### Table of contents / Table des matières

<table>
<thead>
<tr>
<th>Organization of the Conference</th>
<th>iv</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface/Préface</td>
<td>v</td>
</tr>
</tbody>
</table>

#### 1. MINERAL EXPLORATION

| Modélisation des gîtes d'or du district de Rouyn-Noranda (Abitibi): Des mesures structurales aux cartes paléobarométriques prévisionnelles | 1 |
| M. Jébrak, P. Holyland, A. Carrier & J. Angelier |

| G. Chi & J. Guha |

| Power-Laws Versus Lognormal Models in Mineral Exploration | 17 |
| F.P. Agterberg |

| A Spatial Analysis Method for Geochemical Anomaly Recognition | 27 |
| Q. Cheng, F.P. Agterberg & F.G. Bonham-Carter |

| Fractal Lognormal Percentage Assessment of Porphyry Copper Resources | 37 |
| R.A. Crovelli, S.B. Suslick, D.A. Singer & R.H. Balay |

#### 2. MINERAL ECONOMICS

| An Optimized 2D Model of Complex Mine Feasibility Studies using the DMV Method | 46 |
| S. Frimpong & J.M. Whiting |

| Simulation of a Mine Accounting System | 56 |
| X. Tang & J. Elbrond |

| The Mine Manager -- An Application of Computer Gaming to Mineral Project Decision Making | 67 |
| J.E. Allison, M.L. Bilodeau, R.G. Dimitrakopoulos |

| An Option Pricing Analysis of the 1990 Capital Structure of East Rand Proprietary Mine | 77 |
| M.R. Samis |

#### 3. GEOSTATISTICS AND ORE BODY MODELING

| Random Kriging: A Useful Tool in the Case of Unsurveyed Drill Holes | 87 |
| G.W. Verly |

| Unsmoothed Estimation with Dense Secondary Information Using Probability Field Technique | 95 |
| G. Bourgault & A.G. Journel |
4. OPERATIONS RESEARCH

Design and Simulation of an Underground Haulage System using SLAM II
S. Frimpong & J.M. Whiting

Economic Optimization of Stope Geometry Using Separable Programming with Special Branch and Bound Techniques
J. Ovanic & D.S. Young

Shave Off Grade Instead of Cut Off Grade
J. Elbrond, A.H. Harb, N. Sisto & X. Tang

5. MINE PLANNING

A Modified Network Flow Algorithm for Pit Limit Optimization
Y.D. Jiang

L.D. Pareja & C.W. Pelley

Geometric Modelling for Mining Dilution Control.
D. Cauppers, L. Guerreiro, J.P. Rodrigues, J. Almeida & A. Soares

6. ROCK MECHANICS

COAL MINING GROUND CONTROL

Optimizing Seismic Characterization of Longwall Coal Mine Overburden Using CAD and Computer-Enhanced Techniques: Case Study From Longwall Mining Operations, Western Maryland, U.S.A.
K.K. Cohen, M.A. Trevits & D. Rudenko

Nonlinear Approach for Determining Design Criteria for Yield Pillar Performance
W.C. Smith, D.R. Dolinar & K.Y. Haramy

Application of Numerical Modeling to the Analysis of Strata Interactions
H. Maleki, R.W. Mckibbin, F. M. Jones & R.A. Wheeler

Overview of Recent Developments by USBM in Coal Mine Design Using Numerical Modeling Techniques.

Development of a Discrete Element Code for Mine Modeling
S.M. Oelfke & G.G.W. Mustoe
Geostatistical Techniques and Multiple Parameter Mapping for Ground Control in Mining
J. Riefenberg

Application of Computer Models to Underground Coal Mine Design in the Sydney Coalfield, Nova Scotia
P. Cain

ROCKBURSTING

Tunnel Stability Assessment During Rockbursts
P. Vasak & P.K. Kaiser

M.A. Heib, P. Bigarre, J.P. Josien & Y. Guise

Finite Element Model for the Outbursts in Underground Mines
X. Chen, K. Barron & D. Chan

3D GEOMECHANICAL MODELS

Energy Considerations in Geomechanical Mine Design.
M. Grabinsky, B. Corkum, J. Curran & V.N. Kazakidis

3D Finite Element Modelling of Mine-and-Fill Sequences
H. S. Mitri, L. Zhang & K. Fotoohi

Coupled 3D FE Modelling of Mining in Wet Ground
W.G. Pariseau

OPEN PIT GEOMECHANICS

Modelling of Gravity Changes in Mining Areas
A. Szostak-Chrzanowski, A. Chrzanowski & E. Popiolek

Slope Stability of the Eastern Wall of Copper Mountain Open Pit Mines, Gaspé, Québec
N. Feknous, R. Simard, J. Sarraïlh, H.S. Mitri & G. Morin

Stability Analysis of an Open Pit Wall Using the Limit Equilibrium Method
L. Turgeon, M. Aubertin & Y. Beauchamp

GROUND SUPPORT

Finite Element Modeling Study of a Cable Bolt Support System Installed in a Longwall Coal Mine in Western Colorado.
V.R. Shea-Albin, D.R. Dolinar & S.C. Tadolini

Simulation numérique du remblayage d'un chantier de mine avec du remblai hydraulique cimenté: élaboration du modèle
J. Ouellet, B. Bussière & G. Gagnon
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reducing the Amount of Cement in Backfilled Stopes.</td>
<td>340</td>
</tr>
<tr>
<td><strong>M.H. Leite, R. Corthesy, D.E. Gill &amp; G. Beaupré</strong></td>
<td></td>
</tr>
<tr>
<td>A Preliminary Assessment of Mechanical Characteristics of Stiff Backfills Under Confinement</td>
<td>348</td>
</tr>
<tr>
<td><strong>B. Arjang &amp; G. Swan</strong></td>
<td></td>
</tr>
<tr>
<td>Stability of Mine Backfilled Stopes in a Faulted Rock Mass</td>
<td>355</td>
</tr>
<tr>
<td><strong>K. Fatoohi &amp; H. S. Mitri</strong></td>
<td></td>
</tr>
<tr>
<td><strong>SOFT ROCK</strong></td>
<td></td>
</tr>
<tr>
<td>Real Time Geomechanical Monitoring at the Waste Isolation Pilot Plant</td>
<td>362</td>
</tr>
<tr>
<td><strong>J.L. Francke, R.C. Carrasco, R.E. Lewis &amp; D.E. Mathieu</strong></td>
<td></td>
</tr>
<tr>
<td>Estimation of Surface Subsidence at the Waste Isolation Pilot Plant</td>
<td>370</td>
</tr>
<tr>
<td><strong>C.A. Givens, M.A. Valdivia, S. Saeb, C.T. Francke &amp; S.J. Patchet</strong></td>
<td></td>
</tr>
<tr>
<td><strong>UNDERGROUND MINING</strong></td>
<td></td>
</tr>
<tr>
<td>Application of the Inactive Mines Database</td>
<td>380</td>
</tr>
<tr>
<td><strong>J.B. Vance, J.R. Walmsley &amp; M.C. Bétournay</strong></td>
<td></td>
</tr>
<tr>
<td>Stability Assessment of an Inactive Mine Using the Block-Spring Model</td>
<td>390</td>
</tr>
<tr>
<td><strong>B. Wang, Y.S. Yu &amp; T. Aston</strong></td>
<td></td>
</tr>
<tr>
<td>Obtaining Quality Cavity Monitoring Survey Data</td>
<td>400</td>
</tr>
<tr>
<td><strong>S.G.L. Mah, R.T. Pakalnis, R. Poulin &amp; L.M. Clark</strong></td>
<td></td>
</tr>
<tr>
<td>Predicting Joint Behaviour Using Artificial Neural Networks</td>
<td>408</td>
</tr>
<tr>
<td><strong>J. Hadjigeorgiou, J.S. Lessard &amp; F. Flament</strong></td>
<td></td>
</tr>
<tr>
<td>Numerical Modeling of Caving Using Continuum and Micro-Mechanical Models</td>
<td>416</td>
</tr>
<tr>
<td><strong>L.J. Lorig, M.P. Board, D.O. Potyondy &amp; M.T. Coetzee</strong></td>
<td></td>
</tr>
<tr>
<td>An Algorithm for Designing Mine Pillars with the Convergence-Confinement Method</td>
<td>426</td>
</tr>
<tr>
<td><strong>D.E. Gill &amp; M.H. Leite</strong></td>
<td></td>
</tr>
<tr>
<td>Evaluation of Field Properties and Stress Condition by Displacement Back-Analysis Using Boundary Element Principle</td>
<td>436</td>
</tr>
<tr>
<td><strong>D. Zou</strong></td>
<td></td>
</tr>
<tr>
<td>Numerical Modelling as a Tool for Stability of Shallow Stopes of Hard Rock Mines</td>
<td>446</td>
</tr>
<tr>
<td><strong>M.C. Bétournay &amp; H.S. Mitri.</strong></td>
<td></td>
</tr>
<tr>
<td>FE Simulation of Central Pillar Mining at the Homestake Mine</td>
<td>456</td>
</tr>
<tr>
<td><strong>J.C. Johnson, M.E. Poad, M.J. Stahl &amp; W.G. Pariseau</strong></td>
<td></td>
</tr>
<tr>
<td>Numerical Modelling of Ground Deformation Associated with Mining of Steep Tabular Orebodies</td>
<td>464</td>
</tr>
<tr>
<td><strong>E. Eberhardt, D. Stead &amp; M.J. Reeves</strong></td>
<td></td>
</tr>
</tbody>
</table>
Finite Element Analyses for the Interpretation Model of the 3D Borehole Slotter

G. He, R. Corthésy, D.E. Gill, M.H. Leite & H.H. Kanduth

7. MINING GEOPHYSICS

The Introduction of Continuous Seismic Monitoring at Mt. Charlotte Gold Mine

P.A. Mikula.

Three-Dimensional Imaging of Underground Mine Structures Using Geophysical Tomography with Tests for Resolution and Robustness

M.J. Jackson, M.J. Friedel, D.R. Tweeton, D.F. Scott & T. Williams

Seismic Modelling of the McConnell Orebody, Sudbury Basin

R.A. Borsato

Use of Seismic Density Analyses in Burst-Prone Mines

V.N. Kazakidis, A.R. Punkkinen, T.J. Villeneuve & B.T. Corkum

8. ROCK FRAGMENTATION

Numerical Modelling of the Stress-Field around Nested Blastholes

R. Yang & B. Mohanty

Digital Imaging of Blasting Process in Field

S.H. Chung

SHOTPlus Blast Designer

J.P. Tidman & B.H.A. Brown

NBLAST - Noranda's Blasthole Drilling Information System

J. Leung & G. Léonard

IBLAST - Noranda's Interactive Blasting Layout and Analysis System

P.J. Lunder

9. AI & KNOWLEDGE BASED SYSTEMS

Les Systèmes Experts dans l'Industrie Minière: Bilan de l'Expérience Sout et Orientations Futures

Y. Gueniffey, S. Kouniali, H. Baroudi & J.P. Piquet

Development of a Knowledge-Based Automatic Stope Scheduling Model

Y. Su, S. Vongpaisal & H. Smith
10. MINING AND PROCESS AUTOMATION

A Positioning System to Aid Underground Navigation
E.H. Hinton, G.R. Baiden & N. Vagenas 577

The Total Mining System TMS™ - The Future of Open Pit Mining
J.P. Peck & C. Hendricks 586

System Analysis for Robotic Mining
L. Mottola, M.J. Scoble, J.P. Peck & G.R. Baiden 595

Simulation Studies of Automated Truck Haulage Systems at INCO Mines
N.M. Lemay, N. Vagenas & A.D. Akerman 605

Self-Learning Cutting Pattern Control for a Voest-Alpine Miner AM100
M. Zhao & J.N. Wilson 614

Automatic Navigation Controller for an APM Five-Section Bridge Conveyor
A.K. Reynolds & J.N. Wilson 623

Development of a Database and Graphic Aided Software System for Planning and Analysis of Mining Equipment
T. Schumacher & R. Hunefeld 631

An Integrated Software Simulator for the Analysis of Mining Shovels
H. Wu, L. Daneshmend, C. Hendricks & M. Scoble 638

A PC-Based Monitoring System for Mine Hoisting
M.J. Beus, F.T. Duda, Jr. & T.J. Orr 646

Observer-Based Path-Tracking Controller for Forward/Backward Motion of an Articulated Vehicle
V. Polotski 654

Robust Computer Vision Techniques for Rock Fragmentation and Loading Analysis
A. Bedair, L. Daneshmend, C. Hendricks & M. Scoble 664

Telerobotics Issues in the Operation of a LHD Vehicle
F. Labonté, J-L. Giraud & V. Polotski 672

11. MINING INFRASTRUCTURE

G. Atkinson & M. Scoble 682

EOLAVAL - An Integrated Mine Ventilation Design Software
K. Fytas & P. Thibault 689

Mine Ventilation: Waste Heat Recovery
L.H. Smith & D.C. Arthur 699

AutoVENT: AutoCAD-Based Ventilation Modelling Software
P.J. Lunder 706
Geological Computer Applications in the Uranium Industry

D.J. Dyet

Safety Assessment Software for Spontaneous Combustion in the Valea Jiului Coal Basin

I. Matei, G. Babut, R. Moraru & C. Hanna

12. MINERAL PROCESSING

Application of Knowledge-Based Systems Technology in Optimization of Mineral Grinding Circuits

A. Farzanegan, A.R. Laplante & D.A. Lowther

Measurement of Bubble Swarm Buoyancy Velocity in Three-Phase System

G. Shen, H. Nawfal, J. Watson, J.A. Finch & S. Banisi

Computer Simulation Applied to the Design of Mineral Processing Plants

M. Goldman

Automation Possibilities for Sample Prep in Mining Laboratories

G.A. Schroth

An Assessment of the Effects of Recirculating Loads on the Dynamic Performance of Simple Flotation Circuit Structures

B.C. Blakey, D. Hodouin & C. Bazin

Remote Communication for Sensor Testing and Tune-Up

C.O. Gomez, E. Chnyrenkov, J.A. Finch & F. Falvo

External Reflection Infrared Spectroscopy of Collector Monolayers on Mineral Surfaces: A Computer Simulation Approach

Z. Xu

Surface Complexation Modelling

Q. Zhang, Z. Xu & J.A. Finch

Multivariable Receding Horizon Predictive Control of a Grinding Circuit with Constraints and Maximisation of Ore Throughput

R. Lestage, A. Pomerleau & D. Hodouin

AUTOSTOP: A Unified Software for Simulation of Automatic Stochastic Optimal Predictive Control Loops

D. Hodouin, E. Gagnon & A. Pomerleau

Application of Time Series Analysis to the Control and Optimization of Ilmenite Reduction Furnaces

C. Bazin & B. Girard
13. MINE WASTE MANAGEMENT

A Conceptual Model for the Flow of Brine Through Salt Backfill.  
E. De Souza & R.S. Winsor.  

Databases for Acid Rock Drainage Prediction and Monitoring  
R.W. Lawrence & E.J. Sherlock  

Selected Modelling Approaches to Assess Sulphide Mineral Oxidation in Mine Wastes  
R.V. Nicholson, J.M. Scharer, B. Elberling & E.C.M. Kwong  

Components in the Design of Engineered Soil Cover Systems for Acid Generating Mine Waste  
D.A. Swanson, S.L. Barbour, G.W. Wilson & M. O'Kane  

Unsaturated Flow Modeling of Covers for Reactive Tailings.  

Conventional and New Methods for Treating Acid Mine Drainage  
N. Kuyucak  

Applications of Finite Element Techniques in the Analysis of Stresses and Deformations of Tailing Dams  
H.M. Keira, C. Priscu & B. Touileb  

Hybrid Simulation of Hydrocyclone Separation for Oil-Solids-Water  
R.M. Changirwa & M.C. Rockwell