2nd Call for Concept Proposals for CIERSE Projects with Newmont

CSM and Newmont established the Center for Innovation in Earth Resources Science & Engineering (CIERSE) in the Mining Engineering Department on December 21, 2009. During the year, CIERSE had five active research projects in progress and two additional projects under consideration at the end of 2010. CSM and Newmont met on January 10, 2011 for an annual review of these projects and jointly decided to solicit additional proposals for potential funding in the 2011-2012 academic year.

CIERSE has approximately $500,000 to award for support to continue previously approved projects and for initiating new research projects. Although all projects will compete for this funding, we expect that some of the previously approved projects will be funded for a subsequent year. This would leave approximately $350,000 available to initiate new research projects.

Newmont has a wide range of research interests, many of which are appropriate for researchers at CSM to consider. Some suggestions for potential research are listed below and address opportunities for innovation in the following focus areas:

- Economic Geology & Exploration
- Mining/Geological Engineering & Mine Operations
- Mineral Processing and Extractive Metallurgy
- Environmental Stewardship
- Energy Sources, Supply, Uses, Efficiency, Impact
- Business & Economics
- Teaching & Training

CIERSE is now calling for a second round of Concept Proposals from CSM faculty and researchers that address one or more of Newmont's interests in innovation. Please submit your proposals to Steve Enders and Kadri Dagdelen by February 28th. Concept proposals should be in Attachment A (included below) format and no longer than 1000 words. Please break out your funding needs for each year if your project is expected to take longer than one year.

CIERSE will also accept Concept Proposals for more complex projects that address opportunities for innovation, which require longer timeframes and larger budgets potentially spanning up to two or three years. We will also present these to Newmont for potential additional funding.

Although it is appropriate to describe your proposed research project in terms of potential future phases of work, please submit only a proposal and budget for the first phase of work. We would be delighted to work with Newmont to find additional separate funding for successful projects that may enter a later stage of research including pilot testing or prototype development, for examples.

You will be notified no later than May 1, 2011 whether or not your proposed project has been approved for CIERSE funding. Please address any questions about CIERSE or this Call for Concept Proposals to Steve Enders at 720-257-8189 or menders@mines.edu.

CENTER FOR INNVOATION IN EARTH RESOURCES SCIENCE & ENGINEERING

Some of Newmont's Innovation Interests as of Jan 31, 2011

1. Challenges in Mineral Exploration.

- Fast accurate mineral identification in the field. It would be useful to be able to do this remotely, better then we can at present.
- More accurate and faster geological mapping (including structure).
- Obtaining grade and physical property information between drill holes.
- A means of estimating grade in the field (in outcrop or drill core).
- Near real-time analysis of geochemical samples.
- Improved capabilities of current XRF technology for minerals of interest including pathfinders. Improvements needed in detection limits and representative sampling methodology.
- Some hand-held technology to apply to quantifying the presence of the "light" elements, which are XRF-insensitive, would be desirable.
- Better 3-D modeling programs for inverting geophysical data sets which are in some cases are acquired over very large areas. "Better" here implies handling these large data sets in a computationally efficient manner. The incorporation of geologically-based constraints is an important aspect of the approach.
- Development of very highly sensitive, broad bandwidth, practical, and affordable electric or magnetic field sensors.
- Efficient, networked, "smart" sensors that are part of a distributed data acquisition system.
- Build a spectral library for thermal infrared responses from a suite of minerals that would be of interest in mineral exploration and develop a robust methodology for classification and interpretation of TIR signatures.
- Fluid flow dynamics and modeling – site and district (present hydrology and past hydrothermal).
- Faster cheaper drilling, perhaps non-mechanical.

2. Challenges in Metallurgical Processing

- The extraction of gold from certain ore types, particularly those with unfavorable chemistry (e.g. refractory sulfide, carbon-rich, silica encapsulated ores). This includes the enargite problem.
- Cost effective neutralization/handling/stabilization of toxic compounds, such as mercury, arsenic, etc.
- The capability to in-situ leach with nontoxic solutions.
- Higher efficiency, less toxic gravity and flotation circuits.
- Non-toxic alternative to cyanide for selective mineral leaching.
- More immediate on-site assaying capability.
- Silver recovery from processed ores (specific to one site).
- Preferential breakage of rocks. Preferential liberation of minerals.

3. Challenges in Mining.

- Imaging of an ore deposit without a full drill-out to make quicker and better business decisions.
- A lack of effective downhole tools for physical property assessment (density, material strength, XRF/XRD, spectral geology, laser ablation, etc.) that will work well given the kinds of holes we have to work with, i.e. they are typically short, prone to collapse, lined with mud, often dry, and much smaller in diameter than what the petroleum folks deal with.
- Faster, less expensive underground excavation and haulage. Increase our ability to remove waste faster in order to develop quicker access to the ore would be highly beneficial.
- Faster, less expensive open pit excavation and haulage - similar to underground haulage, speed is a limiting factor in surface or open pit mining.
- Identification of sites where a pit wall failure could occur. Pit slope stabilization techniques.
- Identification of voids, particularly when mining a deposit that has pre-existing underground operations and/or where we have backfilled a stope.

- The use of robotics and automation in production, including advanced positioning, driverless navigation, remote control, and collision avoidance.

- Non-pyrotechnic fragmentation. Fragmentation without having to drill holes.

- Rapid in-field discrimination of ore-versus waste, particularly after a blast (includes blast displacement modeling).

4. Challenges in Environmental, Community Relations and Safety.

- Problems associated with a lack of water in some cases and the challenges associated with dewatering in others.

- Minimizing surface expression of the operations including underground processing capability.

- ESR (including reclamation, sustainability, community relations) and HSLP-related issues.

- Vegetation growth in reclaimed area in arid climates and with challenging soil chemistry. Long term, cost effective monitoring of waste dumps and tailings (submarine in some cases).

- Reduction in accident frequency, loss time, property damage.

- Remote control drilling (as many of our accidents take place on drill rigs).

- Better real-time monitoring of the location of workers (especially underground) and moving equipment, as well as RFID and collision avoidance.

- Immediate location of persons trapped in an underground mining disaster.

5. Challenges in Energy Efficiency and Supply.

- Power generation and storage, including renewable energy, in locations where there is not enough affordable grid power available. Portability and the ability to send surplus back into the national grid are attractive options. Fossil fuels versus bio-fuels, hydropower, wind, nuclear, and solar options.

- Effective utilization of geothermal power, particularly in our Nevada operations.

Attachment A

STATEMENT OF WORK
Pursuant to
MASTER RESEARCH AGREEMENT
BETWEEN
COLORADO SCHOOL OF MINES ("CSM")
AND
NEWMONT USA LIMITED ("CONTRACTOR")

Statement of Work Number (for approved Statements of Work only): _____

This Project Is: _____a Standard Project, or _____a Special Project

This Project Is: _____a CIERSE Project, or _____ a Non-CIERSE Project

A. Project Title: _____
_____
___

B. Technical Scope Of Research – CSM shall perform research generally of the following scope:

{INSERT GENERAL DESCRIPTION OF RESEARCH TO BE PERFORMED AND ANY BACKGROUND FOR THE REASON OR NEED BEHIND THE RESEARCH}

C. Research Tasks – CSM shall perform the following research tasks:

{INSERT DETAILED LISTING/DESCRIPTION OF RESEARCH TASKS TO BE PERORMED BY CSM, AND INCLUDE ANY MILESTONES TO BE PURSUED, AND IF THE RESEARCH IS TO BE PERFORMED IN SEPARATELY FUNDED STAGES, CLEARLY IDENTIFY EACH SEPARATELY-FUNDED STAGE OF THE RESEARCH}

D. Deliverables – Following completion of the research tasks listed in section E above, CSM shall provide Contractor with a final written technical report reporting on the research preformed and results of that research. CSM shall also as part of this Project provide Contractor with the following other deliverables:

{IDENTIFY AND DESCRIBE ALL DELIVERABLES TO BE PROVIDED TO CONTRACTOR BY CSM, OTHER THAN THE FINAL TECHNICAL REPORT}

E. Budgeted Cost – The funds to be paid by Contractor to fund performance of the research by CSM is as follows:

{INSERT DOLLAR COST TO BE PAID BY CONTRACTOR TO FUND THE RESEARCH, AND IF THE RESEARCH INVOLVES SEPARATELY FUNDED RESEARCH STAGES, LIST THE FUNDING FOR EACH OF THE DIFERENT STAGES}

F. Research Schedule – The research of this Project shall be performed according to the following time schedule:

{DESCRIBE START DATE AND TIME PERIOD AVAILABLE FOR PERFORMANCE OF THE RESEARCH, INCLUDING THE SCHEDULE FOR PERFORMING DIFFERENT RESEARCH STAGES IF THE RESEARCH INVOLVES SEPARATELY FUNDED STAGES}

G. Contractor Non-Monetary Support – Contractor is to provide the following non-monetary support and materials for the Project:

{DESCRIBE ALL NON-MONETARY SUPPORT AND ALL MATERIALS TO BE PROVIDED BY CONTRACTOR FOR THE RESEARCH EFFORT}

H. Research Personnel – The following CSM Personnel are key to performance of the Project:

1. Principal Investigator: _____
2. Other Key Persons: _____
   _____
   _____
   _____

I. Contractor Contact – The following individual at Contractor shall be the primary contact for this Project and normal Project communications and invoices for the Project shall be sent to that contact person at the address listed below, or such other person or address as may later be specified by Contractor in writing:

Contractor Contact Name: _____
Contractor Contact Address: _____
_____
_____
_____
_____

J. Special Intellectual Property Provisions (to be used only for a Special Project) – For this Special Project only, the following intellectual property provisions shall entirely supersede the standard intellectual provisions of paragraph 12, including all subparagraphs thereof. This section J. shall be of no effect if this Project is not designated above as a Special Project.

{INSERT SPECIAL INTELLECTUAL PROPERTY PROVISIONS – FOR SPECIAL PROJECT ONLY}

K. Special Confidentiality Provisions (to be used only for a Special Project) – For this Special Project only, the following confidentiality provisions shall entirely supersede the standard confidentiality provisions of paragraph 11, including all subparagraphs thereof. This section K. shall be of no effect if this Project is not designated above as a Special Project.

{INSERT SPECIAL CONFIDENTIALITY PROVISIONS – FOR SPECIAL PROJECT ONLY}

L. Other – The following items are also a part of this Project:

{LIST/DESCRIBE ANY OTHER REQUIREMENTS FOR THE PROJECT NOT COVERED ABOVE – THIS SECTION IS NOT TO BE USED TO VARY THE TERMS OF THE AGREEMENT}

ACCEPTED AND AGREED TO this _____ day of _____, 20__.

COLORADO SCHOOL OF MINES	**NEWMONT USA LIMITED**
BY:_____	BY:_____
Name:_____	Name:_____
Title:_____	Title:_____