretre, Malgorzata Chmiel, Aurelien Mordret, Frank Santaguida, Dan Chisholm, Rosemary Fayjaloun, Phil Dales
- P.054* **Hyperspectral Mineral and Chemical Characterization From μ -XRF and Machine Learning: Applications to Carlin-Type Gold Deposits**
Rocky Devon Barker, Shaun Barker, Matthew J Cracknell, Geoffrey Holms, Elizabeth Stock
- P.055 **Virtual Minerals Education: Progress and Potential**
Michael Roach, Robert Scott
- P.056 **Role of Chalcophile Elements' Dual Behavior in Ore-Genesis Interpretation and Mineral Exploration**
Azam Soltani Dehnavi
- P.057 **Integrated Downhole VNIR-SWIR and TIR Hyperspectral Mineralogy and Geochemistry for Defining Lithostratigraphy and Alteration**
Jessica Stromberg, Mark Pearce, Sam Spinks
- P.058 **Spectral Properties of Sulphate Minerals in VNIR-SWIR and TIR Wavelengths: Implications for Minerals Systems from Exploration and Mining to Remediation**
Jessica Stromberg, Jon Huntington

- P.059* **Regional Public Data Sets as Tools for Unveiling Poorly Explored Mineral Potential in Paleoproterozoic Gold Provinces in Brazil**
Leandro Duarte Campos
- P.060 **The Optimal Pathways Leading to Earthquake-Enhanced Gold Precipitation in the Epithermal Environment**
Pablo Sanchez-Alfaro, Irene Wallis, Martin Reich, Pablo Iturrieta, Pamela Perez-Flores, José Cembrano
- P.061* **Trace Element Hygrometry and Barometry of Porphyry-Forming Magmas**
Simon Dahlstrom, *Jon Blundy*, Lena Melekhova, Bob Loucks, Frances Cooper
- P.062 **Mapping Potassic Alteration in Porphyry Cu Deposits: An Integrated Approach Using Hyperspectral Techniques and Multielement Analyses**
Cari Deyell, Britt Bluemel
- P.063* **Breccias in Subvolcanic and Porphyry Copper Systems**
Richard J Turley, Alison C Rust, Jon D Blundy, *Damaris Butters*
- P.064 **A New Sulfur-in-Apatite Oxybarometer for Magmatic and Magmatic-Hydrothermal Systems**
Jackie Wrage, Brian A. Konecke, Adrian Fiege, Adam C. Simon, Stefan Linsler, Francesco Vetere, Francois Holtz, Harald Behrens
- P.065 **Geochemical Indicators of Orogenic Compressive Stress in Datable Igneous Rocks, with Implications for Porphyry Copper Ore Genesis and Exploration Targeting**
Robert Loucks, Marco Fiorentini

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- P.066* **The Importance of LA-ICP-MS Imaging for Zircon-Based Fertility Studies**
Christopher Leslie, Sebastien Meffre, David Cooke, Jay Thompson, Ned Howard

Porphyry Copper Deposits – South America

- P.067* **Platinum Group Elements as a Fertility Indicator in the Supergiant Rio Blanco Cu Porphyry Deposit, Central Chile**
Yamila Cajal, Ian Henry Campbell, Claudio Martínez
- P.068* **Can Zircon Trace Elements Correlate Whole-Rock Fertility Indicators for Porphyry-Copper Deposits? Application of a New Zircon Oxybarometer at El Teniente District**
Gonzalo Javier Henriquez, Robert R Loucks, Marco L Fiorentini, Charlotte M Allen
- P.069 **Sulfur-Rich Ore Forming Magmas: Evidence from Anhydrite and High-Sulfur Apatite Inclusions**
Michael C Hutchinson, John H Dilles, Kalin Kouzmanov
- P.070 **Discrimination of Magmatic-Hydrothermal Deposit Types Using Epidote ICP-MS Trace Element Chemistry**
Michael Baker, David R Cooke, Jamie J Wilkinson, Huayong Chen, Clara Wilkinson, Peter Hollings, Zhaoshan Chang, Nathan Fox, Jennifer Thompson
- P.071* **Copper-Gold Fertility Insights: Platinum Group Elements Geochemistry from Polo Sur and Penacho Blanco, Centinela District, Northern Chile**
Carlos I. Carrasco-Godoy, Ian H. Campbell

- P.072 **A New Model for the Structural Controls on the Emplacement of Porphyry Cu \pm Mo \pm Au Deposits**
Jose Piquer, Pablo Sanchez, Pamela Perez-Flores
- P.073 **Updating the Andean Porphyry Copper Alteration Model: Integrating Hyperspectral Core Imaging Data and Applying Machine Learning Methodologies to Start the Conversation**
Sam Scher, Tom Carmichael, Brenton Crawford, Ronell Carey, Brigitte A Martini
- P.074 **Evidence for an Early to Middle Eocene (50-42 Ma) “Pre-Incaic” Tectonic Phase in the El Peñon and Augusta Victoria Area (69°30’-69°15’, 24°00’-24°30’), Northern Chile**
Natalia Astudillo Leyton, Rodolfo Ferrando, Diego Montecino, Carlos Venegas
- P.075 **Exploradora Project, Eocene-Oligocene Chilean Belt: Update**
Eduardo F Bello, Rafael N Diéguez, Juan C Toro
- P.076 **Stable Isotope Characteristics of Prograde Hydrothermal Alteration at Cerro Colorado Porphyry Cu (-Mo) Deposit, Northern Chile**
Farhad Bouzari, Alan H. Clark
- P.077 **Apatite at La Granja Cu-Mo Porphyry, Peru**
Emily Brugge, Jamie J Wilkinson, Andrew Miles
- P.078 **Geochemical Analysis of Zircon-Hosted Melt Inclusions from the Escondida Porphyry Copper Deposit, Chile**
Damaris Butters, Jon Blundy, Brian Tattitch, Tim Stockhausen

P.080* **Occurrence and Distribution of Silver in the World-Class Río Blanco Porphyry Cu-Mo Deposit, Chile**

Jorge Crespo, Martin Reich, Fernando Barra, Juan José Verdugo, Claudio Martínez

P.081 **Magmatic Textures and Hydrothermal Alteration Assemblages of the Paleoproterozoic Porphyry and Epithermal Systems in the Tapajós-Xingu Mineral Provinces**

Bruna De Freitas, Caetano Juliani

P.082 **Structural Geology of the Porphyry Copper Deposits of El Abra-Fortuna Batholith, Chile**

John H Dilles, Andrew J Tomlinson

P.083 **New Structural Insights from the Yabricoya Porphyry: “Reverse Graben” Architecture Masked Within an Uplifted Tectonic Pillar and Their District Exploration Consequences**

Thomas Eggers, Guillermo Fuentes



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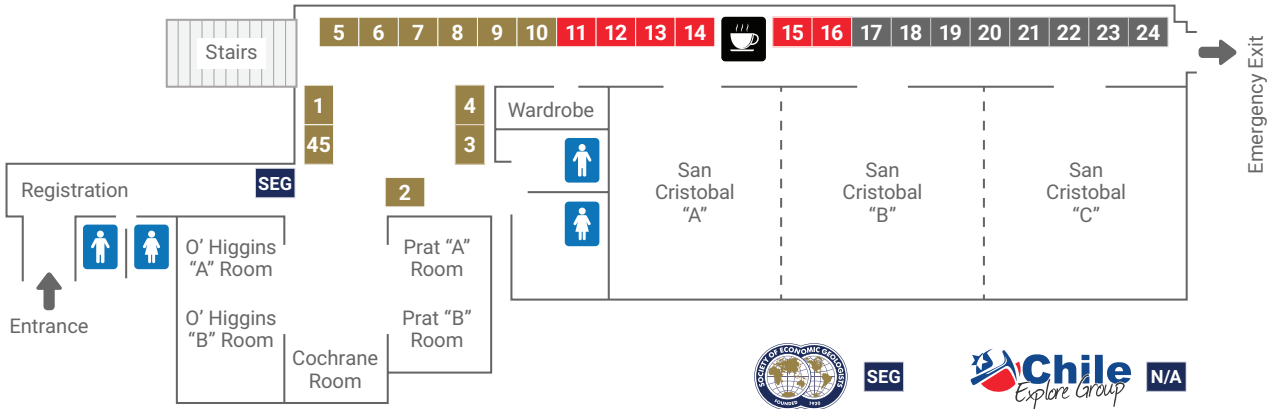


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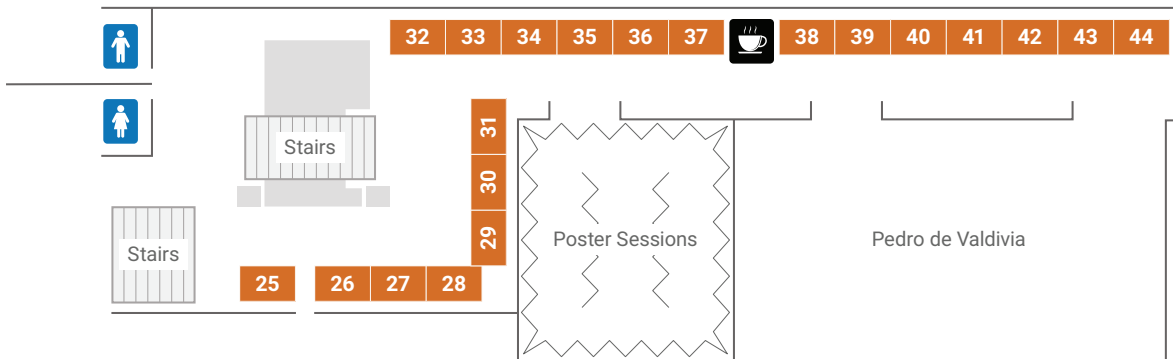
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Abstracts Deadline: March 31, 2020

Plan to attend a grand celebration in Whistler, British Columbia, for SEG's 100th anniversary. We will showcase the scientific accomplishments and mineral discoveries that have defined the past 100 years and the new science, technology, and thinking that will guide us into the next century. Be with us to forge the future as we build on past successes!

The technical program will evolve around six major themes:

- ***Game Changers: The First Hundred Years***
- ***Lindgren's Legacy: Ore Deposits in Depth***
- ***Gold 2020: Golden Past, Precious Future***
- ***Basins Through Time:
Linking Process and Ore Systems***
- ***Ore Deposit Structure:
Processes, Patterns, and Innovations***
- ***2020 Vision: The Next Hundred Years***

Welcome to Whistler!

Join us at the Whistler Conference Centre to learn, discuss, and inspire. We will host the global mineral exploration community, including industry, academia, government, early career professionals, and students, to a program of exceptional technical sessions and posters, field trips, and workshops in this world-class resort and spectacular mountain setting.

Be sure to mark this one on your calendar for 2020!

Gerry Carlson, *Pacific Ridge Exploration, SEG 2020 Chair*
Brian Hoal, *Executive Director, Society of Economic Geologists*

SEG2020.org

