



2007 Annual Report



MINERAL DEPOSIT RESEARCH UNIT

2007 ANNUAL REPORT

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Cover photos, top left to right: Veining in the Ridgeway Cu-Au porphyry deposit, New South Wales, Australia; Ken Hickey and Jim Essman (Newmont) at the Rain Pit, Nevada; Along the main road over Paso Sico (Sico Pass) connecting Chile with northern Argentina; Eagle Rock (Tuff of the Cottonwood Canyon Fm.), Carlin - Jerritt Canyon, Nevada.

ABOUT MDRU

The Mineral Deposit Research Unit (MDRU) is a collaborative venture between the mining industry and The University of British Columbia (UBC). The unit, which was established in 1989 with support and financial assistance from the mining industry and the Natural Sciences and Engineering Research Council of Canada (NSERC), is administratively part of the Department of Earth and Ocean Sciences (EOS) and an internationally recognized research group dedicated to solving mineral exploration-related problems. Acting as the hub for integrated geological and geophysical research programs at UBC, MDRU seeks to solve research questions of interest to the community through the training of highly qualified geologists.

At the end of 2007, MDRU had 61 corporate, individual and government members, which include major and junior mining and exploration companies from Canada, United States, Perú, South Africa, Turkey and Australia. MDRU has collaborative research projects with economic geology research groups in the United States, Turkey and Australia, and has projects in North and South America, Asia, Australia, and Africa. All projects are designed in conjunction with corporate members, and address fundamental questions relevant to the mining and exploration industry.

MDRU assists members by increasing the understanding of mineral deposits and methods that are used for their discovery. This is accomplished through:

- Research projects,
- Resource Centre,
- Short courses and workshops,
- Training of qualified geologists.

MDRU and faculty in the Department of Earth & Ocean Sciences have established themselves as the most recognized economic geologic research centre in Canada. It has furthermore established a reputation for research excellence, and is attracting graduate students and researchers from around the world. Graduate students and senior researchers are active in Canada, United States, Perú, Argentina, Turkey, China (Tibet), New Zealand, and Australia, with expanding opportunities elsewhere. Regardless of their geographic focus, project results are applicable to understanding ore genesis processes and assisting exploration programs.

MDRU differs from other university-based applied research bodies and other economic geology research groups in that MDRU did not result from government-sponsored programs nor does it receive significant financial support for infrastructure from government programs or directly from university budgets. Instead, it grew from the combined interests of the mining industry headquartered in Vancouver and The University of British Columbia and is sustained by high levels of cooperation between the mineral exploration community and the Department. A Board of Directors charged with the long-term sustainability governs MDRU. A separate Research Generative Group, composed of the membership of MDRU, is charged with contributing to the development of the technical research program.

MESSAGE FROM THE DIRECTOR

Dr. Richard M. Tosdal



The Mineral Deposit Research Unit had another extremely successful year in 2007, and enters 2008 with new research initiatives, strengthened collaborations with economic geology research groups around the world, new research staff, and an expansion of the unit in new directions. MDRU continues to be active on four continents in six broad research themes ranging from traditional hydrothermal ore deposit investigations to kimberlite and diamond investigations to the development of exploration techniques, particularly the integration of geologic and geophysical data to build 3-D earth models.

In 2007, MDRU established the groundwork for future multi-company projects in mapping far-field alteration around porphyry Cu systems; continued site specific investigations at epithermal and porphyry deposits, sedimentary Cu deposits in northwestern Canada, and continuation of the CO₂ sequestration project. Site-specific projects continue to be developed in a range of environments.

The commodity markets remain very strong and our industry sponsors recognize the need to invest in the training of the next generation of geoscientists. Membership for 2008 is projected to remain constant from last year, as we currently count 61 mining companies, individuals and government agencies as members of MDRU. We thank them for their continued support.

Throughout 2007, MDRU continued to disseminate technical information to diamond and metal companies through the independently funded Sheahan – MDRU Literature Service. Some 28 companies and individuals subscribe to the service through which their geoscientists can maintain current knowledge and awareness of the newest scientific and technological advances.

MDRU enters 2008 on a positive note with the prospect of developing a wide-ranging variety of research topics on all the habitable continents of the world. We look forward to the coming year.

A handwritten signature in black ink, appearing to read "Richard M. Tosdal". The signature is fluid and cursive, written in a professional style.

2007 REPORT OF ACTIVITIES

MEMBERSHIP

MDRU currently has five Foundation Members, fifty Corporate Members and three Individual Members. Although the latter members only provide small financial contributions to the annual income of MDRU, all are regarded as important. The Geological Survey of Canada (GSC), the Geological Survey Branch of the B.C. Ministry of Employment and Investment (BCGSB) and the Department of Northern Affairs (Yukon) - Yukon Geoscience Office continue to be active participants in MDRU.

FOUNDATION MEMBERS

AngloAmerican Exploration Canada Ltd.
Barrick Gold Corp.
Goldcorp Inc.
Kennecott Exploration Co.
Teck Cominco Ltd.

INDIVIDUAL MEMBERS

Peter Fischl
Daniel Rubiolo
Anne J.B. Thompson

GOVERNMENT ASSOCIATES

British Columbia Geological Survey
Geological Survey of Canada
Yukon Geology Program

CORPORATE MEMBERS

Almaden Resources Corp.
Amarc Resources Ltd.
AngloGold Ashanti Ltd.
Ashton Mining of Canada Inc.
BHP Billiton Ltd.
Calibre Mining Corp.
Canadian Zinc Corp.
Cardero Resource Corp.
Cash Minerals Ltd.
Cia. De Minas Buenaventura S.A.A.
Coeur d'Alene Mines Corp.
Corriente Resources Inc.
Diamondex Resources Ltd.
Entrée Gold Inc.
Equity Engineering Ltd.
First Point Minerals Corp.
Freeport-McMoRan Copper & Gold Inc.
Full Metal Minerals
Galore Resources Inc.
Geoinformatics Exploration Inc.
Geoscience BC
Hecla Mining Co.
Imperial Metals Corp.
Ivanhoe Mines Ltd.
Jinshan Gold Mines Inc.
Kenrich - Eskay Mining Corp.
Klondike Star Mineral Corp.
Lysander Minerals Corp.
Miramar Mining Corp.

Newcrest Mining Ltd.
Newmont Mining Corp.
Northgate Exploration Ltd.
Novagold Resources Inc.
Pacific Rim Mining Corp.
Pacifica Resources Ltd.
Pan American Silver Corp.
Phelps Dodge Mining Co.
Resolute Mining Ltd.
Rimfire Minerals Corp.
Roca Mines Inc.
Savant Explorations Ltd.
Selwyn Resources Ltd.
Stornaway Diamonds Corp.
StrataGold Corp.
Triex Minerals Corp.
Tuprag Metal Madencilik
Tyhee Development Corp.
Western Copper Corp.
Vale Inco
Xstrata Nickel Plc.

STAFF CHANGES

Dr. Thomas Bissig rejoins MDRU as a joint MDRU-Geosciences BC Research Associate in charge of coordinating the Alkalic Systems project. He previously has been a Research Associate at MDRU on the Cuale VMS deposit in west-central Mexico and the Central Peruvian polymetallic belt projects. He most recently was an Assistant Professor at Universidad Católica del Norte in Antofagasta, Chile.

Dr. Kirstie Simpson is a joint CODES-MDRU Research Associates working on the Alkalic Systems project and editing a new book on Breccias to be published by the CODES group at the University of Tasmania. She most recently comes from the Geological Survey of Canada.

Dr. Shaun Barker comes to MDRU from New Zealand via the Australian National University where he completed his Ph.D. under Stephen Cox investigating fluid flow and fluid-rock reaction processes in and around fault zones. He joins the ongoing "Vectors to Carlin-type Au deposits" project that now is on the third renewal.

Dr. Kenneth Hickey, formerly a senior Research Associate at MDRU, has accepted a faculty position within the Department of Earth & Ocean Sciences at the University of British Columbia. He continues to coordinate the Carlin-type Au deposit research program in Nevada.

SHORT COURSES

Three short courses attended by as many as 170 registrants were offered in 2007:

VIEW FROM THE FRINGE: FAR-FIELD ALTERATION AROUND ORE DEPOSITS

By Nick Oliver (JCU), Ross Large (CODES – University of Tasmania), Greg Dipple (MDRU), Scott Halley (Mineral Mapping Service), and Richard Tosdal (MDRU). AMEBC Mineral Exploration Roundup, Vancouver, January 2007.

FIELD MAPPING OF ORE DEPOSITS: ANATOMY OF A TILTED PORPHYRY CU BATHOLITH AND ITS HYDROTHERMAL ALTERATION FEATURES, YERINGTON, NEVADA (USA)

By John Dilles and Richard Tosdal, Joint MDRU - Oregon State University, April, 2007.

ALTERATION FOOTPRINTS IN MAGMATIC-HYDROTHERMAL SYSTEMS

By Greg Dipple and Richard Tosdal (MDRU). Held at the Minerals South meeting, Cranbrook, BC, October, 2007.

GRADUATE THESES COMPLETED IN 2007

Crawford, E.C., Klondike placer gold: New tools for examining morphology, composition and crystallinity: M.Sc., 151 p.

Gofton, E.L., The Renard 4 Kimberlite: Implications for ascent of kimberlites in the shallow crust: M.Sc., 118 p.

Scheel, E., Turnagain Alaska-type ultramafic-mafic complex in northern British Columbia: M.Sc., 120 p.

Whitty, W.H.R., Structural and metamorphic evolution of the Ormsby zone and relative timing of gold mineralization: Discovery property, Yellowknife greenstone belt, Slave Province, Canada: M.Sc., 113 p.

RESEARCH ACTIVITIES

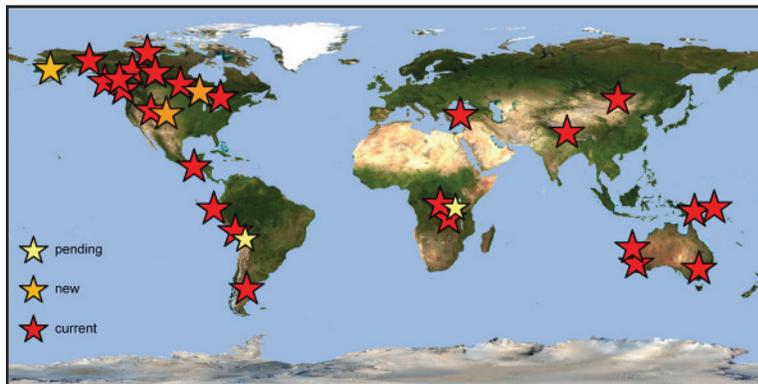
MDRU initiates and funds research projects on a wide variety of topics and scales. Where possible, research is undertaken in large project environments supported by an industry consortium as these scales of projects generate significant results because of the critical mass of intellectual talent and resources to address the questions posed. In addition to the larger projects, small site-specific or topic-specific projects are established with single company support. Overall, research within MDRU & EOS revolves around six themes in which we have established expertise.

Support for current and past projects comes from industry sponsors, NSERC, Yukon Geology Program, Geological Survey of Canada, British Columbia Geological Survey Branch, Geoscience BC, the Rocks to Riches Program and the Science Council of British Columbia.

Research funded through MDRU involves EOS faculty as well as geologists in various government, industry, and university institutions in Canada, the United States, and Australia. EOS faculty members also coordinate several of the research themes, and their involvement within the activities of MDRU is vital. Faculty managed research groups such as the Diamond Laboratory (Maya Kopylova) and the Geophysical Inversion Facility (UBC-GIF, Doug Oldenburg) are important compliments to MDRU and to the success of the research programs. The state-of-the-art analytical facility of the Pacific Centre for Isotopic and Geochemical Research (PCIGR, Dominique Weis, James Scoates, James Mortensen, Greg Dipple) is a critical partner in many research projects. Their collaboration with MDRU contributes greatly to the success of projects, and their continued involvement is critical to the future of MDRU.

Research Associates and Post-Doctoral Fellows comprise the bulk of the senior research staff, and at the end of 2007, there were five. Post-graduate thesis projects are essential to MDRU, and to date MDRU has supported 50 theses. At the end of 2007, MDRU supported 25 Ph.D. and 20 M.Sc. projects. Four theses were completed in 2007.

Research was active in all six themes during the year. Four projects were supported by multi-company consortium. The Shallow and Deep-Level Alkalic Mineral Deposits, Tethyan Metallogenesis – Turkey, and Carbon Sequestration projects entered their final years. The Footprints in Archean Lode-Gold Deposits project entered Year 2. Groundwork was laid for projects to begin in 2008 with efforts focused on expanding the Magmatic-Hydrothermal research theme. New projects will involve faculty, research associates, post-doctoral fellows, graduate students, and research assistants. Seventy-seven faculty, researchers, graduate students, and administrative staff participated in projects associated with MDRU during 2007.



MDRU project locations.

THEME 1

MAGMATIC-HYDROTHERMAL DEPOSITS

DR. RICHARD TOSDAL - RESEARCH COORDINATOR

Shallow and deep-level alkalic mineral deposits: An integrated exploration model.

Dr. Thomas Bissig, Project Coordinator

Alkalic deposits have features atypical of 'classic' porphyry and epithermal systems that both allow them to be put into these classes as well as distinguish them from the sub-alkalic systems. Although known around the world, the quality of individual deposit descriptions in the public domain varies markedly. In contrast to their more common calc-alkalic cousins, there has been little effort made towards developing a coherent model that integrates the characteristics of various alteration styles that can develop in either a shallow- or deep-level alkalic igneous setting. Instead, the calc-alkalic model has driven the community's view of alkalic deposits historically. This 3-year, multidisciplinary project advances understanding of the characteristics of individual alkalic systems and integrates that information into a holistic model for the porphyry and epithermal environment. The project is a joint effort with the Centre for Ore Deposit Research (CODES) at the University of Tasmania. Dr.

David Cooke heads the collaborating research group at CODES. Nine companies support the project, including Amarc Resources, AngloGold Ashanti, Barrick Gold, Lysander Minerals, Newmont Mining, Newcrest Mining, Imperial Metals, Novagold, and Teck Cominco. Additional financial support derives from Geoscience B.C. and from the Collaborative Research and Development program of the

Natural Sciences and Engineering Research Council of Canada.

Nine graduate students are working on the project from MDRU and CODES. Study sites include Mount Polley (Meghan Jackson, M.Sc. MDRU, and Heidi Pass, Ph.D., CODES), Mt. Milligan (Paul Jago, M.Sc. MDRU), Galore Creek (Janina Micko, Ph.D. MDRU, and Kevin Byrne, M.Sc. MDRU) and Lorraine (Adam Bath, Ph.D. CODES) in B.C., and Cowal (Amber Henry, M.Sc. MDRU, and Wojciech Zukowski, Ph.D. CODES), N.S.W. (Australia), Porgera and Ladolam (Jacqueline Blackwell, Ph.D. CODES), P.N.G.



J. Micko at Galore Creek, northwestern BC.

Porphyry and epithermal deposits

Dr. Richard Tosdal, Project Coordinator

At the Manantial Espejo property in Argentina (Stefan Wallier), detailed mapping of low-sulfidation style epithermal deposits has defined the paragenesis, zoning, and volcanologic setting of the vein deposits. Pan American Silver is supporting the project.

Continental margin tectonics strongly influences the formation and preservation of porphyry Cu deposits. A framework study on the Oyu Tolgoi porphyry Cu-Au deposits in Mongolia (Alan Wainwright) is linking igneous petrology, stratigraphy, and geochronology to define the setting of these Devonian deposits. Ivanhoe Mines is supporting this project. A project at the giant Quellaveco porphyry Cu-Mo deposit in southern Perú was established in 2007. Anglo American Exploration Peru sponsors this project. These two porphyry Cu projects are also developing techniques to investigate magma chemistry of the highly altered porphyry stocks through trace elements analysis of zircon, sphene and apatite using the Sensitive High-Resolution Ion Microprobe at Stanford University in association with Drs. Joseph Wooden and Frank Mazdab. All projects are, in addition to the industry sponsors, supported by a Discovery Grant from NSERC (Richard Tosdal) as well as individual grants to the students from the Society of Economic Geologists.

Footprints of Archean lode-gold deposits

Dr. Farhad Bouzari, Project Coordinator

Archean lode-gold deposits are of significant economic importance and attractive exploration target especially in the vast terrains of the Superior and Slave cratons of central and northern Canada. They include some of the world's highest grade and largest gold deposits (e.g., Red Lake, Ontario: 31 million ounces of gold at average grade of 21 g/t). Moreover, their vertical extension, as much as 3 km, provides a unique opportunity to view the anatomy of the Earth's oldest hydrothermal systems and in particular the evolution of hydrothermal systems at depth. Whereas the structural setting of these gold-only deposits is well studied, fundamental aspects of the hydrothermal system and their architecture remain elusive despite many years of excellent research, largely in Canada

and Australia. Thus, predictive models of hydrothermal systems showing mineralogical and geochemical relationships in detail are not widely available to guide exploration or are subject to conflicting interpretation. Nonetheless, Archean gold deposits clearly have unique and complex characteristics as they appear to commonly have evolved from a volumetrically large, but barren, early-stage to a more localized and mineralized stage, thus in this aspect similar to many other ore deposit types. Therefore, the goal is to characterize and distinguish footprints of each stage of a hydrothermal system, or of superposed systems. Once established, these footprints provide guidelines to pinpoint each stage within a broader zone of alteration visible in surface outcrops, potentially leading to the identification of the fluid pathways where gold will be located. Such a study also benefits current research on hydrothermal ore deposits as it demonstrates how and why these systems evolve from a large barren system to an ore deposition stage and why in most cases their life ends at the early barren stage.

The Red Lake Gold Mines (Campbell and Red Lake operations), northwestern Ontario, is an excellent location to study footprints and vectors of hydrothermal alteration and mineralization related to Archean lode-gold deposits. Underground mining is developed to depth of approximately 2 km below the surface and extends over 2 km along strike. Moreover, past producing mines and scattered alteration and mineralization are common in the district and the focus of exploration for many years. The deposit is carbonate-quartz lode hosted in Fe-tholeiite, komatiite and minor felsic volcanic rocks near the folded contact with a sequence of younger chemical and clastic sedimentary rocks. Gold is concentrated along major NW-trending penetrative deformation zones cutting pervasively altered host rocks. Deformation zones are well developed and appear to have long and multi-

stage history and therefore display complex relationship to gold mineralization. Ore zones are commonly narrow and high-grade (e.g., 72 g/t in the High-Grade Zone). Felsic intrusive bodies postdate mineralization. Overall, elements of earlier barren alterations and later structurally controlled gold mineralization are well displayed and thus the focus of current research.

This project is the first step in a collaborative program with Goldcorp Canada and NSERC at the Red Lake Gold mines to examine the hydrothermal alteration on the camp and deposit scale. Studies at deposit scale are currently focused along two northeast-oriented cross sections by examining and sampling over 20,000 m of drill-holes. At the regional scale, an area about 100 km² is under investigation by sampling outcrops and collar portion of surface

drill holes. The main primary themes are to map alteration assemblages (aided by petrography, XRD and ASD); study whole rock geochemical variation (major and trace elements); and through a Ph.D. investigation by Elizabeth Stock study single mineral geochemical variations (trace and isotope).

The project will integrate mineralogical and geochemical data with known structural data and develop a view of the anatomy lode gold system. A practical outcome of the project is a series of predictive tools to vector toward gold in the Red Lake area, and elsewhere in Canada. The results will have immediate benefit to ongoing gold exploration in the district and elsewhere in Canada, as well as examine the size and nature of these enigmatic metalliferous hydrothermal systems.



High-grade gold ore, Red Lake Mine, ON.

Nature, origin and structural controls on Phanerozoic orogenic gold deposits
Dr. Jim Mortensen, Project Coordinator

Phanerozoic orogenic gold deposits (OGDs) are commonly associated with rich and extensive placer deposits, and therefore represent attractive exploration targets. However OGDs are one of the least understood styles of gold mineralization, and uncertainties concerning specific controls on their formation hamper exploration. Detailed studies of OGDs are underway in the Klondike Gold District in western Yukon and in the Otago Schist Belt in South Island, New Zealand. A new collaborative project has also recently been initiated with Dave Rhys of Panterra Geoservices, Inc., focusing on the various styles of OGD mineralization in the Cariboo Gold District in east-central British Columbia. A total of 8 months of geological mapping and structural investigations were carried out in the Klondike in 2006 and 2007, in collaboration with Doug Mackenzie and Dave Craw from the University of Otago. A structural model for the controls on gold-bearing vein systems in the Klondike was developed and is being applied and further refined during on-going exploration work in the area. A new geological map of the Klondike District and adjoining Indian River area is currently being prepared for publication in 2008 by the Yukon Geological Survey. Isotopic dating and lead isotopic investigations in the Klondike are also continuing.



Klondike River, Yukon.

A detailed investigation of the age and lead isotopic characteristics of gold bearing vein systems and shear zones in the Otago Schist Belt was begun in 2006. This new work builds on over twenty years of structural and metamorphic studies in the region by Dave Craw, Doug Mackenzie and other colleagues at the University of Otago. The Cariboo Gold District project investigates the gold-bearing vein and replacement deposits in the historic Wells-Barkerville gold camp, which are hosted

by metamorphic rocks of the Barkerville terrane and closely resemble OGD mineralization in the Klondike District. We are also studying gold-bearing vein systems and shear zones hosted within structurally higher and much less metamorphosed sedimentary units at the Spanish Mountain and Fraser gold deposits, and determine whether these deposits represent a higher-level manifestation of the same hydrothermal systems that operated in the Wells-Barkerville camp or result from completely unrelated systems. Work in the Cariboo Gold District builds on ten years of structural work by Dave Rhys in this area. Dr. Bruce Yardley from the University of Leeds is joining the project in 2008 as an additional collaborator, focusing on the fluid chemistry of the Klondike and Cariboo gold districts.

Global volcanogenic massive sulfide deposits
Dr. Jim Mortensen, Project Coordinator

A study of the volcanological and paleotectonic settings in which precious metal enriched VMS mineralization occurs within the Stikinia terrane in western and northwestern British Columbia was completed in 2007 and results are being prepared for publication. A separate project focusing on the volcanological and paleotectonic setting of VMS deposits in the mid-Paleozoic Sicker Group on Vancouver Island

(including the Myra Falls deposits) and regional potential for undiscovered VMS deposits is also underway with Tyler Ruks (Ph.D. candidate with Mortensen). This project is currently funded by five mineral exploration companies, with matching funds from Geoscience BC.

A new project was initiated in 2007 aimed at developing a detailed chronostratigraphic framework (using U-Pb zircon dating methods) for the Mt. Read Volcanic Belt (MRVB) in Tasmania. This work is being done in collaboration with researchers from CODES at the University of Tasmania. The MRVB is one of the most productive VMS districts in the world; however, additional research into the nature and genesis of deposits in the belt is currently hampered by very limited age constraints on magmatism associated with VMS formation. A total of 28 samples of intrusive and extrusive rock units from throughout the MRVB were collected for U-Pb zircon dating during June of 2007. Zircons have been separated from all of the samples, and U-Pb dating, using both high precision chemical abrasion TIMS methods as well as laser ablation ICP-MS, is now underway. Initial results have demonstrated that it is possible to obtain ages with accuracy and precision of less than 0.1% (2 sigma). This level of precision will be needed in order to resolve the fine age variations within the belt.



Mt Polley region, south-central BC.

THEME 2 METALLOGENIC FRAMEWORK

DR. KENNETH HICKEY - RESEARCH COORDINATOR

Metallogenesis of the Tethyan collage: Magmatic association and age of ore deposition in Turkey

Dr. Ilkay Kuscu, Project Coordinator

The Mesozoic and Cenozoic Tethyan collage stretching from Europe across southern Eurasia is an extremely complex geologic terrane caught between colliding continents. Although complicated, the geodynamic setting of the Tethyan collage is reasonably well known as a result of decades of geologic investigation. However, a similar understanding of the metallogenic evolution of the region is not available or only sparsely known. With the opening or potential opening of much of this region to mineral exploration as a result of political events of the last decade and hopefully continuing into the future coupled with the presence of world class deposits within the Tethyan collage, developing a metallogenic framework for the region will aid future exploration. The project

focuses initially on transects across the belt in western and central Turkey. Barrick Gold and Teck Cominco supported the initial stages of the project. Tüprag Metal Madencilik Sanayi ve Ticaret Limited, a subsidiary of El Dorado Gold, joined the project as a sponsor in 2007. The project will end in 2008.

Structural evolution of Ormsby Zone *Dr. Richard Tosdal, Project Coordinator*

The Yellowknife belt of the N.W.T. has been the site of extensive gold mining. On the northern end of the belt, new exploration has defined gold resources near the abandoned Discovery Mine. The new prospect, the Ormsby Zone, is the site of research on the structural and metamorphic framework of gold (William Whitty). The critical question addressed is the paragenetic timing of gold deposition within the deformation and metamorphic sequence. This project was completed in 2007.



A - B kafa pit, Turkey.

**Geology of the Hope Bay greenstone belt,
Nunavut**

Dr. Richard Tosdal, Project Coordinator

The Hope Belt greenstone belt is the site of active exploration for shear zone hosted gold deposits. As part of a regional exploration program supported by Miramar Hope Bay Mining, Andrew Shannon is undertaking a volcanology and petrochemistry study of the stratigraphy to better define the distribution of rocks that are favorable host units to the significant gold deposits and prospects currently known in the belt. The project will be completed in early 2008.

**Mapping the Resource Potential Beneath the
Chilcotin Flood Basalts**

***Dr. J. Kelly Russell & Dr. Graham Andrews,
Project Coordinators***

The Neogene (22-1 Ma) Chilcotin flood basalt (CFB) province of south-central British Columbia overlies an area of nearly 55,500 km². It covers and obscures Paleozoic-Mesozoic basement rocks with high Cu-Au(-Mo) mineral potential (e.g., Quesnel Trough) and hydrocarbon-prospective Cretaceous-Eocene sedimentary rocks of the Nechako Basin, except for rare erosional basement “windows”. The CFB is composed of plateau lavas and associated volcanoclastic breccias that reach thicknesses of up to 200 m and are typically overlain by thick Pleistocene glacial deposits. This project is the first to examine the CFB from a volcanological perspective.

Our goal is to better constrain the present thickness distribution of the CFB through fieldwork, geochronology, and geochemistry, in the context of better-understood flood basalt provinces elsewhere. By establishing a three dimensional volcanic architecture, we are delivering “hard-data-points” for geophysical surveys (e.g., locally exact thickness

measurements) and to provide 3-D geo-referenced physical property data from collected samples. In addition to aiding larger-scale geophysical exploration, fieldwork locates and identifies basement “windows” where the basalt is thin, and identify ancient drainages below and within the CFB, with the potential to host placer deposits.

Results from the 2006 and 2007 field seasons indicate that the distribution of the CGB is highly variable and thickness variations are strongly influenced by paleo-topography. It is probable that the thickest (> 50 m) sequences of CGB reflect the locations of pre-Miocene paleo-drainage systems; these paleo-valleys are sub-parallel to present-day valleys and may be fault-controlled. If true, areas between the thick, basinal accumulations of CGB represent basement highlands and may be covered by a relatively thin (<20 m?) and “exploration-friendly” basalt cover.



Chilcotin flood basalts, central BC.

THEME 3 EXPLORATION METHODOLOGY

DR. RICHARD TOSDAL - RESEARCH COORDINATOR

Mapping thermal anomalies

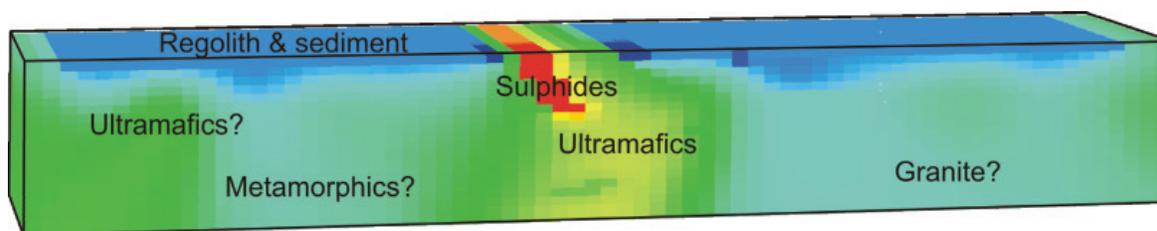
Dr. Ken Hickey, Project Coordinator

Previous MDRU research has reconstructed the Eocene paleogeography around the northern Carlin trend (Nevada) and outlined a zone of apatite fission track age resetting around those gold deposits. This zone of resetting reflects a large zone of convective heat transport that is the footprint of a “Carlin-related” geothermal system. This project applied the lessons learned in the previous project to other clusters of Carlin type deposits to evaluate whether similar zones of resetting characterize Carlin-type deposits, and if there is some correlation between the size of the reset zone and the gold endowment. As part of the project, Iskra Zamarron is reconstructing the eruptive history of the Caetano tuff, which is a critical volcanic unit adjacent to the emerging world-class gold camp in the Pipeline – Cortez Hills area. Industry sponsors Barrick Gold, Newmont Mining Corporation, and Placer Dome, prior to the merger with Barrick, extended the project. Additional funds secured through the US Geological Survey Mineral Resources External Research Program allowed the project to continue into 2007.

Combining Geology, Physical Properties, and Geophysical Inversion for 3-D Integrated Earth Models

Dr. Ken Hickey, Project Coordinator

Geophysicists now produce 3-D images of subsurface physical properties by inverting a wide range of geophysical survey data. There is still much to be learned about how to extract specific geologic information from geophysical inversion results and how best to integrate geologic constraints and information into the geophysical inversion process in order to further refine resulting models of ore deposits and associated geology. This project seeks to delineate more explicitly how inversion tools and geologic information can be used together to help answer geologic questions in a range of mineralized environments. The project combines the expertise in MDRU, the Department, and the Geophysical Inversion Facility headed by Doug Oldenberg. Study areas include the northern Carlin trend Nevada (Ken Hickey), Kabanga in Tanzania, Timmins area of Ontario (Dianne Mitchinson), Flin Flon and Rio Blanco (Nicolas Pizarro), and the Lenora-Wiluna Greenstone belt of Western Australia (Nick Williams). AngloGold



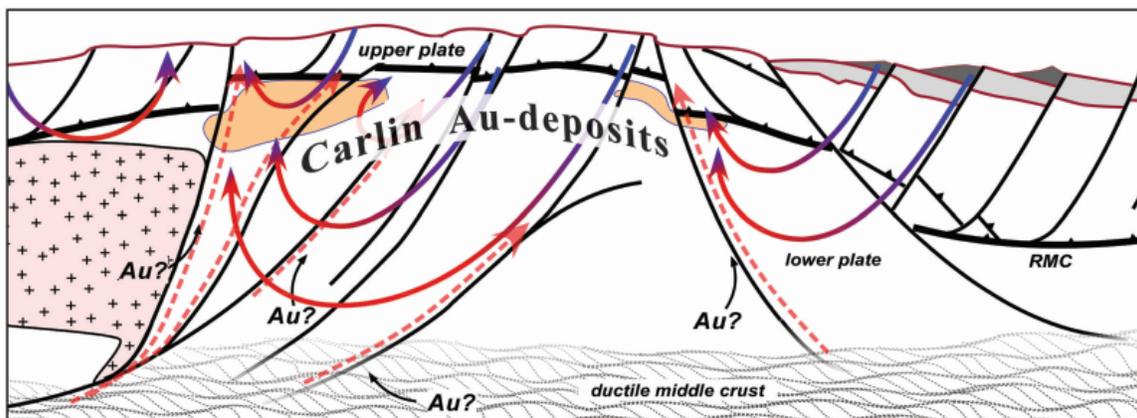
Geologically-constrained UBC-GIF inversion.

North America, Anglo American, Barrick Gold, Geoinformatics Exploration, Inco Technical Services (now part of Vale Inco), Noranda Falconbridge (now part of XStrata), Placer Dome Exploration (now part of Barrick Gold), Teck Cominco, WMC International (now part of BHP Billiton) are financially and logistically supported the project. Three students are in the final write-up stage, and expected to be completed in 2008.

Vectors toward Carlin type gold deposits
Dr. Kenneth Hickey, Project Coordinator

One of the main challenges faced by companies exploring for Carlin-type deposits is to be able to search under the sequences of Paleozoic to Quaternary rocks overlying the Lower Paleozoic, carbonate dominated, miogeoclinal rocks that form the main host for mineralization.

circulation and where it may manifest under cover. These tracers will also provide a means to define direction and scale of fluid flow and help delineate feeder structures within areas of Eocene hydrothermal activity. Jeremy Vaughan is undertaking the geochemical tracer study as part of his Ph.D. The study area will encompass all the major Carlin-type deposits in the Great Basin west of the Ruby Mountains. The results of the project should have implications beyond the Great Basin, and have the potential to assist in the evaluation and exploration of other terranes favorable for Carlin-type gold deposits, or other sedimentary rock-hosted deposits. This project is sponsored by Barrick Gold, Newmont Mining Company, and Teck Cominco Ltd, with matching funds provided by a Collaborative Research and Development grant from the Natural Sciences and Engineering Research Council.



Cartoon illustrating fluid flow in Carlin-Type deposits.

The current project builds upon the existing MDRU research with the aim of developing an integrated model for the exploration of Carlin-type deposits that maximizes the potential for success under cover. The project combines a well-constrained geological understanding of the paleogeographical, tectonic and magmatic environment of gold deposition with a range of thermometers, thermochronometers and geochemical tracers to delineate the location and scale of Eocene hydrothermal fluid

Integrating paleogeography-tectonics, geochemistry and thermochronology to develop vectors towards ore: Redstone Sedimentary Copper Belt, NWT.
Dr. Kenneth Hickey, Project Coordinator

This new project seeks to improve understanding of the controls on sedimentary Cu mineralization and develop better far-field tracers of the mineralization to aid the detection of deposits in the subsurface. The project will focus on the

Redstone copper belt in the eastern Mackenzie Mountains of the NWT, Canada. The research proceeds on regional and prospect scales and seeks to define the basin architecture and tectonic / sedimentological framework for sediment-hosted Cu deposits. It also examines mineralogical, geochemical, and thermal expressions of the hydrothermal flow to help develop vectors toward ore. When complete, the project will provide a better understanding of sediment-hosted Cu systems, and provide data to help regional exploration in sedimentary copper belts.

Geochemistry, mineralogy and morphology of gold: Applications to exploration and understanding placer/lode relationships
Dr. Jim Mortensen, Project Coordinator

The relationship between placer and lode gold deposits is generally not well understood, and in many parts of the world, placer gold deposits of substantial size exist for which no lode source has been convincingly identified. From an exploration standpoint, placer gold clearly indicates the potential for significant lode sources, but because the linkage is poor, there is little constraint on what type of deposit might be providing the placer gold. Understanding this linkage is thus an unsolved question that has practical implications. Evan Crawford utilized the geochemistry, mineralogy and crystallinity of gold grains to investigate the linkages between lode gold occurrences in the



Jim Mortensen and Yukon placer miner Mike McDougall alongside the Sixty-Mile River, Yukon.

Klondike District in west-central Yukon and placer deposits derived from them. Dr. Rob Chapman (University of Leeds) and Bill LeBarge (Yukon Geological Survey) are collaborators on this study. The basic premise is that major, minor and trace element compositions of placer gold, together with the nature of the contained micro-inclusion suite, should provide a unique signature that can be used to constrain the specific type of lode source(s) from which the gold was derived. Conversely, the information may constrain how placer gold might be modified or augmented by in situ growth within the surficial environment. A separate component of this study focuses on the evolution of the shape(s) of placer gold grains during alluvial/fluvial transport. Evan Crawford's work included development of a relatively rapid, semi-quantitative method of quantifying the evolution of grain shape with distance traveled. This provides a very valuable new tool for better delimiting possible source area(s) for placer gold.



Placer gold, Yukon.

THEME 4 MAGMATIC SULFIDE DEPOSITS

DR. JAMES SCOATES - RESEARCH COORDINATOR

Layered mafic-ultramafic intrusions and flood basalts from Large Igneous Provinces worldwide are major sources of economic Ni-Cu-PGE deposits. Erik Scheel (M.Sc. May 2007) completed his petrologic, geochemical and geochronological study of the Turnagain Alaskan-type ultramafic intrusion (north-central B.C.) and its associated nickel sulfide mineralization. The Turnagain project was supported by Hard Creek Nickel Corporation (HCNC), and Erik is now a Project Geologist with HCNC. Andrew Greene (Ph.D.) is finishing his dissertation on the volcanological, geochemical and stratigraphic architecture of flood basalts from the giant Triassic Wrangellia terrane that is exposed over



Wrangellia Flood Basalt, Wrangell Mtns., Alaska.

2000 km along the west coast of North America from Vancouver Island to Alaska. An additional component of the Wrangellia project includes assessing the magmatic sulfide potential of the basalts and underlying sills using whole rock PGE chemistry as a monitor of sulfide saturation state; recent work has involved comparison of the Wrangellia PGE chemistry with that of large igneous provinces worldwide. The Wrangellia project has been generously supported by the

former B.C.-Yukon Chamber of Mines Rock to Riches Program, NSERC, and research grants from the Yukon and B.C. Geological Surveys. Katrin Breitsprecher (Ph.D.) is in her third-year of a major geochemical and isotopic study (Sr-Nd-Hf-Pb) of Mesozoic porphyry intrusions across southern B.C. from the Quesnel and Stikine terranes with the aim of linking subduction cycles to magma genesis and mineralization style (funding from GSC TGI-3 and Geoscience BC). Elsewhere in Canada, Caroline-Emmanuelle Morisset (Ph.D.) has nearly completed her dissertation on the origin of massive Fe-Ti oxide ores (hemo-ilmenite \pm rutile) in Proterozoic anorthosite complexes in Quebec based on a



Massive Fe-Ti Oxide ore, St. Urbain, Quebec.

comprehensive petrologic, geochemical, isotopic and geochronologic study of the deposits and their associated host rocks (supported by Rio Tinto Iron and Titanium, NSERC CRD, and NSERC). Finally, a recently completed project involved determining the first precise U-Pb crystallization age of the platiniferous Merensky Reef in the Bushveld Complex, South Africa, by the single-grain chemical abrasion ID-TIMS technique (funding from NSERC).

THEME 5 KIMBERLITE

DR. MAYA KOPYLOVA AND DR. J. KELLY RUSSELL - RESEARCH COORDINATORS

Mapping and interpretation of volcanic facies is now recognized as a critical tool in the prediction of diamond distribution and in the evaluation of kimberlite during exploration. The active MDRU research program is addressing fundamental issues concerning the eruption of kimberlite volcanoes and the practical issues of how volcanic facies relate to diamond grade distributions.

Currently, Maya Kopylova, Kelly Russell and Barbara Scott Smith (Adjunct Professor) are funded by DeBeers Canada and NSERC to establish a volcanological framework for the two (Main and Northwest) nested kimberlite craters that form the Victor Pipe (Ontario). The PhD project of Bram van Stratten has the ultimate goals of establishing a petrological or volcanological explanation for the heterogeneous distribution of diamond in Victor Main and Northwest bodies.

The most recent project on kimberlites is funded by Diavik Diamond Mines (Rio Tinto-Aber joint venture) to create understanding of the deposits within the four Diavik kimberlite pipes (A154N, A154S, A418, and A21). Stephen Moss' PhD research is aimed at testing the hypothesis that the diamond distributions may reflect the volcanic facies (including re-sedimentation) of the deposits superposed on original compositional differences between kimberlites. The first two years of his research have consisted of elucidating the volcanological properties of the kimberlite deposits at in the A154N and A154S kimberlite bodies. Highlights of the study include: a) the first granulometric datasets (e.g., size distributions) for pyroclastic kimberlite which supports comparisons against

other conventional deposits, and b) facies re-constructions of the upper 120 m of A154N pipe, and c) a model for the geometry of the kimberlite volcano including a deep, partly-filled, steep-walled crater preserved at the end of the eruption. These results show that the upper 60 m of kimberlite deposits in pipe A154N actually derive from another source. These "orphaned deposits" are diamond-rich and appear to be pyroclastic kimberlite deposits produced by another kimberlite volcano but captured by this kimberlite volcano's empty crater. We suggest that this may be a much more common phenomena than expected because: a) kimberlites occur in clusters, and kimberlite eruption produce broad shallow volcanic craters underpinned by deep (> 400 m) steep-walled, 100-200 m diameter conduits that are largely empty (forming lakes) and volcanism in kimberlite clusters overlaps in time. The implication is that these open holes resulting from kimberlite eruptions act as receptacles for "orphaned" deposits from adjacent kimberlite volcanoes. Infill of a single kimberlite pipe can be the result of multiple eruptions from different locations. We consider this a first order result for volcanological sciences and for the diamond exploration industry.

M.Sc. student (Curtis Brett) is near completion of his research project to characterize the mineralogy and geochemistry of individual phases of kimberlite at Diavik. A practical application of this work would be to develop chemical and or mineralogical "fingerprints" for distinguishing between diamondiferous and non-diamondiferous phases of kimberlite in the Diavik cluster. Preliminary results from coherent facies (hypabyssal) and volcanoclastic (pyroclastic

and reseeded) facies suggest that there are substantial differences between melts that derive from pyroclastic vs. coherent facies kimberlite. Future work will integrate stable isotopic analysis (C and O) of carbonate from the same sample

suite. The work is also beginning to reveal complexities in the origin of olivine phenocrysts and xenoliths that may shed light on the mantle regimes sampled by kimberlites and their evolution during ascent.



Explosive eruption of Colima volcano [Vulcan de Colima], Mexico, 2005. Photo by Melissa Zack.

THEME 6 SUSTAINABILITY

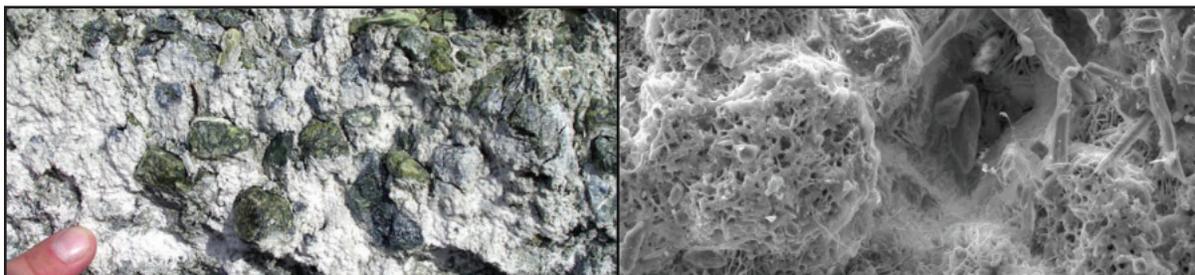
DR. GREG DIPPLE - RESEARCH COORDINATOR

Carbon Sequestration in Mine Tailings **Prof. Greg Dipple and Prof. Gordon Southam** **(University of Western Ontario), Project** **Coordinators**

The Carbon Sequestration in Mine Tailings project examines the potential for using mine waste to store atmospheric carbon dioxide, thereby mitigating industrial greenhouse gas emissions. Specifically, the project seeks to identify and quantify any ongoing carbon sequestration that results from mining, and to develop a predictive model for accelerating carbon uptake in mine tailings. The project is in its final year, and is sponsored by BHP Billiton, Diavik Diamond Mine Inc., and the Natural Sciences and Engineering Research Council of Canada (NSERC). It examines carbon uptake and cycling in tailings from two active mines: the Mount Keith Nickel Mine, Western Australia and the Diavik Diamond Mine, NWT, Canada.

Carbon dioxide is trapped at Mount Keith and Diavik in mineral precipitates as surface crusts (efflorescences) and cements in tailings within months of tailings deposition. The mineral hosts to carbon dioxide include the

magnesium carbonate minerals nesquehonite and hydromagnesite, which are volumetrically the most important hosts, and other Mg, Ca, and Na carbonate minerals of limited abundance. The source of bound carbon is determined using a three-isotope fingerprinting system. The bound carbon is derived from recycled bedrock carbon, the atmosphere, and from industrial waste streams. The rate at which carbon is fixed is strongly influenced by the climate and industrial processes. Sasha Wilson (PhD student, UBC) is completing the mineralogical and isotopic analysis of an extensive tailings sample suite to produce a statistically valid assessment of the rates of carbon uptake. NSERC-funded undergraduate summer research assistants Shelley Oliver and Claire Brown have worked with Sasha to process the large number of samples needed for this analysis. Postdoctoral fellow Shaun Barker has developed a new acid leach method for carbon-13 and radiocarbon analysis. This technique has allowed selective isotopic analysis of nesquehonite and hydromagnesite that avoids contamination from bedrock carbonate minerals magnesite and dolomite. Radiocarbon analysis has proven essential for distinguishing between trapping of



Field and scanning electron microscope images of mineralogically bound carbon dioxide.



White carbonate precipitate in mine tailings.

atmospheric carbon dioxide and recycling of carbon from bedrock minerals.

Carbon fixation occurs by abiotic and microbially mediated pathways. Key mineral dissolution rates laws were determined experimentally by PhD candidate James Thom and incorporated into a geochemical model for identifying acceleration scenarios. PhD student Ian Power has examined microbial acceleration of carbon fixation in the field and experimentally. Halophilic (salt tolerant) photosynthetic microbes have been cultured from tailings storage facilities waters and other environments for use in laboratory

experiments to assess acceleration of carbon sequestration with microbial activity. Selected acceleration scenarios are currently being tested at the bench-top scale. At the conclusion of the project in August 2008, rates and mechanisms of carbon uptake from Diavik and Mount Keith will be reported, and several abiotic and microbially-mediated acceleration scenarios identified. Extending our knowledge of the rates and mechanisms of carbon cycling to other mine types and climates, and further testing and identification of acceleration scenarios will be the basis of a proposal for a follow-on carbon sequestration project that will be circulated to MDRU members in the coming months.

SHEAHAN-MDRU LITERATURE SERVICE

The Sheahan-MDRU Literature Service and economic geology library continued to thrive and grow in 2007 as a non-profit service, wholly sustained by subscribing mineral exploration companies. Diamond and base/precious metals newsletters were distributed each month and population of the online database continued. The database contained over 100,000 highly relevant references at the end of 2007. The number of subscribers continues to hold steady with twenty-eight major and junior companies combined receiving the service. The Sheahan-MDRU Literature Service finished 2007 with a small deficit budget. Karie Smith, CFO/Executive Coordinator (MDRU), assumed management of the Service in mid-2007.

RESOURCE CENTRE

The Resource Centre, located mainly in Room 202 of the Geology building, contains the following equipment:

- GIS computer - dedicated to map preparation and spatial data manipulation
- Various computers - windows applications - presentation and database
- Digitizer and Plotter - map and diagram production
- B.C. Minfile/Yukon Minfile - online/compact disk
- Island Copper Archive - BHP archive files, data, and core from Island Copper
- Work areas - reading, meeting, map preparation

Databases include GEOREF, B.C. Minfile, and Yukon Minfile. Arne Toma supervises the Resource Centre and his office also provides space for visiting researchers and Individual Members. Improvements to the computer facilities and software upgrades are an ongoing minor part of the MDRU budget.

The other part of the Resource Centre is located in Rooms 313Q and 323. These rooms contain fluid inclusion equipment, a petrographic microscope, a binocular microscope, and a section storage area. MDRU personnel and Individual Members continue to provide various petrographic and analytical services to the industry, often involving contractual arrangements with analytical laboratories in the Department (XRD, Microprobe and SEM). This work helps foster interaction between MDRU, the industry and EOS.

INTERNATIONAL ACTIVITY

MDRU continues to gain international recognition through research projects, publications, international members, lectures, visitors and overseas visits. International activities in 2007 included fieldwork on 4 continents (North America, South America, Australia and Asia), lectures to international geological societies, and participation at international meetings in Canada, Australia, Perú, USA, England, Ireland, and Australia. Fieldwork in USA, Australia, Argentina, and Perú as part of graduate student projects is providing important exploration information, international experience for the students and exposure for MDRU.

SOCIETY OF ECONOMIC GEOLOGISTS STUDENT CHAPTER (UBC)

The UBC Society of Economic Geologists Student Chapter is open to UBC undergraduate and graduate students interested in the study of economic geology and its essential role in our society. The goal is to maintain the chapter as a research resource and discussion forum.

The major activity of the Student Chapter each year is an annual student-organized international trip to a region of the world with notable geology and mineral wealth. Each two-week trip, usually in May, aims to visit several world-class mines, including type examples of particular deposit styles, as well as a range of different deposit types to broaden participants' understanding of mineralizing process. In addition the tours aim to expose students to different landscapes and cultures.

Sweden was the destination for the 2007 trip (see http://www.mdru.ubc.ca/home/resources/seg/seg_ft/2007se.php), with eastern Europe on the schedule for 2008 (see http://www.mdru.ubc.ca/home/resources/seg/seg_fieldtrips.php).

As a non-profit society with no membership fees required, the Student Chapter must gather funds through fund-raising activities. We gratefully acknowledge the companies, organizations and individuals who supported us in 2007: Equity Engineering Ltd., Kaminak Gold Corp., Barrick Gold Corp., the Society of Economic Geologists, the Geological Association of Canada, Ed Balon and MDRU.

SUMMARY

The past year was excellent for MDRU. In 2007, MDRU laid the groundwork for future multi-company projects to begin in 2008 and continued to graduate highly-trained young geoscientists who are now working for the minerals industry. It ended the year with an increase in membership largely from within the junior sector. MDRU continues to produce high-quality research and organize short courses that are well attended by the geologic community. MDRU advanced further on the international scene through overseas visits and visitors combined with the publication of a number of papers in major journals during the year.



Red Chris exploration camp, northwestern BC.

EXPENDITURE AND BUDGET

MDRU ACCOUNTS

MDRU has three UBC accounts. The Industry Funds account contains membership fees and other income related to charge-outs of technical support. The Short Course and Endowment accounts are retained separately to simplify accounting and reporting requirements. During 2007, funds in the Short Course and Endowment accounts supplemented the operating expenditures. Additional funds were derived from the salary charge-outs for technical support to the projects.

2007 INCOME AND EXPENDITURE

Income and expenditure for 2007 are shown in Table 1. Membership fees received were higher than projected, as was the income from the endowment and salary charged to other sources. Income from short course was also higher due to the attendance level at the course offered during the Mineral Exploration Roundup. Income derived from salary charge-out to projects and to other faculty accounts was higher than projected.

Expenses for 2007 were slightly lower than projected. No new equipment was purchased for the MDRU infrastructure, resulting in a lower than projected operating expense. Financial short falls in the management of the Sheahan-MDRU literature service continued to impact the expenditures in 2007.

Overall, the MDRU infrastructure accounts ended the year with a surplus in the three accounts, approaching the required minimum budget surplus approximately equal to one-years operating budget, as required by the MDRU Board of Directors.



El Tatio, Chile.

TABLE 1. INCOME AND EXPENDITURES FOR 2007 (X \$1000)

INCOME:	Proposed	Actual
Foundation Members Fees	80.0	80.0
MDRU Membership Fees	101.4	143.9
Charge Outs (Salary and Equipment)	61.8	95.9
Endowment Interest	97.2	104.5
Short Courses (Net Income)	25.0	28.8
Publication (Net Income)	0.9	0.8
Total Income	366.3	453.9
EXPENSES:		
Salaries & Benefits - RT/KS/AT/SW/temp	264.3	273.8
Operating Expense	20.0	15.0
Travel & Conferences	10.0	3.6
Equipment	4.0	9.5
Research Review Meeting	0.0	6.4
Publications	0.0	0.0
Sheahan Library	27.8	9.1
Total Expenses	326.1	317.4
CARRY FORWARD:		
Carry Forward from 2006	131.5	134.4
Total 2007 Budgeted Income	366.3	453.9
Total 2007 Budgeted Expenses	326.1	317.4
Profit/(Loss) Budgeted for 2007	40.3	136.5
Estimated Carry-forward to 2008	171.8	270.9

CASH IN LIEU

MDRU continues to receive additional support from UBC, particularly in the form of space, and assistance from Financial Services and other UBC departments. The Geological Survey Branch of the BC Ministry of Investment and Employment (BCGSB) continues to provide publications, although the BCGSB has moved to the electronic distribution of many publications. MDRU member companies also donated a considerable amount of personnel time to MDRU including attendance at meetings of the Board of Advisors and research discussion for project planning. Board members have also been involved in the fund raising initiative as have been other members of the mining and exploration community.

2008 BUDGET

The 2008 budget is outlined in Table 2. The anticipated membership income is expected to hold constant. Short course income is expected to increase slightly due to the number of courses being offered. Publication costs from previous years are being recouped over time, and a modest income is projected. Additional income will accrue from salary charge-outs to the projects and other faculty in the Department. In 2008, the library is projected to break even. Project activity, a full administrative staff, and associated travel lead to projected expenses for 2008 approximately the same as in 2007.



Altos de Chicama Mine, Peru.

TABLE 2. PROPOSED MDRU 2008 BUDGET (X \$1000)

INCOME:	Budget
Foundation Members Fees (Received & Promised)	80.0
General Membership Fees (Received & Promised)	139.9
Charge Outs	40.3
Endowment Projection	107.9
Short Courses (Net Income)	35.0
Publication (Net Income)	0.8
Total Income	403.9

EXPENSES:	
Salaries & Benefits - RT/KS/AT/temp	296.9
Operating Expense	16.0
Travel & Conferences	10.0
Equipment	6.0
Publications	0.0
Sheahan Library	0.0
Accounts Audit	15.0
Director Search	50.0
Total Expenses	393.8

CARRY FORWARD:	
Carry Forward from 2007	270.9
Total 2008 Budgeted Income	403.9
Total 2008 Budgeted Expenses	393.8
Profit/(Loss) Budgeted for 2008	10.1
Estimated Carry-forward to 2009	281.0

LOOKING AHEAD TO 2008

ADMINISTRATION AND MEMBERSHIP

MDRU continues to develop large-scale regional or thematic research projects around global issues, and to establish highly visible projects on a smaller scale that are supported by one or two companies interested in a particular problem, region, or deposit. These opportunities are reflected in the research projects currently established and opportunities expected to arise in 2008. As new projects become funded, it is envisioned that sufficient resources will become available to employ new post-doctoral fellows or research associates who will be responsible for managing and on-going project development. New projects also maintain membership and attract new members.

Access to these research projects and the results both technical and human resources are the most important reason for companies to belong to MDRU. New projects that have sufficient relevance and appeal to attract funding under the present circumstances are critical for survival. In addition to research, the continued delivery of high-quality short courses is important, particularly for attracting junior companies and non-Canadian companies as members. Maintaining the facilities in the Resource Centre is critical for Individual members.

MDRU RESEARCH PROJECTS

Research expenditures for all MDRU projects are projected to be approximately \$1.815 million for 2008. Of this figure, about 43% is directly from industry contributions and 57% derives from non-industry sources such as NSERC and provincial or territorial governments. Active economic geology projects in 2008 will be:

- Structure and tectonic controls on porphyry Cu and epithermal deposits – NSERC discovery grant with NSERC industrial graduate scholarship
- Vectors toward Carlin-type Au deposits: Barrick Gold, Newmont Mining, Teck Cominco, NSERC – CRD Grant
- Footprints in Archean lode gold system: Goldcorp Canada, NSERC – CRD grant
- Peru porphyry Cu-Mo – Anglo American Exploration
- CO2 sequestration – WMC, Kennecott, Yukon government, NSERC CRD grant
- Alkalic systems – AngloGold Ashanti, Barrick Gold, Newmont USA, Teck Cominco, Amarc Resources, Imperial Metals, Newcrest Mining, NovaGold Resources Canada, Lysander Minerals, Geoscience BC, NSERC – CRD grant
- Diavik volcanology – Diavik Mining, NSERC CRD
- Chilcotin Plateau – Geoscience BC
- Taseko Lake porphyry systems – Galore Lakes, Geoscience BC
- Tethyan metallogeny – Barrick Gold, Teck Cominco

- Victor : DeBeers, NSERC CRD grant
- Kimberlites of Slave: NSERC Discovery
- Sedimentary Copper: Western Copper, NSERC CRD grant pending
- Footprints of porphyry Cu deposits : Barrick Gold, Teck Cominco, BHP Billiton, CVRD, Imperial Metals, Codelco, Geoscience BC; NSERC CRD grant pending
- Cariboo Gold: Geosciences BC
- Sicker Group: Geosciences BC
- Eastern Mexico magmatism: Almaden Minerals
- (Canada) Ltd, NSERC
- Fe-Ti Oxide Mineralization in Proterozoic Anorthosites Québec - Rio Tinto Iron and Titanium Inc., NSERC
- Turnagain Ni-Cu-PGE Project, B.C. - Hard Creek Nickel Corporation (\$55,950)
- Wrangellia Flood Basalts - Rocks to Riches Program, Yukon Geological Survey, B.C. Geological Survey

NEW RESEARCH PROJECTS FOR 2008

New research projects were in development at the end of 2007:

- Mineral mapping and lithogeochemistry of far-field alteration around porphyry Cu systems
- Sedimentary Cu deposits in northwestern Canada
- Reconstructing the low-sulfidation epithermal deposits at Cerro Bayo, Chile
- The porphyry Cu-Au deposit at Reko Diq, Pakistan

RESOURCE CENTRE

Further minor upgrades to facilities in the Resource Centre will be considered in 2008. Computer hardware and software to expand GIS and 3-D modelling capabilities, printing and networking capabilities, as well as microscopy and photographic equipment are all candidates for updating as equipment improves, research needs change and budgets allow. Upgraded facilities can be made available at cost or shared with other members of the Department.

SHORT COURSES

Four short courses are planned for the first half of 2008. Other potential courses are under preparation.

SQUEEZING MORE OUT OF THE ROCKS

By Richard Tosdal and Kenneth Hickey (MDRU), David Rhys (Panterra Geosciences), and Peter Lewis (Lewis Geosciences). Held at the Mineral Exploration Roundup in Vancouver, January 2008.

MINERAL PROJECT ASSESSMENT AND INVESTMENT DECISIONS

By Michael Doggett (Queen's University), February, 2008.

FIELD MAPPING OF ORE DEPOSITS

By John Dilles (Oregon State University) and Richard Tosdal (MDRU),

Session 1 - March, 2008

Session 2 - April, 2008.



John Dilles and students during the field mapping course, Yerington, Nevada.

INTERNATIONAL NETWORKS

MDRU continues to work domestically and internationally to increase exposure through research projects, collaboration with other research groups, interaction with companies, and presentation of short courses and presentations. Efforts are continuing to seek international members and to consolidate the reputation of MDRU within the industry. MDRU has established collaborative working relations with the University of Tasmania (CODES), Oregon State University, Leeds University, and the Royal School of Mines at Imperial College in London, England. MDRU is continuing to investigate collaborative research efforts with universities in the US, Australia, Europe, and in Perú.

BOARD OF DIRECTORS

May, 2008

Adshead, Neil	Passport Capital, Independent Director
Bavinton, Owen	AngloAmerican plc.
Britten, Ron	First Point Minerals Corp., Chair, MDRU Research Generative Group
Dobak, Paul	Barrick Gold Corp.
Franklin, Jim	Independent Director
Graham, Ian	Kennecott Exploration Co.
Hepburn, John	Vice-President, Research, UBC.
Holroyd, Bob	Teck Cominco Ltd.
McDonald, John	Retired, Independent Director
Smith, Paul	Head, Department of Earth and Ocean Sciences, UBC
Still, Alastair	Goldcorp Inc.

MDRU TEAM IN 2007 - 2008

Administrative Staff

Tosdal, Richard	Director
Smith, Karie	CFO/Executive Coordinator
Swanson, Christine	Manager, Sheahan-MDRU Literature Service
Toma, Arne	Resource Centre Coordinator
Wong, Sue	Finance Clerk

Project Coordinators - Senior Research Staff

Andrews, Graham	Kimberlite Volcanology
Barker, Shaun	Carlin Vectors
Bissig, Thomas	Alkaline Systems, Peru
Bouzari, Farhad	Campbell - Red Lake Archean lode-gold deposits
Chamberlain, Claire	Alkaline Systems, Lake Victoria Geochron
Kuscu, Ilkay	Tethyan Metallogeny, Turkey
Mackenzie, Doug	Klondike District
Phillips, Nigel	MDRU-GIF
Simpson, Kirstie	Alkaline Systems

Professors and Associates

Chapman, Rob	Professor	Leeds	Placer Gold
Cooke, David	Lecturer	CODES	Alkaline Systems
Craw, Dave	Professor	Otago	Klondike District
Dilles, John	Professor	Oregon St.	Porphyry Footprint
Dipple, Greg	Associate Professor	UBC	Metamorphic Petrology
Dube, Benoit	Research Geologist	GSC	Archean Footprints
Gleeson, Sarah	Associate Professor	U of AB	Sedimentary Cu
Groat, Lee	Professor	UBC	Pegmatites and Gems
Hickey, Ken	Assistant Professor	UBC	Carlin District, MDRU-GIF
Kennedy, Lori	Associate Professor	UBC	Structural Geology
Kopylova, Maya	Assistant Professor	UBC	Kimberlite
Mortensen, Jim	Professor	UBC	Geochronology, Cordilleran Tectonics
Oldenburg, Doug	Professor	UBC	Inverse theory / Electromagnetic Geophysics
Piercey, Steve	Associate Professor	MERC	Massive Sulphide Deposits
Rhys, David	President	Panterra	Orogenic Gold
Russell, Kelly	Professor	UBC	Geochemistry and Volcanology
Scoates, James	Associate Professor	UBC	Magmatic Ore Deposits
Weis, Dominique	Professor	UBC	Isotope Geochemistry

Graduate Students

Barnes, Elspeth	Ph.D.	Yukon Pegmatites	Lee Groat
Beranek, Luke	Ph.D.	Cordilleran Tectonics	Jim Mortensen
Blevings, Scott	M.Sc.	Taseko Lakes: Structural control	Lori Kennedy
Breitsprecher, Katrin	Ph.D.	Isotope geochemistry	James Scoates & Dominique Weis
Brett, Curtis	M.Sc.	Kimberlite Volcanology: Diavik	Kelly Russell
Byrne, Kevin	M.Sc.	Intrusion related Cu-Au	Richard Tosdal
Cade, Andrea	Ph.D.	Geology of gemstone deposits	Lee Groat
Crawford, Evan	M.Sc.	Gold Geochemistry	Jim Mortensen
DeStefano, Andrea	Ph.D.	Jericho kimberlite (N. Slave, Canada)	Maya Kopylova

Graduate Students *continued*

Dohaney, Jacqueline	M.Sc.	Chilcotin Group Basalts	Kelly Russell
Escalante, Abraham	Ph.D.	Central Peru	Greg Dipple
Farrell, Rebecca-Ellen	M.Sc.	Chilcotin Group basalts	Kelly Russell
Gofton, Emma	M.Sc.	Kimberlite Volcanology: Renard	Kelly Russell & Richard Tosdal
Greene, Andrew	Ph.D.	Triassic Wrangellia oceanic plateau	James Scoates
Henriques, Frederico	Ph.D.	Alkaline Systems: Cu Isotopes	James Scoates
Henry, Amber	M.Sc.	Alkaline Systems: Lake Cowal	Richard Tosdal
Hollis, Lucy	M.Sc.	Taseko Lakes: Porphyry-epithermal mineralization	Lori Kennedy
Jackson, Meghan	M.Sc.	Alkaline Systems: Mt. Polley	Richard Tosdal
Jago, Paul	M.Sc.	Alkaline Systems: Mt. Milligan	Richard Tosdal
Leslie, Christopher	M.Sc.	Misty Creek Embayment, NT	Jim Mortensen
MacNeil, Dan	M.Sc.	Donlin Creek	Richard Tosdal
Micko, Janina	Ph.D.	Alkaline Systems: Galore Creek	Richard Tosdal
Mitchinson, Dianne	Ph.D.	MDRU-GIF: Timmins	Richard Tosdal
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