Following on from previous symposia, the Australian Centre for Geomechanics looks forward to hosting Ground Support 2019 in Canada. The International Ground Support Symposia have been a fundamental platform for advancing ground support excellence in mining and underground construction for over 35 years. It has been more than 25 years since this symposium was held in Canada and we are delighted to return to Sudbury!

Symposium Themes

- Rock mass classification
- Modelling and field verification
- In situ and laboratory testing
- Ground support for seismic conditions and dynamic testing
- Rockfalls and failure mechanisms
- Support design methods (mining and civil engineering)
- Risk and performance assessment
- Surface support
- Ground support corrosion
- Ground support in caving
- Analytical (non-empirical) principles and methods for shotcrete support design
- Ground support monitoring
- Ground support quality control

See inside for list of 70+ accepted abstracts!

Previous Ground Support Symposia

1st 1983 Abisko, Sweden
2nd 1992 Sudbury, Canada
3rd 1997 Lillehammer, Norway
4th 1999 Kalgoorlie, Australia
5th 2004 Perth, Australia
6th 2008 Cape Town, South Africa
7th 2013 Perth, Australia
8th 2016 Luleå, Sweden

Keynote speakers include:

Peter Andrews
VP and Group Head of Geotechnical, Gold Fields Australia Pty Ltd

Dr Mark Board
Vice President – Technical Services, Hecla Limited, USA

Frédéric Mercier-Langevin
General Manager Goldex Complex, Agnico Eagle Mines Ltd., Canada

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Professor Weishen Zhu
Shandong University, China

TUESDAY | 22 OCTOBER

Time Dependent Processes in Ground Support Workshop

WEDNESDAY | 23 OCTOBER

Ninth International Symposium on Ground Support in Mining and Underground Construction

THURSDAY | 24 OCTOBER

FRIDAY | 25 OCTOBER

Symposium Dinner

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**KEYNOTE ADDRESS:** Ground support from a corporate perspective M Board, Hecla Limited, USA

**KEYNOTE ADDRESS:** Ground support – a mine manager’s perspective F Mercier-Langevin, Agnico Eagle Mines Ltd., Canada

Dynamic bolt development and application in ultra deep mechanised mining R Abreu, New Concept Mining, South Africa; J Ekkerd, S Potgieter, Gold Fields South Africa, South Africa; P Andrews, Gold Fields Australia Pty Ltd

Explicit discrete fracture network numerical analyses of the stability of underground stope and effects of cablebolt support at Mine Raglan P Andrieux, T Lavioe, S Guido, A2GC, Canada; R Caumartin, Glencore Canada, Canada

Dynamic testing of a surface support system R Brändle, Geobrugg AG, Switzerland; RL Fonseca, Geobrugg Ibérica S.A., Spain

Stability assessment of initial shotcrete lining using a 2D continuum modelling approach N Bahrani, S Naseri, Dalhousie University, Canada

Application of the Geological Strength Index in Peruvian underground mines: retrospective 18 years after its implementation LAM Camones, Mine Design Engineering Inc., Canada; CC Nuñez, Pan American Silver Peru, Peru

Modelling the response of reinforcement elements during dynamic loading LYM Cardona, J Valleses, Universidad de Chile, Chile

Challenges of mining in large deformation underground mines: CSA Mine case study B Chapula, Glencore, Australia; M Sharifzadeh, Western Australian School of Mines, Australia

Analysis of in situ and laboratory corrosion coupons AJ Chambers, CB Sunderland, CC Clark, MJ Powers, National Institute for Occupational Safety and Health, USA

Microbiologically induced corrosion in underground mines H Chen, O Kimyon, HL Ramandi, A Crosby, S Soydam, University of New South Wales Sydney, Australia

Evolution of a dynamic support system at Vale’s Copper Cliff mine: case studies DR Chinnaswamy, A Breckon, R Savignac, Vale Canada Ltd, Canada

Rockbolting advances at the Vanscoy Mine, Saskatchewan T Coleman, SRK Consulting (Canada) Inc., Canada; D Neely, Nutrien Vanscoy Mine, Canada

Support design validation and the need for a multi-faceted approach L Costeta, R Brummer, T Katsoga, B Paudel, Itasca Consulting Canada Inc., Canada

Laser-based scanning to manage geotechnical risk in deep mines DB Counter, Glencore Canada Corporation, Canada

Development of a single-pass detailed damage mapping application D Cumming-Potvin, Y Potvin, J Wesseloo, P Harris, M Heinsen Egan, S Tierney, Australian Centre for Geomechanics and The University of Western Australia, Australia; C. Ho, Australia

Technologies of ground support monitoring in block caving operations T Dawn, W Conrad, M van Balkom, Cany Systems, USA

Practical methods of assessing ground control hazards in the workplace AP Dirige, Workplace Safety North, Canada

Corroded rock support issues – implementation of an investigation and rehabilitation program J Dorion, Glencore Canada Corporation, Canada

Raiseboring in difficult rock conditions C Edelbro, Itasca Consultants AB, Sweden; R Brummer, Itasca Consulting Canada Inc., Canada; M Pierce, Pierce Engineering, USA; D Sandström, Bolden Mineral AB, Sweden; J Sjöberg, Itasca Consultants AB, Sweden

Shotcrete behavior under dynamic loads and early strength development for rapid mine development F Erisman, M Hanson, Sika, Switzerland

Ground support challenges in arctic mining conditions V Falmagne, N St-Onge, Agnico Eagle Mines Ltd, Canada

A comparison between load distributions of support elements measured in the laboratory and in situ using optical fiber strain sensing B Forbes, Queen’s University, Canada; N Vlachopoulos, Royal Military College of Canada, Canada; MS Diederichs, Queen’s University, Canada; AJ Hyett, YieldPoint Inc., Canada

Evaluation of ground support design at Eleonore Mine using bonded block model T Garza-Cruz, L Bouzeran, Itasca Consulting Group Inc., USA; M Pierce, Pierce Engineering, USA; A Jalbout, M Ruest, Goldcorp Inc., Canada

About the likely performance of ground support systems submitted to dynamic loading D Goudreau, Newmont Mining Corporation, Canada

Advanced geotechnical monitoring technology to assess ground support effectiveness L Gélinas, V Falmagne, B Béard, Agnico Eagle Mines Ltd, Canada; O Matte, Université Laval, Canada

Quality control and quality assurance of resin rebar installation at the Tanco Mine, Manitoba, Canada O Gibbons, CE Lee, SRK Consulting (Canada) Inc., Canada

Review of seismic and geomechanics hazard, Uchucchacua Mine, Peru M Gonzalez, Mirarco Mining Innovation, Canada; R Beltran, Buenaventura Company, Peru

Identification of critical seismic parameters contributing to high demand on ground support element at LaRonde Mine G Sasseville, A Jalbout, M Ruest, Goldcorp Inc., Canada

Forensic investigations of ground control failures J Hadjigeorgiou, University of Toronto, Canada

The evaluation of rockbolt as rock support in underground gold mine, Pongkor, West Java, Indonesia PN Hartami, S Supriyadi, Trisakti University and Syarif Hidayatullah State Islamic University, Indonesia; L Lillian, Trisakti University, Indonesia; R Pratama, PT Aneka Tambang Tbk, Indonesia

Limitations of standard analytical methods of shaft design N Hentrich, S Block, DS Calderén, DMT GmbH & Co. KG, Germany

A framework for extracting value from ground movement and support monitoring data AJ Hyett, YieldPoint Inc., Canada; BJ Forbes, Queen’s University, Canada

A case study of design and performance of diaphragm wall braced with struts for deep excavation S Isphal, G Dora, M Naeem, Ammicco Contracting Co., Qatar

Geomechanical approach to design the lower mine’s material handling system at Eleonore Mine G Sasseville, M Goren, Université Laval, Canada; P Morisette, Agnico Eagle Mines Ltd., Canada

Rehabilitation and recovery methods for converged drawpoints C Kamp, New Gold Inc., Canada

Preloaded dynamic testing of rockbolts G Knox, New Concept Mining, South Africa

Ground support applications at Vale’s Coleman Mine D Landry, E Reimer, Vale Canada Limited, Canada

Evolution of the support systems and support practices in high-stress conditions at Vale’s Creighton Mine F Malek, M Yao, Vale Canada Ltd., Canada

Development and application of new artificial expandable pillars for ground support in hard rock mining Y Li, Northeastern University, China

Improvements in the numerical modelling of dynamic testing for reinforcement and retaining elements used in underground excavations E Mambino, J A Valleses, L Burgos, University of Chile, Chile; C Gonzalez, MIRARCO Mining Innovation, Canada

Suppression of spalling risk by confinement and engineered rock mass damage A McDonald, Golder Associates Ltd., Canada; SD McKinnon, Queen’s University, Canada

*As of 19 March 2019. Accepted abstracts list is subject to change. For updates, please visit www.groundsupport2019.com*
Relating measured rock mass deformation to support load  
D Milne, University of Saskatchewan, Canada

Barcelona test as an alternative method for the fiber reinforced shotcrete quality control  
V Monteiro, F Silva, Pontifical Catholic University of Rio de Janeiro, Brazil;  
F Pereira, A da Silva, AngloGold Ashanti, Brazil

Managing the seismic risk in development headings below 3 km depth at the LaRonde Mine  
P Morissette, P Turcotte, Agnico Eagle Mines Limited, Canada

Finite element analysis of the Superbolt under dynamic loading  
B Nguyen, M Cai, K Challagulla, Laurentian University, Canada

Evaluating the application of empirical GSI correlations and conversions based on Q’ and RMR parameters for varying ground conditions  
Palleske, K Kalenchuk, Mine Design Engineering, Canada; M Diederichs, Queen’s University, Canada

Control of rock mass conditions and deformations in underground workings and shafts with new measurement and monitoring systems  
S Peters, T Gorka, DMT GmbH & Co. KG, Germany

Towards optimising ground support systems in underground mines  
Y Potvin, Australian Centre for Geomechanics and The University of Western Australia, Australia;  
J Hadgegeorgiou, University of Toronto, Canada; J Wesseloo, Australian Centre for Geomechanics and The University of Western Australia, Australia

Planning for corrosion of ground support in cave mines  
R Preston, J Roy, R Bewick, Golder Associates Ltd., Canada

High-tensile steel rolled mesh applications for ground support  
Pritchard, Pritchard Mining Technologies Inc., USA; E Rorem, Geobrugg North America; USA

Monitoring the consumption of deformation capacity due to seismic loading  
D Rebuli, S Meyer, Institute of Mine Seismology, Canada

Development of a new cementitious grout for permafrost conditions  
S Reny, W Clements, J Peña Cruz, King Packaged Materials Company, Canada

Development of a new Sandvik little brother dynamic rockbolt and the in situ dynamic evaluation of bolts  
W Roach, M Rataj, B Darlington, Sandvik Mining and Rock Technology, Australia

Polyester resin injection of dynamic resin and cable bolting systems to improve development efficiency  
T Roberts, Jennmar Australia; D Faulkner, Jennmar Corporation, USA

Design, testing and application of geofabric face mesh  
T Roberts, Jennmar Australia, Australia; L Morizzi, BHP, Australia; A Dodds, Jennmar Australia, Australia

Laboratory testing of rockbolts under static shear-tension  
R Royer, D MacDonald, K Judge, S Gaines, Natural Resources Canada, Canada

Numerical investigation of shotcrete-rockbolt arches  
D Saiang, Luleå University of Technology, Sweden; A Nystöm, Boliden Minerals AB, Sweden; P Zhang, Luleå University of Technology, Sweden; M Larsson, Boliden Minerals AB, Sweden

Geotechnical block modelling for the 3D visualisation of rock mass quality for the Kipushi project  
D Sewnum, M Wanless, W Joughin, SRK Consulting South Africa, South Africa

The evolution and performance of the Henderson Mine’s C-arch shotcrete drawpoint support  
Nl Shea, Climax Molybdenum, USA

A comprehensive review of mining practices in surface support – an international survey  
G Shekhar, H Schunnnesson, A Gustafson, Luleå University of Technology, Sweden

Improving the safety and lowering the cost of ground support operations by using LiDAR to measure the thickness of sprayed shotcrete  
K Smillie, GeoSLAM Ltd., UK

Microseismic analysis techniques following large events for better understanding of stress release and transfer  
L Smith-Boughner, Y Abolfazlzadeh, J Leslie, Z Anderson, ESG Solutions, Canada

Portal design – updated practices  
R Stephenson, M Sandy, AMC Consultants Pty Ltd, Australia

A new paradigm in ground support monitoring through ultrasonic monitoring of clusters of rock bolts  
S Sun, K-T Wu, SE Kruger, D Levesque, D Gagnon, Y Quenneville, R Lacroix, R Royer, Natural Resources Canada, Canada

Mining initiative on ground support and equipment: 12 years of accomplishments  
G Swan, Rock Tech Centre AB/Migs Consortium, Sweden; J Hedlin, Rock Tech Centre, Sweden

Numerically designing a combined yielding support for coal burst control  
F Tahamsebinia, C Zhang, I Canbulat, S Suydam, University of New South Wales Sydney, Australia

Shotcrete at the new Afton Mine – an overview  
Z Todorovic, New Gold Inc., Canada

Forecasting and quantifying rock mass damage in underground mining  
A Vakili, Mining One Consultants Pty Ltd, Australia; P Fuller, Dalmour Pty Ltd, Australia; B Roache, Mining Consultants Pty Ltd, Australia

Utilising databases and 3D visualisation software to accurately track and monitor underground support and upgrade requirements  
K Veltin, A Pakula, D Kennard, R Preston, Golder Associates Ltd., Canada

Recovery methodology for the northern mining block at Cliffs Nickel Mine  
AE Vidal da Silva, M Hopkins, A Mutale, E Nezomba, BHP Nickel West, Australia

The value of ongoing quality assurance in the form of support testing and quality control during mining support processes  
N Viljoen, B Murphy, SRK Consulting (Canada) Inc., Canada

Numerical analysis of dynamic response of underground opening in jointed rockmass  
S Warema, E Nordlund, C Yi, S Shirzadegan, P Zhang, Luleå University of Technology, Sweden

3DEC numerical modelling of rockburst damages event in Kilirunavaara Mine  
S Warema, E Nordström, E Nordlund, S Dineo, Luleå University of Technology, Sweden

Ground support design for weak rock mass – predicting and managing time-dependent closure in squeezing ground  
S Warren, K Dehn, L Martin, National Institute of Occupational Safety and Health, USA; L Sandbok, Barrick Gold Corporation, Turquoise Ridge Joint Venture, USA; C Barnard, Golder Associates, USA; M Rutford, RESPEC, USA; R Pakalnis, Pakalnis and Associates and University of British Columbia, Canada

Numerical investigation of the dynamic response of a rockbolt under drop testing and real seismic loading conditions  
P Zhang, E Nordlund, Luleå University of Technology, Sweden

Numerical modelling and laboratory verification of new deformation-controlled rock bolt  
Y Yokota, Kaijima Technical Research Institute Singapore, Kaijima Corporation, Singapore; Z Zhao, W Nie, Nanyang Technological University, Singapore; K Date, K Iwano, Y Koizumi, Y Okada, Kaijima Technical Research Institute, Kaijima Corporation, Singapore

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22 October 2019 | Sudbury, Canada

Workshop Facilitators

**Professor John Hadjigeorgiou**
Pierre Lassonde Chair in Mining Engineering
University of Toronto, Canada

Professor Hadjigeorgiou holds the Pierre Lassonde Chair in Mining Engineering at the University of Toronto. John has over 25 years of extensive mining experience from both academia and industry, having served as a technical adviser to mining operations worldwide.

**Dr Marty Hudyma**
Associate Professor
Laurentian University, Canada

Marty Hudyma is an Associate Professor at Laurentian University in Sudbury, Ontario, Canada. Marty has worked for Noranda Minerals, Brunswick Mining, Mount Isa Mines, the Australian Centre for Geomechanics and Itasca Consulting Canada Inc.

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