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Item 20

Discussion of the Disseminated-Gold-Ore-Occurrence Model

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CONTENTS

Introduction 107
Checklists of the regional, district, and deposit attributes of disseminated gold occurrences 109
- Alligator Ridge, Nevada 110
- Borealis, Nevada 111
- Carlin, Nevada 112
- Cortez, Nevada 114
- DeLamar, Idaho 115
- Getchell, Nevada 117
- Gold Acres, Nevada 120
- Hasbrouck Peak, Nevada 123
- Jerritt Canyon, Nevada 126
- Maggie Creek/Gold Quarry, Nevada 127
- McLaughlin, California 128
- Mercur, Utah 131
- Round Mountain, Nevada 133
- Round Mountain mine, Nevada 138
- Sulphur, Nevada 142

Attributes of disseminated gold deposits 109
- Regional features 109
- District characteristics 146
- Deposit traits 146

References cited 147
Workshop agenda 148
Workshop participants 149
Suggested reading on disseminated gold deposits 149

INTRODUCTION

The ultimate objective of the 1982 workshop was, if possible, to develop an ore-occurrence model for the disseminated-gold-deposit type. Such a model should assure a common vocabulary and body of factual data that define the common classifiable deposit characteristics and lead to the systematic identification of favorable geologic environments of deposition. Several ore-occurrence models for other types of deposits at various qualitative and quantitative levels have been created to organize data systematically for meeting special-purpose needs (Erickson, 1982; Cox, 1983a, b), but the seeming diversity between sediment- and volcanic-hosted disseminated gold occurrences appeared, at the outset, to pose difficulties in arriving at a simple model. Options for framing a model were considered first, and the elements composing one followed.

Recently, two types of occurrence models have been developed, each of which provides an example of model technology. A genetic-geologic uranium model, for example, encompasses the widely ranging igneous, sedimentary, and metamorphic environments in which uranium forms (Finch and others, 1980). The environment and processes of formation of deposits thought to have a common origin are considered in a time-process sequence. The matrix is intended to consider every event, condition, and process that influenced mineralization, and thus aid in evaluation of the resources. As an example of the second type of model, the computer program "Prospector" (Duda, 1980) was designed for the identification or recognition of specific types of deposits (for example, porphyry copper, massive sulfide) and links field and laboratory observable or inferred evidence with an inference network of plausible rules based on probabilistic reasoning. Such a model provides a systematic methodology for creating a useful resource model and may assist in evaluating geologic terranes and the discovery of unrecognized resources.

The consensus of the workshop was that a definitive or quantitative model, such as those described above, may be premature for disseminated gold deposits; however, documentation of the geologic attributes as well as of existing gaps in data is an important first step in establishing the status of knowledge.

f. Chemical evolution -----	See 4a(1) above.
5. Source of elements --------	Leached from deep-seated intrusive(?) and (or) surrounding sedimentary rocks.
6. Geophysical signatures	
a. Gravity ----------------	n.d.
b. Magnetic ---------------	The Lynn window (locus of the Roberts Mountains Formation) is situated at a magnetic "high".
c. Induced polarization ---	n.d.
d. Seismic ----------------	n.d.
e. Radiometric ------------	n.d.
7. Summary of apparent depositional environment.	Low-pressure low-temperature near-surface deposition.
8. Byproduct metals ----------	Hg.
G. Summary, features for resource evaluation.	Anomalously high geochemical values for As, Au, Hg, Sb, and Tl in a carbonate sedimentary sequence that contains silicification and argillization as the major alteration types.

Cortez, Nevada

[Data from J. J. Rytuba. n.d., no data available]

A. Name/location ----------------	Cortez. T. 27 N., R. 47, 48 E., Lander County, Nev.
B. Deposit type -----------------	Carbonate-hosted, disseminated.
C. Other examples ---------------	Horse Canyon and Gold Acres, Nev.
D. Regional attributes	
1. Presence of gold ----------	Ag-Au district.
2. Terrane -------------------	Tectonostratigraphic accreted oceanic crust over miogeoclinal shelf of craton.
3. Basement ------------------	Concealed.
4. Igneous association -------	Several felsic dikes of biotite-quartz-sanidine porphyry of age and composition to those of the Caetano Tuff.
5. Structural regime ---------	North-northwest-striking normal faults.
6. Level of erosion ----------	Apparently near-surface, as evidenced by open breccia and vein.
E. District attributes	
1. Host rocks ----------------	Finely laminated carbonaceous siltstone beds of the Roberts Mountains Formation.
2. Traps ---------------------	Ore bodies follow general strike and dip of dikes.
3. Preparation ---------------	Silicification; brecciation and fracturing, formation of jasperiod.
4. Size ----------------------	0.8 by 6.4 km. Cortez main production: 4.5 million oz Ag, 24,000 oz Au (139.9 million g Ag, 146,000 g Au) and some minor Pb, Cu, and Zn from mantos in the Hamburg dolomite.
5. Extensions ----------------	New discovery in district being put into production at Horse Canyon, which holds 3.4 million ton (3.08 million t) of ore containing .05 oz Au/t (1.9 g Au/t).
F. Deposit attributes	
1. Host rocks ----------------	Deposit occurs in thin bedded siltstone of the Roberts Mountains Formation (Wells and others, 1969).
2. Size/shape ----------------	3.4 million st of ore containing 0.29 oz Au/t (3.1 million mt at 9 g Au/t) in irregular to tabular ore bodies striking north-northwest and dipping 30°-40° SW.
3. Physical characteristics	
a. Ore/gangue mineralogy --	Native gold, pyrite, Au-, As-, Sb-, and Hg-bearing pyrite and gangue minerals of quartz, calcite, and very minor barite.
b. Structures -------------	Disseminated and fracture controlled. Some minor quartz-gold veins.
c. Textures ---------------	Fine-grained, locally open breccias and fractures.
d. Host-rock type/age -----	Silurian and Devonian Roberts Mountains Formation and 34-m.y.-old felsic dikes.
e. Paragenesis ------------	n.d.

4. Chemical characteristics	
a. Solution chemistry	
(1) Inclusions ---------	n.d.
(2) Stability ----------	n.d.
(3) Solubility ---------	n.d.
(4) Isotopes -----------	n.d.
(5) Cause of deposition	n.d.
b. Temperature ------------	175°-200°C from fluid inclusions (Rye, this volume).
c. Associated anomalies ---	As, Sb, Hg, W, Tl.
d. Alteration/zonation ----	Silicification, carbon oxidation, argillization of felsic dikes to montmorillonite.
e. Oxidized or carbonaceous materials.	Both carbonaceous and oxidized ore present.
f. Chemical evolution -----	n.d.
5. Source of elements --------	n.d.
6. Geophysical signatures	
a. Gravity ----------------	n.d.
b. Magnetic ---------------	n.d.
c. Induced polarization ---	n.d.
d. Seismic ----------------	n.d.
e. Radiometric ------------	n.d.
7. Summary of apparent depositional environment.	Deposition in faulted and fractured silty limestone adjacent to felsic dikes. Ore solutions rose along contact of felsic dikes and laterally spread out into the carbonate rocks. Silicification was accompanied by gold and pyrite deposition, along with trace amounts of As, Sb, Hg, Tl, and W
8. Byproduct metals ----------	Ag.
G. Summary, features for resource evaluation.	Low-grade geochemical anomalies of As, Au, Hg, Sb, and W in and adjacent to jasperoid replacement bodies in carbonate rocks.

DeLamar, Idaho

[Data from W. C. Bagby. n.d., no data available]

A. Name/location ---------------	DeLamar silver mine, Owyhee Mountains, southwestern Idaho.
B. Deposit type ----------------	Volcanic-hosted disseminated silver/gold.
C. Other examples --------------	Waterloo(?), Calif.; Rochester(?), Nev.
D. Regional attributes	
1. Presence of gold ----------	The region is known for placer gold discovered in 1863, and for silver and gold production from veins in the Silver City area until 1914.
2. Terrane -------------------	Cretaceous-Paleocene plutonic terrane overlain by Miocene volcanic rocks. Would be considered an inner continental margin.
3. Basement ------------------	Outliers of the Idaho batholith, with small roof pendants of metasedimentary rock.
4. Igneous association -------	Granodiorite of the Idaho batholith and alkali olivine basalt and rhyolite of the Owyhee volcanic field. The volcanic field is marginal to the Snake River rift.
5. Structural regime ---------	The basement rocks are associated with Mesozoic subduction. The volcanic rocks are associated with later rifting possibly associated with Basin and Range development. The regional structure is dominated by N. 10°-20° W.-trending oblique-slip normal faults.
6. Level of erosion ----------	Erosion is considerable but varies regionally. Epithermal veins in the region indicate that erosion has not yet stripped away those deposits.