DESCRIPTIVE MODEL OF POLYMETALLIC VEINS

By Dennis P. Cox

APPROXIMATE SYNONYM Felsic intrusion-associated Ag-Pb-Zn veins (Sangster, 1984).

DESCRIPTION Quartz-carbonate veins with Au and Ag associated with base metal sulfides related to hypabyssal intrusions in sedimentary and metamorphic terranes.

GEOLOGICAL ENVIRONMENT

Rock Types Calcalkaline to alkaline, diorite to granodiorite, monzonite to monzogranite in small intrusions and dike swarms in sedimentary and metamorphic rocks. Subvolcanic intrusions, necks, dikes, plugs of andesite to rhyolite composition.

Textures Fine- to medium-grained equigranular, and porphyroaphanitic.

Age Range Most are Mesozoic and Cenozoic, but may be any age.

Depositional Environment Near-surface fractures and breccias within thermal aureol of clusters of small intrusions. In some cases peripheral to porphyry systems.

Tectonic Setting(s) Continental margin and island arc volcanic-plutonic belts. Especially zones of local domal uplift.

Associated Deposit Types Porphyry Cu-Mo, porphyry Mo low-F, polymetallic replacement. Placer Au.

DEPOSIT DESCRIPTION

Mineralogy Native Au and electrum with pyrite + sphalerite ± chalcopyrite ± galena ± arsenopyrite ± tetrahedrite-tennantite ± Ag sulfosalts ± argentite ± hematite in veins of quartz + chlorite + calcite ± dolomite ± ankerite ± siderite ± rhodochrosite ± barite ± fluorite ± chalcedony ± adularia.

Texture/Structure Complex, multiphase veins with comb structure, crustification, and colloform textures. Textures may vary from vuggy to compact within mineralized system.

Alteration Generally wide propylitic zones and narrow sericitic and argillic zones. Silicification of carbonate rocks to form jasperoid.

Ore Controls Areas of high permeability: intrusive contacts, fault intersections, and breccia veins and pipes. Replacement ore bodies may form where structures intersect carbonate rocks.

Weathering Minor gossans and Mn-oxide stains. Zn and Pb carbonates and Pb sulfate. Abundant quartz chips in soil. Placer gold concentrations in soils and stream sediments. Supergene enrichment produces high-grade native and horn silver ores in veins where calcite is not abundant.

Geochemical Signature Zn, Cu, Pb, As, Au, Ag, Mn, Ba. Anomalies zoned from Cu-Au outward to Zn-Pb-Ag to Mn at periphery.

EXAMPLES

St. Anthony (Mammoth), USAZ	(Creasey, 1950)
Wallapai District, USAZ	(Thomas, 7949)
Marysville District, USMT	(Knopf, 1913)
Misima I., PPNG	(Williamson and Rogerson, 1983)
Slocan District, CNBC	(Cairnes, 1934)

GRADE AND TONNAGE MODEL OF POLYMETALLIC VEINS

By James D. Bliss and Dennis P. Cox

COMMENTS The data used to generate grade and tonnage models for polymetallic veins reflect considerable complexity in the geology and economic conditions under which deposits are produced or evaluated; This model represents a first attempt to resolve these complexities. Four important

factors may affect the adequacy of this model.

1. Zinc grades are subject to considerable uncertainty because smelters have in the past penalized producers for ore containing zinc which in turn caused mine operators to avoid zinc-bearing ore in their mining and milling. Zinc grades are likely underestimated. Irregular behavior in the zinc-grade model may be due to these factors.

2. Polymetallic veins of two types appear to exist--a base-metal polymetallic vein worked primarily for a base metal or metals and silver and a gold-silver polymetallic vein with copper, lead, and zinc production likely in less than half the deposits. Grade and tonnage models are presented for the base-metal polymetallic veins. Grade and tonnge models are not presented for the gold-silver polymetallic veins because preliminary data are inadequate. In our data, districts in which both types occur generally have six times as many base-metal polymetallic veins as gold-silver polymetallic veins.

3. The Slocan Mining District, British Columbia, Canada, contributed nearly 60 percent of the deposit data for the base-metal polymetallic veins, and this may bias the models in ways not identified.

4. Deposits are defined as all workings within 1 km of each other and having a minimum of 100 tonnes of ore. A few deposits are for districts with workings of unknown spacing. See figs. 90-94.

Name	Country	Name	Countrv
Albert Lea Group	USAZ	Mammoth-St. Anthony	USAZ
Altoona-Elkhor-Mercury	CNBC	Marietta	USMT
Amazon	USMT	Mineral Park	USAZ
Antoine	CNBC	Minniehaha	CNBC
Arlington	CNBC	Molly Gibson	CNBC
Badger	USAZ	Monitor	CNBC
Baltic and Revenue	USCO	Montezuma	CNBC
Baltimore	USMT	Mountain Chief and vicinity	CNBC
Bell	CNBC	Mountain Con	CNBC
Bell and California	USCO	Noonday	CNBC
Bell Boy-Niles-Towsley	USMT	North Cerbat (Golconda)	USAZ
Big Four	USMT	Northern Bell-Jackson	CNBC
Bosum	CNBC	Payne Group	CNBC
Bullion	USCO	Pennsylvania	USCO
C.O.D.	USAZ	Queen Bess and vicinity	CNBC
California-Hartney-Marion	CNBC	Rambler-Cariboo	CNBC
Carnation-Jennie Lind	CNBC	Rio	CNBC
Central Cerbat District	USAZ	Robert Emmet	USMT
Champion-New London	USAZ	Santiago-Commonwealth-	
Chlorite District	USAZ	Centennial	USCO
Comstock	CNBC	Scraton-Pontiac-Sunset	CNBC
Cork-Province	CNBC	Silversmith-Richmond-	
Dardanelles	CNBC	Ruth-Hope	CNBC
Defiance	USAZ	Slocan-Sovereign	CNBC
Eva May	USMT	Soho	CNBC
Fisher Maiden Group	CNBC	Standard and vicinity	CNBC
Flint-Martin	CNBC	Stockton	USAZ
Galena Farm and vicinity	CNBC	Sunshine-Corinth	CNBC
Gray Eagle	USMT	Surprise-Noble Five and	
Idaho-Alamo Group	CNBC	vicinity	CNBC
Idaho-Alamo-Silver Bell	CNBC	Treasure Hill	USAZ
Ivanhoe-Canadian	CNBC	Tybo	USNV
Keno Hill-Galena Hill	CNYT	Union	USNV
King Solomon	USMT	Utica	CNBC
Leadsmith	CNBC	Vancouver Group	CNBC
Legal Tender	USMT	Von Roi-Hewitt-A.U.	CNBC
Little Nell	USMT	Wellington	CNBC
Liverpool	USMT	Wintrop	CNBC
Majestic-Sapphire	CNBC	Wonderful-Elkhorn	CNBC

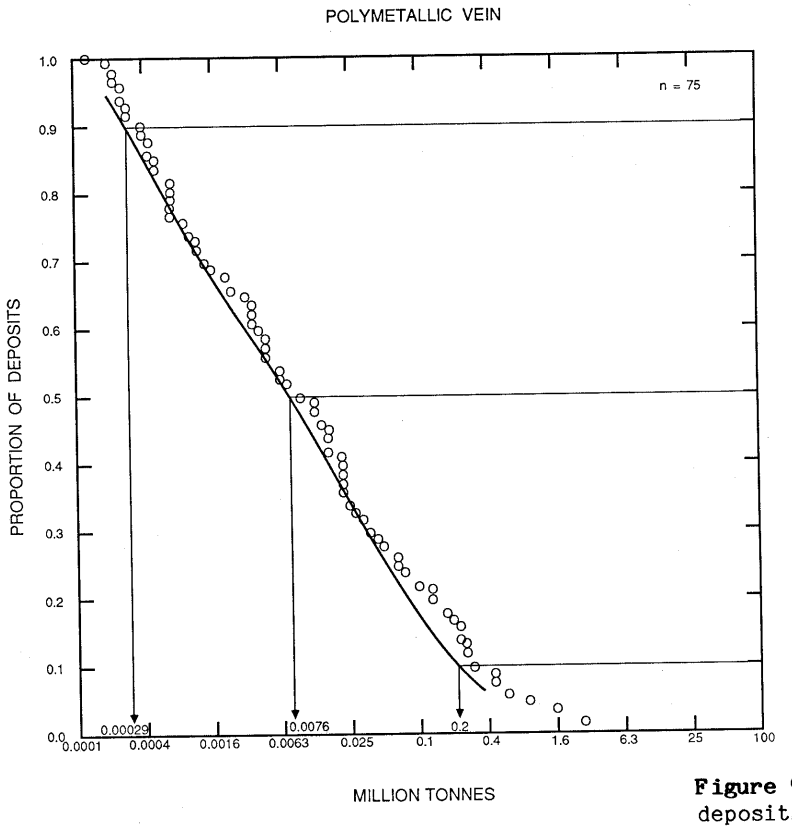

Figure 90. Tonnages of polymetallic vein deposits.

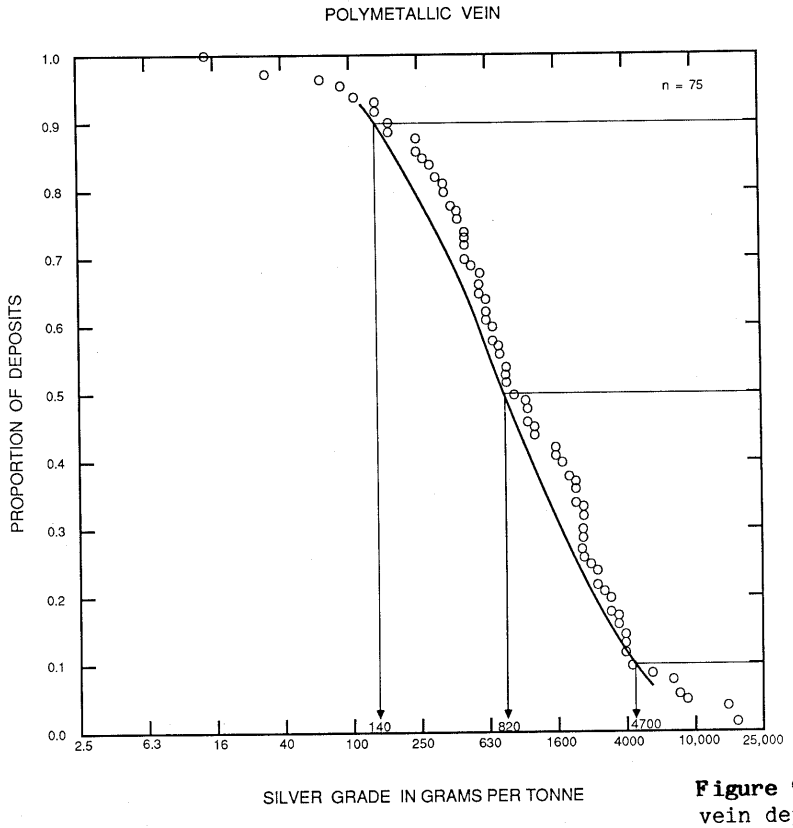

Figure 91. Silver grades of polymetallic vein deposits.

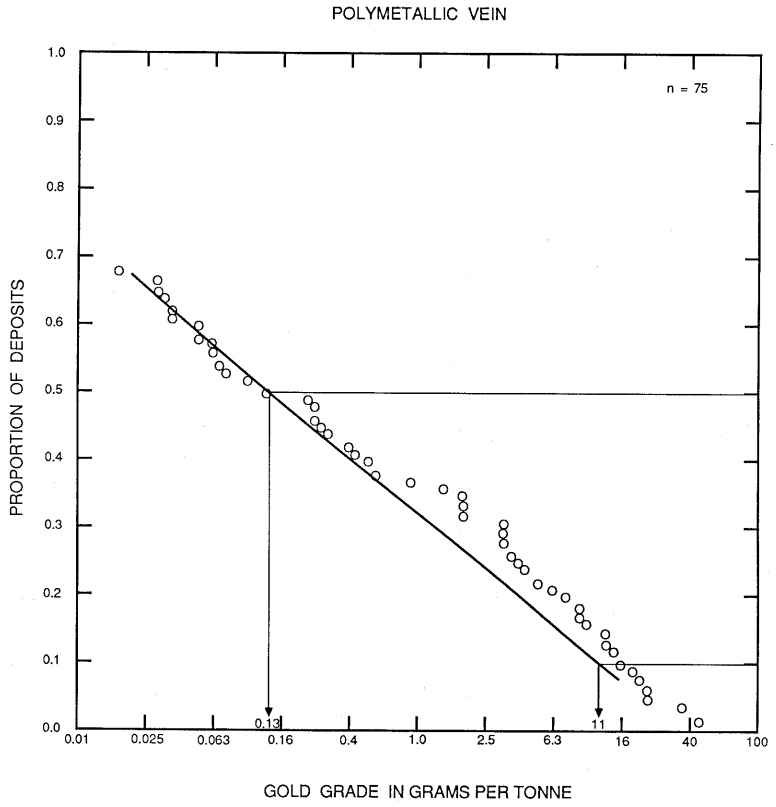

Figure 92. Gold grades of polymetallic vein deposits.

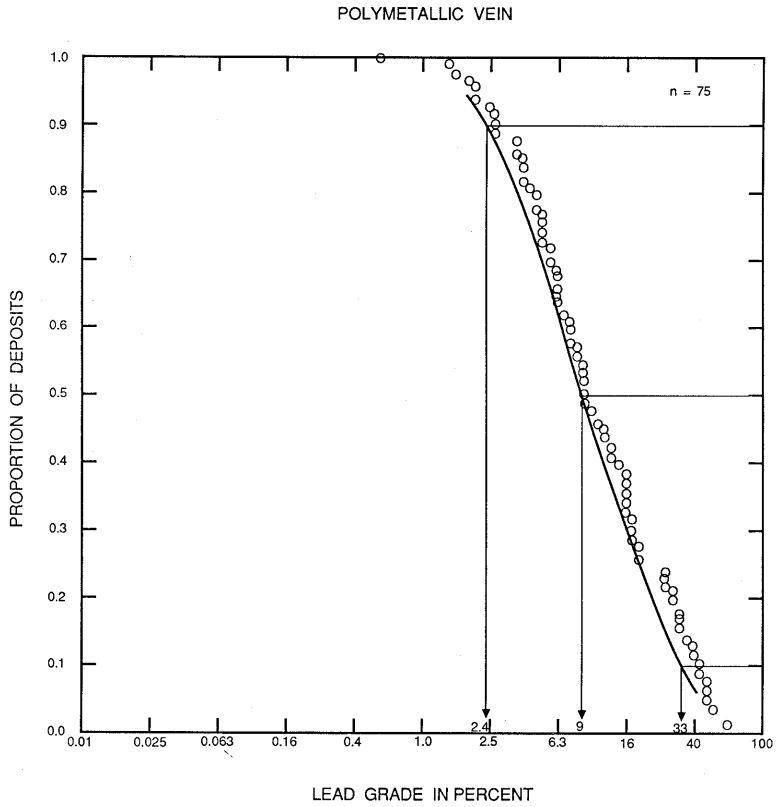

Figure 93. Lead grades of polymetallic vein deposits.

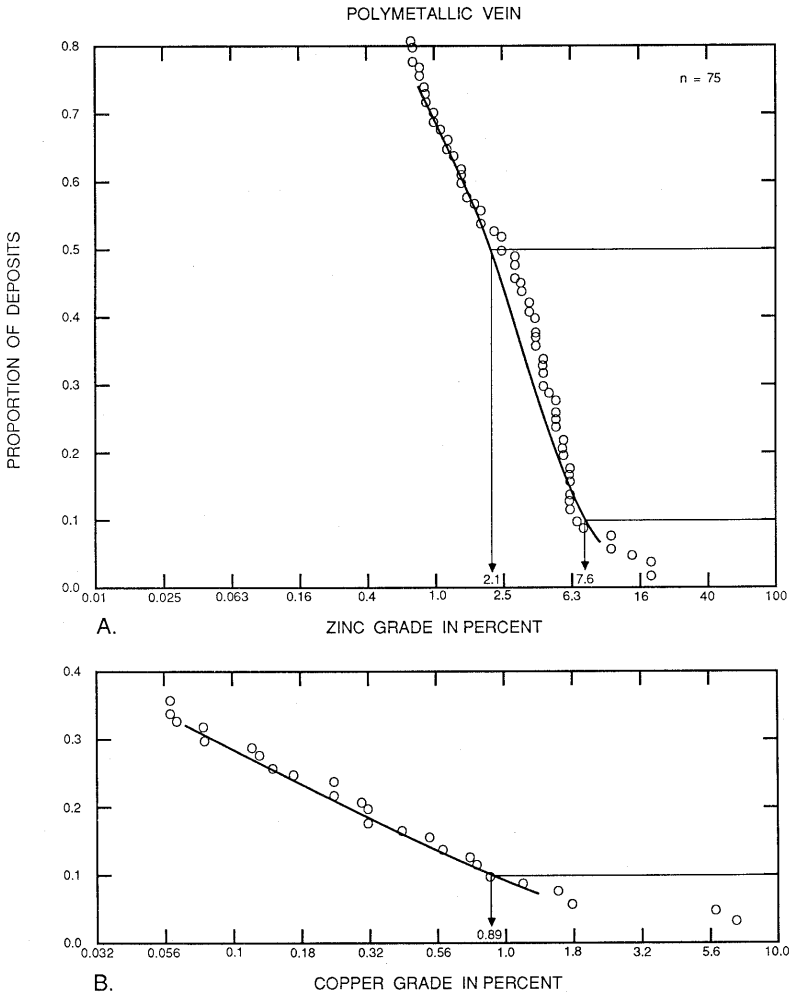

Figure 94. Zinc and copper grades of polymetallic vein deposits. A, Zinc. B, Copper.