THE KIDD CREEK VOLCANOGENIC MASSIVE SULFIDE DEPOSIT: A GROWING GIANT, AFTER FORTY YEARS OF MINING, EXPLORATION, AND RESEARCH

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The Kidd Creek volcanogenic massive sulfide (VMS) deposit, located 25 km north of Timmins, Ontario, was discovered in 1963 by drill testing a strong, airborne electromagnetic conductor following an innovative, geological exploration program implemented by Texas Gulf Sulphur in 1957. Except for an initial 8 m section of clay overburden, the discovery hole, K55-1, intersected base metal mineralization along its 200 m length. Since the commencement of mining in 1963 the Kidd Creek deposit has produced 124.22 Mt grading 6.18 % Zn, 2.31% Cu, 0.22% Pb and 87 g/t Ag US, along with other elements such as Cd, Sn, Ge some of which are, or were, recovered. With the development of D Mine, the extension of the deposit from the 6800 level to the 10,000 level, Kidd’s reserves stand at approximately 23.66 Mt (Figure 1). The Kidd deposit is open at depth; in fact the deepest ore intersection, hole #7091 centered some 3109 m vertically from surface, intersected 442.5 m of mineralization that averaged 1.16% Cu, 7.76% Zn, 0.73% Pb and 84 g Ag. The hole ended in sulfide!

The Kidd Volcanic Complex deposit occurs within the 2.710 to 2.717 Ga Kidd-Munro assemblage, a steeply-dipping and east-west striking, folded package of intercalated ultramafic, mafic, and lesser felsic metavolcanic rocks and intrusions that occur in the western Abitibi Subprovince (Jackson and Fyon, 1991). The Kidd-Munro assemblage extends from 30 km west of Kidd Creek, east for 165 km to the Quebec border where it is interpreted to be continuous with the Stoughton-Roquemaure and lower Malartic groups to the north and east that are of similar age and composition. Other VMS deposits within the Kidd-Munro assemblage include the Chance deposit 2.25 km west of Kidd Creek, the Potter and Potterdoal mines located some 100 km east of Kidd Creek, and several small VMS deposits and occurrences in the Stoughton-Roquemaure and lower Malartic groups.

The Kidd Creek deposit occurs within the Kidd Volcanic Complex, a structurally complicated but coherent lithostratigraphic package that contains a strongly bimodal suite of komatiitic and high silica...
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The Gangue is published quarterly by the Mineral Deposits Division of GAC and is distributed to its members. The Mineral Deposits Division of the Geological Association of Canada is Canada’s foremost society for promoting the study of mineral deposits by supporting local and national meetings, symposia, short courses and field trips. We sponsor the publication of research relating to ore deposits and metallogeny, and recognize the contributions of outstanding Canadian economic geologists by annually awarding the Duncan Derry and William Harvey Gross medals and the Julian Boldy Certificate.

Publication Schedule:

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Information for contributors:
The objective of this newsletter is primarily to provide a forum for members and other professionals to voice new ideas, describe interesting mineral occurrences or expound on deposit models. Articles on ore deposits, deposit models, news events, field trips, book reviews, conferences, reprints of presentations to companies, mining groups or conferences, or other material which may be of interest to the economic geology community are welcome. Manuscripts should be submitted by email in WP or WORD format. A printed version should be mailed or FAXed. Illustrations should be camera-ready (ideally as CDR digital files); photos should be of good quality. Short items dealing with news events or meetings can be submitted by FAX, postal mail or email. Contributions may be edited for clarity or brevity.

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July 2003 – Gangue No. 78
Dear Members,

As a relatively new member of MDD myself, I am honoured to have been selected as the chairperson for 2003-2004. For me personally, the last month or so with the lead up to the Vancouver GAC-MAC-SEG Conference was very hectic, but I was able to see in a very short period of time just how many activities the MDD is involved in that fulfill its mandate to promote mineral deposits research. Moreover, I’ve been privileged to meet and get acquainted with an impressive group of executive and directors who are very dedicated to the cause.

MDD’s participation in the joint GAC-MAC-SEG Conference started two days before the meeting with an MDRU-MDD-sponsored short course in alkaline porphyries and Fe-oxide Cu-Au deposits organized by Dick Tosdal, Murray Hitzman and myself. MDD executive member Dan Marshall co-organized an MAC-sponsored short course in fluid inclusions, for which MDD will help sponsor publication of the short course notes. Something like 40% of the sessions at the meeting were mineral deposits-related, quite a showing, and prominently featured many MDD members. The AGM included a lively discussion of the role of directors – more on that later. For those of you who missed it, the annual luncheon (held jointly this year with the SEG) was a highlight of the conference. The packed house stood as a piper ushered in the head table, joining a large number of invited guests at the head of the room. After lunch, the SEG led off the formal part of the program with the presentation of an award to Nora Dummett in memory of Hugo Dummett. Bob Cathro introduced key founding members of the MDD, including Hugh Morris (Chair #1), Vic Hollister (Chair #3), Steve Scott (Chair #2), Al Sinclair (Treas #1, introduced in absentia as he was unable to attend) and Ken Dawson (Gangue #1), after which Hugh took the floor for a few words about the good old days. The Gross Medal was awarded to Ross Sherlock, with a citation by Dick Tosdal, and the Derry Medal was given to Robert Kerrich, with a citation by Jeremy Richards. The citations and acceptance speeches are published elsewhere in this issue. The 2002 Julian Boldy award winners, Daniel Layton-Matthews, Brian Cousens and Jacob Hanley (all with numerous coauthors) were also announced (2003 winners are announced elsewhere in this issue). Many people remarked that the luncheon assembled one of the most distinguished and accomplished groups of specialists in Canadian mineral deposits ever.

(Continued on page 4)
to come together in one room. It was a real honour for me to MC this special event.

Now it is time to look ahead to the coming year. Hendrik Falck (Government of Northwest Territories – Yellowknife) has graciously consented to assume the Vice Chairpersonship for the coming year, and it is already clear that he will be playing an active role in the organization. ‘Lyn Anglin (GSC – Vancouver) will be continuing (thank goodness) in her role as Secretary. Bob Cathro (Cathro Exploration – BC) is STILL Treasurer, although he may soon be turning over the reigns to someone new, and we hope he sticks around to advise us for at least a few more decades (Bob was acknowledged this year with a Distinguished Service Award from the GAC). Dan Marshall (SFU-Vancouver) continues to wear many hats, primarily as awards coordinator and author of the eagerly anticipated Atlas of Ore Minerals. Dirk Tempelman-Kluit (Vancouver) also continues in his role as publications coordinator. I would like to welcome Kay Thorne (NBDNRE) as the new editor of the Gangue, taking over for Dave Lenz (UNB) who is stepping down. Dave has done an outstanding job, with a high quality on-line newsletter as his legacy. I would like to thank Frank Santaguida for his considerable contributions over the two years as Vice Chair and Chair of MDD. Fortunately, he is not going far away, as he now assumes the duties of Past Chair, which principally involve explaining to the current chair what I’m supposed to be doing. Steve Piercey (Laurentian), Past Chair, would now be a free man, but agreed to stay on as short course coordinator, and will probably be called upon numerous times this year for advice and digital files. Finally, I would like to thank the outgoing directors, Tom Lane, Mike Lesher and Georges Beaudoin, for their contributions over the last several years.

As in previous years, we look forward to contributing to the 2004 GAC meeting at Brock University in St. Catharines. At the very least, we will be helping to sponsor a high-tech metals short course, various sessions, and the annual luncheon. Cliff Stanley agreed to be the MDD representative on the LOC for Halifax in 2005. This year we are also looking forward to the lecture tour by Dr. John Thompson (Teck Cominco – Vancouver), who was recently selected by the MDD as the 2003-2004 Robinson Lecturer. Dan assures us that the Atlas of Ore Minerals will be available for sale at the Brock meeting, if not before, and ‘Lyn and Hendrik are working hard on editing the Yellowknife EXTECH volume, which may be available late next year. Finally, we have several new initiatives going forward this year. The first, being coordinated by Hendrik Falck, is a review of the role of directors in the organization, which will result in an expanded and more active role for them. The second is to develop an endowed prize such as a “best thesis award” to encourage student participation in MDD and reward excellence in research. The seed money for this prize is a generous donation by Catharine Farrow, a past Gross award winner. We may soon be appealing to you, the membership, for donations to help this award to grow; we hope you will consider a contribution. Last, we will be exploring opportunities to build closer relationships with other organizations that support and promote mineral deposits research.

Although the GAC membership overall has declined slightly in recent years, membership in the MDD, the largest division in the GAC, has held it’s own, and is in good financial shape thanks in large part to the sale of publications. Given the financial squeeze on government-funded deposits research and the mining industry in general in the form of shrinking research, travel and discretionary budgets, mergers and lay-offs, this is an impressive record. On behalf of the executive, we pledge to keep it that way, by continuing to offer quality publications, newsletters, short courses, awards, and sessions at the annual meetings.

On a personal note, I would like to extend my sincere thanks and gratitude to the executive, directors, GAC staff and others who pitched in during the 11th hour to make our part of the Vancouver meeting an outstanding success. I sincerely look forward to this year as chair of MDD.

Cheers,
Moira Smith
MDD Chairperson 2003-2004
FIII rhyolite flows overlain by tholeiitic basalts (Bleeker 1999; Barrie, 1999; and Prior et al., 1999). The volcanic complex is structurally underlain by younger Porcupine Group wackes, and this contact is recognized as a steeply dipping folded thrust or unconformity (Bleeker and Parrish, 1996). At the mine, strata are overturned, strike north-south, face west and dip steeply (70 to 80°) east, defining an asymmetric, S-shaped, F1 fold that plunges steeply to the north (Walker et al., 1975; Bleeker, 1999).

The simplified stratigraphic column in Figure 2 provides a general overview of the Kidd Mine stratigraphy and location of massive sulfide deposits. Komatiitic flows and intrusions constitute the base of the known stratigraphic sequence and likely formed a broad, low-relief lava plain upon which the Kidd Creek rhyolitic dome and ridge complex was constructed. The minimum thickness of the komatiitic unit is estimated at 500 metres.

The Footwall rhyolite dome complex (2717.0±2.6/-2.5 Ma, 2716.1 ± 0.6 Ma and 2716.0 ± 0.5 Ma) is comprised of domes, cryptodomes and associated volcaniclastic rocks. The rhyolites issued from two fissures to construct a monogenetic, dome and ridge complex up to 350 m high that extends below, and along the entire 3 km length of the known orebodies (Prior, 1996). The 120 m thick QP rhyolite (2711.5 ± 1.2 Ma) that conformably overlies Footwall rhyolite and massive sulfides issued from two, deposit parallel fissures to construct a dome and ridge complex that also extends the 3 km length of the massive sulfide deposit. The restricted but linear, ridge-like morphology of the Footwall and QP rhyolite ridges, and the massive sulfide deposits, although accentuated during deformation, is interpreted to be primary and attests to the pronounced structural control on volcanism and hydrothermal discharge. Volcaniclastic rocks sandwiched between the Footwall and QP rhyolites, although referred to as epiclastic deposits (Barrie et al., 1999) are primary, syn-eruptive, locally-transported deposits derived from autobrecciation and collapse of underlying Footwall rhyolite domes and pre-existing massive sulfide deposits. The volcaniclastic deposits contain blocks and lapilli-sized fragments of massive pyrite and sphalerite in proximity to the massive sulfide lenses. A succession of tholeiitic basaltic and andesitic flows conformably overlies theQP Rhyolite; the gabbro sills that have dilated the rhyolite stratigraphy in the mine area are the hypabyssal intrusive equivalent of these overlying basaltic flows (Barrie et al., 1999). Zircon U-Pb dating indicates that eruption of the Footwall and QP rhyolites may have spanned a period of some 2.8 Ma (Bleeker et al., 1990).

The Kidd Creek Volcanic Complex is interpreted to have formed within a proto-arc geodynamic setting, with the high silica FIII rhyolites a product of crustal extension during rifting and melting of the lithosphere (Wyman et al., 1999; Prior et al., 1999). A graben interpreted to contain the Kidd VMS deposit is consistent with this geodynamic setting and a recent volcanic reconstruction of the North Rhyolite by DeWolfe et al. (2003), suggest a minimum graben width of 5 to 7 km (Gibson and Kerr, 1993; Bleeker, 1999). Fissures that controlled the eruption and emplacement of the Footwall and QP rhyolites may be graben-parallel structures (Prior, 1996).

The giant Kidd ore system consists of three geochemically distinct, physically-separate sulfide orebodies: the North, Central, and South orebodies that are characterized by pyritic tops and lateral fringes, Zn-rich interiors ( sphalerite-pyrite), massive to semi-massive, Cu-rich bases (chalcopyrite-pyrrhotite-pyrite-sphalerite), and, underlying chalcopyrite-pyrrhotite-pyrite stringer mineralization (Figure 3; Hannington et al., 1999; Barrie et al., 1999). The South orebody also contained a bornite zone within the Cu-rich massive and stringer ore.

Significant proportions of the North, Central, and South orebodies developed within the footwall volcaniclastic units by subseafloor replacement and subsequent zone-refining (Barrie et al., 1999; Hannington et al., 1999). Evidence of subseafloor replacement includes: (a) the post-depositional replacement of rhyolitic fragments and matrix by pyrite and sphalerite; (b) the preservation of vestiges of massive pyrite and sphalerite within the chalcopyrite-pyrrhotite ore; and (c) discordant contacts between massive sulfides and bedding.

The massive sulfide orebodies are enveloped within a broad
zone of sericitization, characterized by K$_2$O enrichment and Na$_2$O depletion, that is preferentially developed within the footwall but which also extends into the overlying QP Rhyolite (Figure 4; Koopman et al, 1999). Fe-chloritization is restricted to the margins of footwall chalcopyrite stringer zones where it defines the main conduits for ascending hydrothermal fluids. Sericitization and chloritization are superimposed on a broad and widespread silicification that, in part, accounts for the distinctively high $\delta^{18}O$ values (+10 to +16 per mil) uniquely characteristic to the Kidd and Horne VMS deposits (Beaty and Taylor, 1988; Huston et al. 1995).

Arguably, the Kidd Creek deposit is one of the best documented and described VMS deposits in the world. Yet, despite the many advances in our description and understanding of the Kidd Creek orebodies there are numerous unresolved questions with relevance to exploration that need to be addressed: 1) What is the heat source that is required to drive a convective system large enough, and long enough to form these giant deposits? The footwall ultramafic flows are not a candidate as their thickness is uncertain and, more importantly, their immediate proximity to the orebodies precludes a significant stratigraphic thickness or volume from which to leach metals. Is the high heat flow a product of deep, sill-like, komatiitic magma that underplated the lithosphere, as proposed and modeled by Barrie (1999), or is the heat flow a product of a large subvol-

Figure 3. Kidd Mine ore-bodies looking east from surface to 10,200 ft.

Figure 4. Cross section and plan slices of the percent mass change Na$_2$O from surface to 10,200 ft (view to southeast).
canic intrusion that has been structurally removed? 2) Is the large size and grade of the Kidd deposit a product of a long lived, but lower temperature convective system punctuated by episodes of magmatic input as suggested by the size, grade and exotic trace element composition of the orebodies (Hannington et al., 1999)? 3) Where are the other VMS deposits? The Chance deposit, some 2.25 km to the northwest is the closest, but why are there no larger deposits nearby, as is typical of many other VMS camps? and 4) On a larger scale, why are there no other significant deposits in the Kidd-Munro and for that matter the Stoughton-Roquemaure and lower Malartic groups? High silica, FIII Rhyolites in the Kidd-Munro assemblage are not restricted to Kidd Creek but, like the komatiites themselves, are a product of regional scale tectonic-magmatic events, one of which formed the Kidd VMS deposits, why are there no others, or are there?

REFERENCES


(Continued on page 13)
It is my great pleasure to present to you Robert Kerrich as this year’s recipient of the Duncan R. Derry Medal of the Mineral Deposits Division of the Geological Association of Canada.

Robert Kerrich is one of Canada’s leading geoscientists, and has maintained this reputation over a long and distinguished career studied with many accolades. A principal landmark in this career was his election as Fellow of the Royal Society of Canada in 1992, but other marks of recognition are numerous, including receipt of a Steacie Fellowship in 1987, the GAC-MDD’s W.H. Gross medal in 1988, the MAC Past President’s Medal in 1989, and the Miller Medal of the Royal Society of Canada in 1999. Although Kerrich’s research focus, and that for which he is best known in our community, has been on the geology of Archean gold deposits, he is a true generalist, and has published over 200 papers on subjects as diverse as alkaline lake chert geochemistry and arsenic concentrations in sediment pore-waters. His best known works in the field of economic geology relate to the genesis of mesothermal gold deposits, and he has contributed seminal works to our understanding of these deposits in the Abitibi and Yellowknife districts of Canada, and Western Australia. As befits a scientist of such distinction, he is also a great teacher and mentor, and has supervised over 14 Ph.D. and 13 M.Sc. students, and 6 post-doctoral fellows, amongst which I count myself.

One of the greatest pleasures in putting together Rob’s nomination package was soliciting and receiving the various letters of support. In addition to his local prairie fan club of Brian Pratt, Kevin Ansdell, and myself, Rob’s supporters extend through Ontario (Brian Fryer and Jim Franklin), as far east at Nova Scotia (Dan Kontak), south of the border to Colorado (Rich Goldfarb), and down under to Perth, Australia (David Groves). I quote from some of their letters:

**Groves:** “Professor Robert Kerrich is a doyen of Canadian geoscience. He has been most influential in making Canada one of the leading countries in economic geology [research worldwide.... His recognition of the importance of “big picture” research has characterized his research career and has set him apart from most of his contemporaries.... Robert Kerrich’s papers and research concepts were seminal and an inspiration for me in setting my own career path.”

**Ansdell:** “His study of gold and base metal deposits [are not deposit specific, but highlight the fact that a mineral deposit is but a small part of the whole evolution of the crust-mantle system. He delights in the big picture, and his mineral deposits work has helped to clarify ideas on supercontinent cycles and accretionary tectonics and mantle evolution in the Archean.”

**Goldfarb:** “As a scientist studying the geology and geochemistry of mineral deposits, Rob's contributions are surpassed by few individuals, if any.... Rob, in contrast to many workers in our field, has always reached outside our discipline to examine complex interrelationships in the Earth sciences that impact our understanding of ore systems. This effort has included applying an exceptionally broad knowledge of topics, which range from lithospheric evolution to crustal hydrology, to help with our understanding of the genesis of world-class ore deposits.... I also can't stress enough Rob's willingness to mentor many of us in the field of economic geology.... Rob is without a doubt an
outstanding and sharing scientist who, more than anything else, seems to enjoy encouraging younger geoscientists.”

Kontak: “His work on mesothermal gold deposits covers several continents and is done in collaboration with numerous geoscientists, all of international stature. Through these efforts he has not only established himself on the global stage, but more importantly also done the same for the Canadian mineral deposit community from which we all benefit... He is a gifted speaker and master of being able to synthesize vast quantities of data and presenting it in a concise, crystal-clear, and logical manner. Mineral deposit geology is complex, but coming from Rob it has a beautiful and elegant simplicity.”

So much for the glowing accolades, but I’m sure you all want to know what Rob is really like. Well, in compiling his nomination, we attempted to do this without Rob’s knowledge, so we were forced to “obtain” a copy of his CV by covert means. What we did not realize though, was that his CV was written in code, and ran for 64 pages of random text. The task of breaking this code fell to Brenda Britton, one of the secretaries in the University of Saskatchewan Geology Department, who managed to reduce it to 44 pages and introduce some degree of chronological order. From this we were able to divine some key statistics such as numbers of students supervised and honours received, although after several tries I gave up trying to count up his publications.

Rob is also the holder of a prestigious endowed chair at the University of Saskatchewan, the George J. McLeod Chair in Geochemistry. This chair has remarkable space–time properties, in fact more akin to a tardis, because it seems to allow him the luxury of perpetual motion, and rarely docks in Saskatoon, preferring the warmer climes of Australia and Mexico. In fact for a couple of years in the mid-90's Rob and his wonderful wife Bev, took up residence on a beach in Perth. From here, he maintained close communication with his students by fax, frequently exchanging entire theses and manuscripts by this archaic medium. In recognition of Rob’s technical prowess, he affectionately became known as Professor Fax, and was given an engraved facsimile of a large roll of fax paper when finally he left the University of Western Australia.

A more dangerous and worrying departure has been Rob’s recent discovery of computers, and in particular e-mail. I wanted to go into this issue at length, but unfortunately my time on this podium has been severely limited, and I have probably gotten myself into enough trouble already at this meeting, so I will just leave you with a warning to beware Rob with a computer — faxes are much safer!

Once again I present and congratulate Rob Kerrich as this year’s Duncan Derry medalist.

**ACCEPTANCE SPEECH FOR THE 2003 DUNCAN R. DERRY MEDAL**

By: Dr. Robert Kerrich

Dr. Richards, Dr. Smith-incoming President, President Price of the SEG, members of the Geological Association and SEG, ladies and gentlemen. Thank you Jeremy for your gracious remarks, and for leading the nomination.

It is a privilege to receive a medal named after Duncan Derry, one of Canada’s pre-eminent economic geologists, co-founder of the Geological Association of Canada, amongst other career achievements.

My passion for Earth Sciences was ignited by those wonderful movies of the International Geophysical program in 1957, that included the crossing of Antarctica. Also, by a junior school enlightened enough to make field trips part of the curriculum. Earth Sciences offered the best of all worlds; the experimental lab, and the field as Earth’s natural laboratory.

Many institutions pass through cycles of renaissance and decline. I was fortunate to be exposed to two renaissance eras driven by exceptional scientists. First at Imperial College, where John Ramsay, Neville Price and their research groups were creating a wholly new body of knowledge on structures and crustal fluids as integral phenomena. Then
at the University of Western Ontario where Bill Fyfe led a research group from the early seventies. There was a palpable sense of excitement as ideas flowed from frequent dynamic interaction between individuals who freely shared their knowledge and expertise. Bill is generous and wise, cares deeply about the planet and its ecosystems, and taught us unrelentingly to question conventional wisdom. He also taught us humility; that ninety percent of our ideas would be wrong, but that the ten percent right might count.

I have also been fortunate in wonderful collaborations with superb graduate students and post-docs, at Western and Saskatoon. All have gone on to carve successful careers for themselves, holding distinguished positions around the world: Jeremy Richards, professor at Edmonton and Lindgren medallist; Rui Feng, CEO of his own Resource Company out of Vancouver; Derek Wyman, Ali Polat, Peter Hollings, and Erdinc Yigitbas, now professors at Sydney, Windsor, Lakehead, and Istanbul respectively; Cam McCuaig, VP exploration for Robertson Associates in Perth; Min Sun, professor and most distinguished scientist 1999, of Hong Kong University; Xiu-Ping Yan, now professor at Nanjing University, and most distinguished scientist 2000 in China. I am intensely proud of them all. I am grateful to Mr. George McLeod, whose endowment to the University of Saskatchewan has underpinned my research team.

A heartwarming, enjoyable aspect of a career in Earth Sciences is to be part of an international community sharing common interests, with a welcome anywhere in the world. My career has been made possible through the loving support of Bev my wife.

I thank the Mineral Deposits Division for the honour bestowed by award of the Duncan Derry medal.

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2003 Duncan Derry medalist, Dr. Robert Kerrich.

WILLIAM H. GROSS Medalist 2003 - Dr. Ross Sherlock

Citation By: Dr. Dick Tosdal

Ladies and gentlemen, members of the Society of Economic Geologists, members of the Mineral Deposits Division of the Geological Association of Canada, Mr. and Madam President, it is a great pleasure to introduce Ross Sherlock, the 2003 William H. Gross medalist. Ross epitomizes the qualities of an economic geologist, and there are not many young scientists that have made contributions in all aspects of the science, including academics, exploration, and government sciences. I can think of a no more deserving candidate.

Ross received his B.Sc. Honours degree from McMaster University in 1986 and then an M.Sc. from Lakehead University in 1989 where he undertook a study of several Ag-Ni-Co-As-Bi veins in the Thunder Bay District. He then migrated back south where he began a Ph.D. at the Univer-
sity of Waterloo. He had the good sense to design, scour up the appropriate financial support, and undertake research in the California wine country of Napa Valley. Specifically, he undertook the geologic and geochemical study of the sheeted vein core at the McLaughlin low-sulfidation epithermal deposit. Ross’ description and genetic model for McLaughlin is a true work of science, and is cited in articles on these systems.

After receiving his Ph.D., Ross migrated to MDRU in Vancouver in 1993 where John Thompson tossed him into the morass of the volcanology and lithogeochemistry of the VMS systems in BC. He rapidly appreciated the critical questions related to VMS deposits in the Cordillera. He furthermore also brought his own research approach and perspective to the project. Perhaps one of his most widely cited contributions is the water depth during formation of the Eskay Creek precious metal deposits.

Ross left MDRU in 1995 as the VMS project ended and began time in industry. The first stop was the Philippines where he was in charge of exploration for epithermal, porphyry Cu-Au and polymetallic VMS deposits with TVI Pacific. After the birth of his twin terrors, George and Sam, he returned to Vancouver in 1997 where he took up a role as a consultant with SRK. He was involved in projects around the world for most of the major mining companies as well as several junior companies as well as several energy companies. The list is impressive and quite long and one that many consulting geologists would like to have.

In 2000, he made another move yet again, but this time into government based science. He took up a position as a Research Scientist in the Canada-Nunavut Geoscience Office in Iqaluit, Nunavut. While there, he established working relations with the northern communities and with companies exploring in the region. He is helping to advance the knowledge base in this poorly known part of Canada, which is contributing to efforts to improve the quality of life of Inuit Canadians.

Ross has amassed a publication list that would be the envy of many of us in the room. He has authored or co-authored over 60 publications and over 40 abstracts or other conference presentations since 1990. Topics range from metallic ore deposits, some of which I have mentioned, dolomitization and other diagenetic processes, semi-precious stones, geologic constraints on resource estimates, as well as editing a volume on VMS deposits.

Ladies and gentlemen, it is my great privilege as a friend and colleague to present to you the 2003 William H. Gross medalist, Dr. Ross Sherlock.

**ACCEPTANCE SPEECH FOR THE 2003 WILLIAM H. GROSS MEDAL**

*By: Dr. Ross Sherlock*

Thank you very much. It really is an honour to receive this award and I'd like to thank MDD and everyone who supported my nomination.

Like most people, if I've had any success as an economic geologist, much of the credit belongs to the people with whom I've had the pleasure of working. As Dick mentioned, I've tended to switch jobs every few years so that list is rather long. In the next couple of minutes, I'll give you a bit of my background and point out some of the people...
When I graduated from McMaster University I took a one-year contract with the Geological Survey of Canada (GSC) running a high arctic geophysical observatory in Mould Bay, located about 700 km to the northwest of Resolute Bay. I quickly realized that although this was a fantastic experience, it was somewhat limiting professionally and personally. Having some time on my hands I started looking around for graduate schools.

Steve Kissin, at Lakehead University, offered me a well-funded and interesting project on Proterozoic epithermal silver deposits, in the Thunder Bay area. So, after my contract with the GSC, I moved south, got married and we moved to Thunder Bay. My M.Sc. project was well constrained and, finding that I enjoyed research, I decided to pursue a Ph.D.

Craig Jowett, Ian Gibson and Gwylim Roberts, at the University of Waterloo, offered me an interesting project working on a small mine in southern California. Unfortunately, almost immediately after our moving to Waterloo, that project collapsed and I was left at loose ends. While looking around for a suitable project, Steven Losh at Cornell University suggested that I call Norm Lehrman at the McLaughlin Mine, which I did, and Norm invited me to California. I quite literally showed up on Norm's doorstep and he put me up and gave me access to everything I needed at McLaughlin for my research. Then after a couple of weeks, he hired me to work on Homestake's regional exploration programs. I then spent the next three years alternating between Waterloo and northern California, either working on my thesis or for Homestake. Many of you will know Norm Lehrman; at that time not only was Norm the chief geologist of a large and complex mine, his personal collection of Pleistocene mammal fossils had just surpassed Stanford's collection and he was actively searching for the central vent on Mt. Konocti, a large volcano located outside his front door. Norm is an enthusiastic proponent of geology and an amazingly diverse student of natural sciences. Working with Norm and the geological staff at McLaughlin was a great learning experience and a real pleasure.

Following my Ph.D., I took a post-doc fellowship at Mineral Deposit Research Unit (MDRU) here in Vancouver with John Thompson and Tim Barrett. Coming from small economic geology departments, it was great to work at MDRU in a very dynamic environment. MDRU at that time had three large, and several small, projects running in BC, each with many graduate students and research associates. I was associated with the volcanogenic massive sulfide (VMS) project, with Tim and several graduate students, on a variety of deposits in BC, although mainly on the Eskay Creek deposit. I learned a great deal about geology from Tim and he still amazes me with the breadth of his geologic knowledge.

I left MDRU in '95 and took a job with an exploration company in the Philippines, working with Nate Brewer and Neil Westol, on a variety of projects at different levels of maturity. My wife and I spent three years working and living in the Philippines, and our children were born in Manila. We found the Philippines to be a fantastic place to live and work and have many fond memories of our time there.

Once the Bre-X bubble burst, we moved back to Vancouver and I took a job with Etheridge Henley and Williams (EHW), a geological consulting firm, which was then acquired by Steffen Robertson and Kirsten (SRK). At EHW and SRK I spent three years working on a variety of projects, ranging from specialized geologic mapping, through to managing exploration projects, resource modeling and bank valuations. I was able to travel a great deal, often to countries that I never knew existed. If I learned anything from consulting, it was that good geological mapping, sec-

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tional work and conceptual models are critical at any stage of a mine, as it underpins all aspects of exploration and development.

About 3 years ago I accepted a position with the Canada-Nunavut Geoscience Office, a partnership office, administered by the GSC, and funded by NRCan, the Government of Nunavut and Indian and Northern Affairs Canada. It is a privileged position, as I have the freedom to conduct research projects on ore deposits in Nunavut, in a reasonably well-funded environment within broad guiding principles. I work with an excellent group of people in our office and through partnerships. It's a great opportunity to work in a frontier environment and contribute framework information to ore deposit research in a poorly understood area of Canada.

In closing I would like to thank my parents, my wife Elizabeth, and more recently my children Sam and George, all of whom have enthusiastically supported all my endeavors no matter where they take us and still manage to maintain their sense of humour.

Thank you.

2003 Julian Boldy Award Winners
(Best Presentations at the GAC 2003 meeting)

Re-Os geochronology of the Red Dog Zn-Pb deposit, northwestern Alaska

2) Bradshaw, G.D.*, Rowins, S.M., Peter, J.M. and Taylor, B.E.
Genesis of the polymetallic Wolverine deposit, Finlayson Lake district, Yukon: transitional volcanic rock-hosted massive sulphide (VHMS) and Sedimentary Exhalative(SEDEX) mineralization in an ancient continental margin setting

Structural and stratigraphic study of the North Rhyolite, Kidd Creek Mine, Timmins, Ontario

Congratulations on a job well done!!


A joint MDD-MDRU sponsored short course organized by Dick Tosdal, Moira Smith and Murray Hitzman took place at the Sheraton Wall Centre in Vancouver on May 24 and 25, 2003, in conjunction with the GAC-MAC-SEG meeting. Approximately 50 registrants and 9 presenters spent two days examining alkaline and gold rich porphyries and Fe-oxide copper-gold (IOCG) deposits to address the question of whether they are related or separate deposit types.

Murray Hitzman (Colorado School of Mines) started the meeting with a short definition of alkaline and gold-rich porphyries and IOCGs, followed by a genetic model suggesting a possible genetic connection between the different types. Dave Johnson (University of Arizona) presented work by Johnson and Mark Barton on IOCG deposits in the western hemisphere, followed by a presentation on alkaline porphyry deposits in British Columbia by consultant Jim Lang. Geordie Mark (Monash University) finished the first day with a description of IOCGs in Australia. Talks on the second day were more deposit specific, focusing primarily on possible hybrid systems. These included the Yerlington district in Nevada (John Dilles, Oregon State University), Rio Grande, Arizaro and Lindero in Argentina (Russell Dow, Colorado School of Mines and Moira Smith, Teck Cominco Ltd.), and the Lorraine alkaline Cu-Au porphyry in British Columbia (Graham Nixon, B.C. Geological survey). Doug Kirwin (Ivanhoe Mines) finished the list of presentations with a description of the Oyo Tolgoi gold rich porphyry deposit in Mongolia.

The course concluded with an open session where participants examined suites of rock samples and posters, and a brief discussion of the information and models presented. Most participants agreed that on a local scale, alteration (including similar calcic-sodic, potassic, and relatively restricted phyllic zones) and mineralization (relatively low sulphide, chalcopyrite, bornite, etc. and gold) could be strikingly similar. But while calcic-sodic alteration is relatively local in the case of alkaline porphyries, it often occurs over vast areas in the case of IOCGs, probably requiring a very large reservoir of basinal brines. In addition it was noted that there is a clear spatial and temporal link to causative intrusions in the case of alkaline porphyry systems, whereas this link is less clear in IOCGs. Some participants concluded that there are no true “hybrid” systems, while others maintain that one could be produced by significant input of basinal brines into an active intrusion-centred hydrothermal system. Clearly there is more work to be done in the study of both deposit types!
Ore Deposits at Depth Challenges and Opportunities

As mining progresses to depth in many of the world's established mining camps, new challenges are being posed for explorationists and engineers alike. These challenges must be addressed or mines will be forced to shut down prematurely, thus potentially leaving a vast amount of untapped mineral wealth at depth.

This field conference will focus on the exploration and geotechnical problems associated with exploring for and mining deep ore bodies and will lead to a broader understanding of advances in technology that now make this feasible.

The field conference will include both relevant field trips and technical sessions covering various aspects of exploration and mining-related challenges associated with deep ore deposits. The organizers will be soliciting papers for sessions dealing with: Geology; Geophysics; Deep Diamond Drilling; Economics and Engineering - with a strong focus on geomechanical issues; Computer software developments as an aid to understanding deep ore bodies; Gases and fluids in deep drill holes: their origin, nature and how are they controlled, and their implications for safety, drilling and mine development.

September 23-26, 2003
McIntyre Community Centre, Timmins, Ontario Canada

ORGANIZED BY:
Porcupine Prospectors and Developers Association
The CIM Geological Society

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http://www.fieldconference-timmins.com/index.htm
1. CHALLENGES POSED BY METAL LEACHING AND ACID ROCK DRAINAGE, AND APPROACHES USED TO ADDRESS THEM
   W.A. Price

2. GEOENVIRONMENTAL MODELS OF MINERAL DEPOSITS: EXAMPLES FROM MASSIVE SULFIDE AND GOLD DEPOSITS
   R.R. Seal II & J.M. Hammarstrom

3. HYDROLOGIC AND GEOCHEMICAL TRANSPORT PROCESSES IN MINE WASTE ROCKS
   L. Smith & R. Beckie

4. OXIDATION AND GAS TRANSPORT IN PILES OF SULFIDIC MATERIAL
   A.I. M. Ritchie

5. MILL TAILINGS: HYDROGEOLOGY AND GEOCHEMISTRY
   D.W. Blowes, C.J. Ptacek & J. Jurjovec

6. MINE-WASTE MINERALOGY AND MINERALOGICAL PERSPECTIVES OF ACID – BASE ACCOUNTING
   J.L. Jambor

7. DEVELOPMENTS IN HUMIDITY-CELL TESTS AND THEIR APPLICATION
   K.A. Lapakko

8. APPLICATION OF RIETVELD ANALYSIS TO ENVIRONMENTAL MINERALOGY
   M. Raudsepp

9. NOVEL SPECTROSCOPIC TECHNIQUES TO CHARACTERIZE MINE WASTE
   C.G. Weisener

10. THE MICROBIOLOGY OF ACID MINE DRAINAGE
    W.D. Gould & A. Kapoor

11. EFFECTS OF MICROBIOLOGICAL AND GEOCHEMICAL INTERACTIONS IN MINE DRAINAGE
    D.K. Nordstrom

12. GEOCHEMISTRY OF CONCENTRATED WATERS AT MINE-WASTE SITES
    C.J. Ptacek & W.D. Blowes

13. USE OF FIELD-SCALE EXPERIMENTS AND REACTIVE SOLUTE-TRANSPORT MODELLING TO EVALUATE REMEDIATION ALTERNATIVES IN STREAMS AFFECTED BY ACID MINE DRAINAGE
    B.A. Kimball, R.L. Runkel & K. Walton-Day

14. ADVANCES IN REACTIVE-TRANSPORT MODELLING OF CONTAMINANT RELEASE AND ATTENUATION FROM MINE-WASTE DEPOSITS
    U. Mayer, D.W. Blowes & E.O. Frind

15. STABLE-ISOTOPE GEOCHEMISTRY OF MINE WATERS AND RELATED SOLIDS
    R.R. Seal II

16. PASSIVE AND ACTIVE TREATMENT OF MINE DRAINAGE
    K. Walton-Day

17. TREATMENT OF MINE DRAINAGE USING PERMEABLE REACTIVE MATERIALS
    D.W. Blowes, J.G. Bain, D.J.A. Smyth & C.J. Ptacek

18. THE DESIGN AND PERFORMANCE OF MINE-WASTE COVER SYSTEMS
    G.W. Wilson

19. THE RUM JUNGLE MINE – A CASE STUDY
    A.I.M. Ritchie & J.W. Bennett

20. EXTREME ACID MINE DRAINAGE FROM A PYRITIC MASSIVE SULFIDE DEPOSIT: THE IRON MOUNTAIN END-MEMBER
Modern Methods in Exploration Geochemistry

A workshop covering the fundamentals of analytical geochemistry and its application in the exploration for hidden deposits.

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MEETINGS, WORKSHOPS, & FIELDTRIPS

2003

- **September 24-25 - CIM Field Conference: Ore Deposits at Depth-Challenges and Opportunities,** Timmins, Ontario Contact: Mr. Damien J. Duff, Falconbridge Limited, Timmins, Ontario; email: dduff@falconbridge.com
- **October 12-15 - Ore Deposits Mapping Course,** Goldfield and Original Bullfrog Districts, Nevada; Jeffrey Hedenquist, Erich Peterson, William Chavez, Jr.; email: membership@segweb.org
- **November 2-5 - Geological Society of America (GSA) Annual Meeting,** Seattle, WA, USA; http://www.geosociety.org
- **November 3 - Modern Methods in Exploration Geochemistry Workshop,** UNB SEG Student Chapter and CIM, Fredericton, NB; Contact: Sean McClenaghan, University of New Brunswick; email: n542@unb.ca
- **November 24 - Diamonds and Kimberlites Short Course,** Laval-INRS-ETE SEG Student Chapter, Chateau Frontenac, Quebec; www.segweb.org/UofTdiamondcourse.pdf
- **November 24-27 - Quebec Exploration 2003,** Chateau Frontenac, Quebec; www.quebecexploration.qc.ca

2004

- **May 9-12 - Canadian Institute of Mining and Metallurgy Annual Meeting 2004,** Edmonton, Alberta; http://www.cim2004.ca/
- **May 15-17 - GAC/MAC Annual Meeting,** Brock University, St. Catharines, Ontario
- **September 19-24 - International Congress on Applied Mineralogy (ICAM),** Águas de Lindóia, Brazil; www.icam2004.org

Visit the Geological Survey of Canada’s website to learn more about the Geoscape Canada posters prepared for selected regions by the GSC in collaboration with the provincial and municipal governments and educators.

For more information, check out http://geoscape.nrcan.gc.ca

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