



C E M I

Centre for Excellence
in Mining Innovation

Adding Value...



CEMI
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in Mining Innovation

Vision

To become an international centre for world-class, industry-driven research and innovation, advancing state-of-the-art concepts, processes and methodologies in support of regional, national and international exploration and mining industries, and providers of mining services and supplies.

Mission

CEMI will focus on mining innovation and develop new research, technology and knowledge transfer capacity, which will:

Add value to mining operations in Northern-Ontario & beyond, through value-driven R&D programs;

Strengthen Northern Ontario's capability to undertake world class research;

Develop highly qualified personnel for the mineral sector and;

Establish an R&D network of expertise at local, national and international levels.

CEMI is part of Ontario's Mining Cluster

Mining operations

Exploration companies

Mining supply and service companies

Mining research and testing

OGS & Geoscience Laboratories

CANMET

NORCAT

CAMIRO - MINING

Education and Training

Colleges and Universities

Federated School of Mines





Research Program - Mineral Exploration

Title: Collaborative Graduate Curriculum

Principal Investigator: Mineral Exploration Research Centre (MERC)

Abstract: The key objective of this initiative is to increase the number of graduate geoscience students in Ontario universities by offering higher quality programs with excellent career prospects in the mining sector, government, and research. Specifically, a curriculum of graduate courses will be offered by a network of nine universities from across Ontario. Participating universities will play host to one or more graduate courses and students from all participating universities will converge at that university for the duration of the course.

Title: Industrial Research Chair in Exploration Geophysics

Principal Investigator: Department of Earth Sciences & MERC, Laurentian University

Abstract: The Chair's research for the first 5 years will focus on the development of geophysical tools and techniques to detect the geophysical response of Cu-Ni-PGE mineralization and associated host rocks in the emerging deep contact, footwall, and newly discovered low sulphide PGE ore environments of the Sudbury Igneous Complex. In Sudbury, Ontario there is little information about the crust at depths >1.5km and geophysical models and techniques will be required to detect and pursue these deposits at depth and to construct sophisticated and quantitative geophysical models of the ore environment and deposit that, when integrated with other geoscientific information, will bring the geophysical anomaly closer to the reality of the ore body. This will aid in exploration (detecting and delimiting new resources) and mine planning (ore geometry, tons, grade, structure, stress directions, and safe work practices).

Research Program - Deep Mining

Title: Dynamic modeling & control of ventilation

Principal Investigator: Helen Shang

Abstract: With increased mine depth, underground temperature and environment becomes crucial for mine safety and working efficiency. An integrated system composed of both ventilation and air conditioning units is required to simultaneously address the environmental issues. In this project, dynamic models and closed-loop control strategies for such a system are explored to achieve efficient use of facilities, optimal system operations and improved energy saving.



Title: Hoisting system maintenance
Principal Investigator: Nick Vayenas

Abstract: Deep mines will require fast transport times and high availability of the hoisting system. Assessment and Ranking of the importance and frequency of the applied preventive maintenance intervals can result in the reduction of operational delays and the increase of hoist utilization and availability. This can improve ore and waste transportation and significantly reduce the associated materials handling costs.

Title: Energy optimization of mine ventilation
Principal Investigator: Kostas Fytas

Abstract: Canadian underground mines spend enormous amounts of money for mine ventilation. As mines are getting deeper ventilation costs are increasing exponentially due to air conditioning requirements. This research project investigates possible means of recovering heat from the exhaust ventilation air.

Title: Short rounds using PCF concept
Principal Investigator: S. P. Singh

Abstract: The penetrating cone fracture (PCF) concept is based upon the initiation and propagation of the controlled fracture by pressurizing a shallow hole. Foremost, critical analysis of the previous studies will be carried out. The current drilling and blasting practice in deep mines will be examined by visiting the operating mines. Initial field work exploring the application of PCF concept will be conducted. Other techniques w/ a potential of application to deep mining conditions will also be examined.

Title: Deep Mine Insulation Study
Principal Investigator: Markus Timusk

Abstract: This exploratory study will investigate the approach of insulating mine walls to reduce cooling costs in deep mines. This study will ascertain the state of art and industrial need. If it is determined that the problem merits further investigation and experimental work, the study will go on to propose in detail how additional investigation shall proceed.

Title: Flexible Design Alternatives
Principal Investigator: Vassilios Kazakidis

Abstract: Deep Mining feasibility studies have been done with the use of limited knowledge in geological and structural information of the ore body. The research will focus on the impact of design changes that were made in the 11 Zone at Craig Mine by comparison using the "what if" scenarios of the original mine plan continued without mine design changes vs. the change of the mine plan implemented.

Mining Exploration

Title: A comparative study of mineralization and unmineralized breccias along the Whistle offset dyke in the North Range of the Sudbury impact structure

Principal Investigator: Drs. Bruno Lafrance and Andy McDonald

Abstract: Sudbury breccia and its metamorphosed equivalent, metabreccia are preferred hosts to Cu-Ni-PGE mineralization in footwall country rocks and offset dykes of the Sudbury Igneous Complex. As most occurrences of breccia are unmineralized, the main objective of the research project is to develop criteria for discriminating between unmineralized and mineralized metabreccia along offset dykes. This would benefit mineral exploration by providing tools helpful in focusing exploration efforts and dollars on the recognition of mineralization-favourable breccia.

Title: Evolution of the Sudbury Igneous Complex Contact Metamorphic Aureole and Controls on Anatexis

Principal Investigator: Drs. Douglas Tinkham and Michael Lesher

Abstract: Much of the Ni-Cu-PGE mineralization in the Sudbury Structure has been generated and modified within the anatectic and contact metamorphic aureole of the Sudbury Igneous Complex. This study will aid exploration by defining field and microscopic criteria for establishing the nature and extents of partial melting, metamorphic devolatilization, and fluid interaction within the aureole and their overprinting by regional metamorphism.

Title: Metamorphic, structural, and geochronological evolution of the South Range of the Sudbury Impact Structure

Principal Investigator: Drs. Douglas Tinkham and Bruno Lafrance

Abstract: The South Range of the Sudbury impact structure has been affected by several orogenic events that displaced and folded Huronian footwall rocks and Ni-Cu massive sulphide deposits at the base of the Sudbury Igneous Complex. This research project will integrate structural geology, metamorphic petrology, geochronology, and geochemistry to produce a 4D interpretation of the tectonic evolution of the South Range before and after the Sudbury impact event.



Research Program - Automation, Telerobotics & Mining Informatics

Title: **Smart Rocks**

Principal Investigator: **Greg Baiden**

Abstract: Project Smart Rocks is designed to track rock flow on a regular basis using a three-dimensional underground fencing system. The purpose is to transmit information concerning blockages occurring in certain types of mining operations using synthetic powered "smart rocks" with built in computer, radio transmission, and positioning capability. When these "smart rocks" are injected into the rock mass, they will have the capability to transmit data as far as 2000 metres for a period of up to two years.

Title: **Wireless condition monitoring of underground mobile & remote mining Machinery**

Principal Investigator: **Markus Timusk**

Abstract: The overall goal of the proposed research is to be able to detect incipient faults and avoid catastrophic failures of mobile and remotely located machinery operating in underground mining environments. The proposed work will involve the design of a system capable of detecting incipient faults in machinery, compressing and transmitting the machine health information to maintenance and production personnel using underground wireless networking technology and established protocols.

Research Program - Integrated Mine Process Engineering

Title: **PERM - Productivity Enhancement & Risk Management**

Principal Investigator: **Peter K. Kaiser**

Abstract: This program will advance the state of knowledge in three areas for mining (from exploration / mining through to the mining/environmental interface), and for underground construction (tunneling to (nuclear) waste disposal):

Theme 1 Design and Construction of Underground Excavations

Site characterization and modeling for repository performance assessment, ore manufacturing and rock fragmentation, innovative geomechanics design and support technology, seismic hazard reduction for deep excavations.

Theme 2 Integrated Mine Design and Risk Mitigation

Exploration planning, planning and logistical optimization and auditing, rapid development, advanced data interpretation.

Theme 3 Environmental Risk Management

Stewardship and impact control, remote monitoring technology, water resource management, and particle chemistry.



Title: PRIMO - Planning & Rapid Integrated Mine Optimization

Principal Investigator: Paul Dunn

Abstract: The design and scheduling of open cut mines can be optimized using commercially available software. However in the case of underground mines, no such optimization tools are currently available. This is partly due to the variability in design problems encountered in underground mines and also due to the complexity of underground design and planning process. There is a recognized need for improved software tools to support the planning, design and operation of underground mines that would greatly enhance the process and efficiency of operations in relation to long term planning and design. PRIMO is a global consortium research project lead by Amira International and MIRARCO and aims at fulfilling this shortage in optimized methodologies and software tools.

Research Program - Environmental & Sustainability

Title: Functionalized Nanoporous Absorbents for Dry-Scrubbing of Sulfur Dioxide in Smelter Emissions

Principal Investigator: Louis Mercier

Abstract: This project will focus on atmospheric pollution mitigation and sensing (primarily SO₂); involving the use of nanomaterials for SO₂ mitigation (and perhaps sensing), specifically pertaining to that produced in mining operations.

Title: Rehabilitation of Peatlands After Mining

Principal Investigator: Daniel Campbell

Abstract: De Beers Canada will extract diamonds from the Victor Mine in the Hudson Bay Lowlands beginning in 2007. Over 95% of this landscape is peatland. We will conduct field experiments to determine whether peatland rehabilitation techniques developed for disturbed peatland in the south boreal region are suitable for disturbed peatlands in a subarctic context and to modify them as required. Rehabilitation protocols will be developed for operational and mine closing phases.

Title: Undergraduate Research Internship Program (URIP)

Principal Investigator: Centre in Mining Materials Research (CIMMR)

Abstract: The goal of CIMMR URIP is to support exploratory-stage research in areas of interest to the mining industry by engaging undergraduate student involvement in relevant research projects. To qualify for the URIP, projects must fall under one of the following areas of interest:

1. Novel approaches to address the mitigation, prevention or remediation of environmental damage caused by mineral industry activities
2. Innovative applications of materials science techniques and technology to elucidate/improve Mining-related issues/processes



Title: Development of polyurethane-polysiloxane polymers for potential application in Mining industry

Principal Investigator: Ravine Narain

Abstract: To develop polyurethane-siloxane polymers for possible application as liner in underground mining. The polyurethane will be synthesized from cyclic carbonate, diamine and diol. Polysiloxane will be incorporated in the poly urethane to enhance the mechanical properties and to impart fire resistance. The ultimate properties of the material will be manipulated by careful selection of diamines diol and the extent of siloxane polymer in the material. The mechanical properties as well as flame resistance will be studied in detail.

Research Program - Human Resource Development

Title: Global experience @ work, Highly-skilled professionals recruitment program

Principal Investigator: Sudbury Chamber of Commerce

Abstract: Greater Sudbury Chamber of Commerce was awarded funding from the Ontario Chamber of Commerce Global Experience @ Work Program to increase community awareness and opportunities to hire foreign-trained Highly Skilled Professionals (HSP's). Partnering with MIRARCO, the Chamber's main goal of this project is to attract, train and retain foreign-trained HSP's in the natural resources sector and related industries within the City of Greater Sudbury. This project identified and complements existing initiatives and companies engaged in workforce recruitment, training and retention. This project builds on a framework to plan and prepare a human resources attraction program based largely on an educate-upgrade-train-experience model.

Under development...

- Evaluation and Mitigation of Risk in Deep Mining Projects
- Rapid Development in highly strained ground
- SME Lead innovation projects

Join the Team...



CEMI
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CEMI leads a new mineral sector research initiative from Northern Ontario. CEMI was incorporated in 2007 as a not-for-profit corporation. Established jointly by industry, government, and Laurentian University in collaboration with regional, national and international R&D partners, CEMI is building on existing strengths in Ontario, Canada and beyond. CEMI is mandated to develop excellence in mining innovation.

CEMI's key research themes:

Exploration
Deep Mining
Integrated Mine Process Engineering
Telerobotics, Automation & Mining Informatics
Environmental & Sustainability

Lead Program Sponsors

Ontario Government \$10 Million
CVRD INCO \$5 Million
Xstrata Nickel \$5 Million

The CEMI Research Advantage

Results oriented
Industry-driven research agenda with value-driven goals
More value for your research dollars
Leverage or research sponsorship
Interdisciplinary and collaborative R&D
Strong links with Universities, Research Centres, and mineral sector companies

Become a Project Sponsor...

CEMI will systematically leverage appointed industrial project sponsorships within the above research themes; for more information on how to become a project sponsor contact 705-675-1151 x2366

CEMI offers unique Employment, Graduate Student, PhD & PDF Opportunities

CEMI is also looking for qualified professional to lead research programs, mentor research staff, liaise with government and industry counterparts, and manage projects.

For details on CEMI student and employment opportunities, please visit www.miningexcellence.ca or email at info@miningexcellence.ca

Our People...



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Founding Members



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Sponsors & Collaborators





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Mining with a Future



**CEMI offers support for Innovation and Research
Projects evolving from Industry, Research Providers,
and Small-Medium Enterprises**

Upcoming Events...

Strategic vs Tactical Approaches in Mining

September 28th - October 1st 2008

Quebec City, Quebec

CEMI

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