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GOLD IN MANITOBA SHORT COURSE

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D. Lentz - University of New Brunswick

David R. Lentz received his B.Sc. (1983) and M.Sc. (1986) degrees in geology from the University of New Brunswick (UNB). He completed a PhD (1992) at the University of Ottawa, and then worked with the Geological Survey of Canada for three years. In 1994, Dave joined the New Brunswick Geological Survey as their mineral deposits geologist. In 1999, he won the Harvey Gross Young Scientist Medal from the Geological Association of Canada (GAC)-MDD. Since 2000, he has held the economic geology chair at UNB (ORE Group), with a research focus on the petrogenesis of ore deposits. Recently, Dave was awarded GAC's Distinguished Service Award and CIM's Distinguished Lecturer this year; most notably, he has edited three best-selling ore deposits-related books for GAC and MAC. He has published well over 100 journal articles and government publications, but is particularly well known for his short courses, workshops, and field trips. Presently, Dave is presently associate editor for Mineralium Deposita, Geoscience Canada, and special volumes for CIM's Exploration and Mining Geology journal. Dave presently is on the executive for CIM's Geological Society, GAC-MDD, AAG, SEG, and Science East and is Chair for the upcoming 24th International Applied Geochemistry Symposium that will be held at UNB in Fredericton, New Brunswick in 2009.

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B. Lafrance - Laurentian University

The author graduated in 1991 from the PhD Geology program at the University of New Brunswick and later worked for three years from 1996-1999 as resident geologist in La Ronge, Saskatchewan. Since 1999, the author has been teaching structural geology at Laurentian University in Sudbury and is doing research in structural geology applied to ore deposit studies.

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C.J. Beaumont-Smith - Manitoba Geological Survey

Chris Beaumont-Smith is a Mineral Deposits Geologist with the Manitoba Geological Survey. He received his Ph.D. in structural geology from the University of New Brunswick. His research interests include structural controls on mineral deposits, mineral deposit geology and regional tectonics. Before joining the MGS, Chris worked with several major Canadian gold and base metal exploration and mining companies, and his interest in mineral exploration is reflected in his exploration-supportive approach to structural analysis. Chris is currently working on the structural controls of gold mineralization in the Snow Lake and Lynn Lake greenstone belts.

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S. Anderson - Manitoba Geological Survey

Scott Anderson is a Mineral Deposit Geologist with the Mineral Deposits Section of the Manitoba Geological Survey. Scott obtained a B.Sc. from the University of Manitoba in 1992 and a Ph.D. from Dalhousie University in 1998. His Ph.D. research focused on the tectonothermal evolution of a segment of the accretionary Laurentian margin in Newfoundland. Prior to joining the MGS in 2001, Scott worked four years in Mexico, conducting gold exploration as the Senior Structural Geologist for Campbell Resources Inc. His current research is focused on the tectonic and metallogenic evolution of the western Superior Province and the south margin of the Hearne craton.

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Developing the Orogenic Gold Deposit Model: Insights from R&D for Exploration Success

Our understanding of gold deposit-forming systems has changed dramatically over the past 30 years, mainly due to the recognition of the role of accretionary complexes and associated Wilson-style plate tectonics in forming large metamorphic derived fluid systems, as well as specialized reduced magmatic hydrothermal systems in associated intrusion-related gold deposits. Detailed research has built on these considerably to the point where predictive metallogeny and applied aspects of geology, geochemistry, and geophysics can be quite effective in exploration. Many of these developments have come from R&D on NSERC-supported funding to researchers in both academe and governments in Canada, as well as fundamental support from industry. The lecturer will review these scientific developments converging on a robust unified model that has the potential for enhancing exploration strategies at all scales. The question is whether further R&D enhances exploration success for gold (or other related metals). If there is a future for R&D in this field, then further support from industry is needed to help drive all sectors involved in R&D worldwide.

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Structural Controls on Hydrothermal Lode Gold Deposits

Hydrothermal lode gold deposits typically consist of mineralized quartz-carbonate veins within altered fault zones. The veins may be barren post-kinematic features that overprint the fault zones, or they may be pre-kinematic features that localized the formation of late fault zones that propagated along the altered wallrocks of the veins. More commonly, the veins are syn-kinematic features that formed during shearing along active fault zones. The fault zones act as channels for the migration of large volumes of gold-bearing hydrothermal fluids during multiple events of rupture and slip reactivation of the fault zones. Hydrothermal minerals precipitate from the fluids to form shear veins and extension veins that are parallel and oblique, respectively, to the walls of the fault zones. The orientation, width, and textures of the veins depend on the orientation of the fault zones with respect to regional stresses, fault cohesion, and the relative restoration rates of stresses and fluid pressures after rupture events. Stress refraction across competent rock bodies may also affect the orientation and nature of mineralized vein systems within fault zones. The presentation addresses the deformation processes that controls the formation of veins, the deposition of gold, and modification of vein systems within fault zones.

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A Review of Lithogeochemistry in Gold Exploration: Evaluation of Pragmatic Tools to Petrogenetic Discrimination Techniques

There are several lithogeochemistry methods that have been applied to gold exploration. There are also numerous types of gold deposits, therefore lithogeochemical signatures will change depending on the host rocks and the specific gold mineralizing environment being studied or explored. Most established lithogeochemical methods have been developed empirically from known gold systems. These orientation studies include assessing the changes in absolute abundances of major and trace elements, as well as examining elemental and molecular ratios spatially (mineralized zones relative to unmineralized host rocks). Obviously these net compositional changes reflect the mineral-chemical effects associated with the alteration assemblages produced. The extent of primary, secondary, and tertiary alteration haloes is a function of the permeability network, mineralogy of the host rocks, and the P, T, pH, etc. of the hydrothermal fluids, and the multitude of fluid flow events that have affected the system. In order to apply trace-element vectoring techniques, it is essential to assess regional background contents of these mineralizing elements within the various host rock types in a region, which can then be compared with typical concentration values found in normal rocks so as to reaffirm the method and baseline data. The author suggests combining several of the key element enrichment factors (EF) into a multi-element (e.g., Au-As-W) EF that is normalized relative to the number of elements used (e.g., n = 3), based on the orientation studies in the specific area. The EF's can be contoured or profiled depending on whether regional, trench, or drill core sampling is being examined. In addition, a robust multi-element EF technique may enhance following discontinuous vein mineralization and therefore grade control within a gold mining operation provided the analytical techniques applied are rapid, reliable, and robust in terms of precision and accuracy of the multi-element analysis employed (Fire Assay, AA, ICP-ES, INAA, etc).

Paleoproterozoic Gold Metallogeny of Manitoba

The Paleoproterozoic represents a major gold producing region in Manitoba. The Paleoproterozoic is dominated by the Trans-Hudson Orogen (THO), an accretionary mobile belt formed as a result of the collision between the Archean Hearne and Superior cratons. Gold production is primarily from orogenic lode gold deposits, which are concentrated in greenstone belts along the southern and northwestern margins of the internal portion of the orogen. Gold mineralization is epigenetic and largely shear zone hosted with the emplacement of mineralization coincident with, or prior to peak regional metamorphism. The presentation will include an overview of historical gold production in Manitoba within the context of the tectonometamorphic history of the internal zone of the THO.

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Orogenic Gold in the Superior Province in Manitoba

Orogenic gold deposits in the Archean Superior Province account for a significant proportion of Canada's total gold endowment. In the western Superior Province, these deposits are spatially associated with crustal-scale faults and accretionary orogenic belts that formed on the margins of the proto-cratonic North Caribou terrane (NCT) during collisional amalgamation of the Superior craton. In Manitoba, known deposits and occurrences of this style of mineralization, which characteristically consists of synkinematic and synmetamorphic quartz-carbonate veins, are concentrated in Neoarchean volcanic-arc terranes on the north (the Oxford Lake–Stull Lake belt) and south (the Rice Lake belt) margins of the Mesoarchean NCT. Major deposits of this type include the Rice Lake deposit of San Gold Corp. and the Twin Lakes deposit of Rolling Rock Resources Corp. This presentation will include a geological overview of the western Superior Province in Manitoba and it's contained orogenic gold deposits, with emphasis on regional exploration parameters.

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