Model 20c

DESCRIPTIVE MODEL OF PORPHYRY Cu-Au

By Dennis P. Cox

DESCRIPTION Stockwork veinlets of chalcopyrite, bornite, and magnetite in porphyritic intrusions and coeval volcanic rocks. Ratio of Au (ppm) to Mo (percent) is greater than 30 (see fig. 77).

GENERAL REFERENCES Sillitoe (1979), Cox and Singer (in press).

GEOLOGICAL ENVIRONMENT

Rock Types Tonalite to monzogranite; dacite, andesite flows and tuffs coeval with intrusive rocks. Also syenite, monzonite, and coeval high-K, low-Ti volcanic rocks (shoshonites).

Textures Intrusive rocks are porphyritic with fine- to medium-grained aplitic groundmass.

Age Range Cretaceus to Quaternary.

Depositional Environment In porphyry intruding coeval volcanic rocks. Both involved and in large-scale breccia. Porphyry bodies may be dikes. Evidence for volcanic center; 1-2 km depth Of emplacement.

Tectonic Setting(s) Island-arc volcanic setting, especially waning stage of volcanic cycle. Also continental margin rift-related volcanism.

Associated Deposit Types Porphyry Cu-Mo; gold placers.

DEPOSIT DESCRIPTION

Mineralogy Chalcopyrite ± bornite; traces of native gold, electrum, sylvanite, and hessite. Quartz + K-feldspar + biotite + magnetite ± chlorite ± actinolite ± anhydrite. Pyrite + sericite ± clay minerals ± calcite may occur in late-stage veinlets.

Texture/Structure Veinlets and disseminations.

Alteration Quartz ± magnetite ± biotite (chlorite) ± K-feldspar ± actinolite, ± anhydrite in interior of system. Outer propylitic zone. Late quartz + pyrite + white mica ± clay may overprint early feldspar-stable alteration.

Ore Controls Veinlets and fractures of quartz, sulfides, K-feldspar magnetite, biotite, or chlorite are closely spaced. Ore zone has a bell shape centered on the volcanic-intrusive center. Highest grade ore is commonly at the level at which the stock divides into branches.

Weathering Surface iron staining may be weak or absent if pyrite content is low in protore. Copper silicates and carbonates. Residual soils contain anomalous amounts of rutile.

Geochemical Signature Central Cu, Au, Ag; peripheral Mo. Peripheral Pb, Zn, Mn anomalies may be present if late sericite pyrite alteration is strong. Au (ppm):Mo (percent) 30 in ore zone. Au enriched in residual soil over ore body. System may have magnetic high over intrusion surrounded by magnetic low over pyrite halo.

EXAMPLES

Dos Pobres, USAZ	(Langton and Williams, 1982)
Copper Mountain, CNBC	(Fahrni and others, 1976)
Tanama, PTRC	(COX, 1985)

GRADE AND TONNAGE MODEL OF PORPHYRY CU-AU

By Donald A. Singer and Dennis P. Cox

COMMENTS See figs. 78-81.

DEPOSITS

Name	Country	Name	Country
Afton	CNBC	Mamut	MDGS
Amacan	PLPN	Mapula	PLPN
Atlas Lutopan	PLPN	Marcopper	PLPN
Basay	PLPN	Marian	PLPN
Bell Copper	CNBC	Mountain Mines	PLPN
Boneng Lobo	PLPN	Ok Tedi	PPNG
Cariboo Bell	CNBC	Panguana	PPNG
Copper Mountain	CNBC	Red Chris	CNBC
Cubuagan	PLPN	Rio Vivi	PTRC
Dizon	PLPN	Saindak South	PKTN
Dos Pobres	USAZ	San Antonio	PLPN
Fish Lake	CNBC	San Fabian	PLPN
Frieda River	PPNG	Santo Nino	PLPN
Galore Creek	CNBC	Santo Tomas	PLPN
Hinobaan	PLPN	Star Mt.-Fubilan	PPNG
Ingerbelle	CNBC	Star Mt.-Futik	PPNG
Kennon	PLPN	Tanama	PTRC
La Alumbrera	AGTN	Tawi-Tawi	PLPN
Lorraine	CNBC	Taysan	PLPN
Lumbay	PLPN	Toledo	PLPN

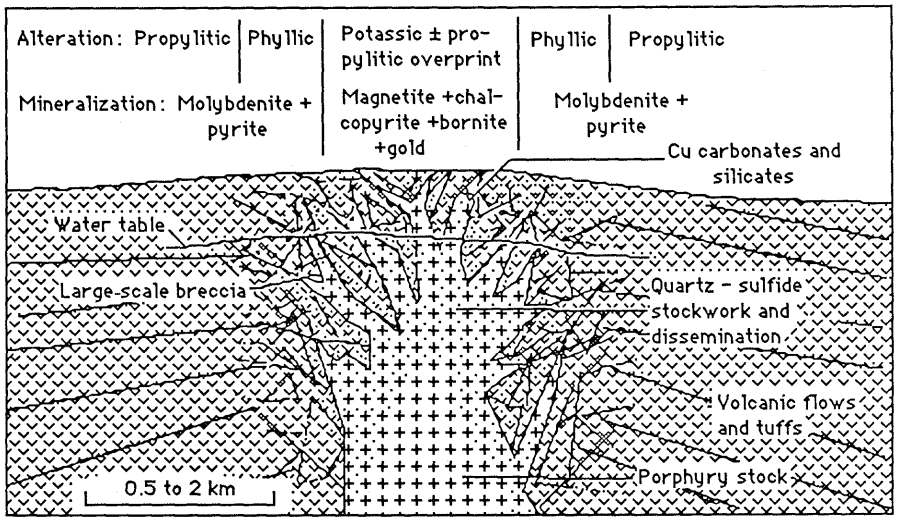

Figure 77. Cartoon cross section of porphyry Cu-Au deposit. Modified from Langton and Williams (1982).

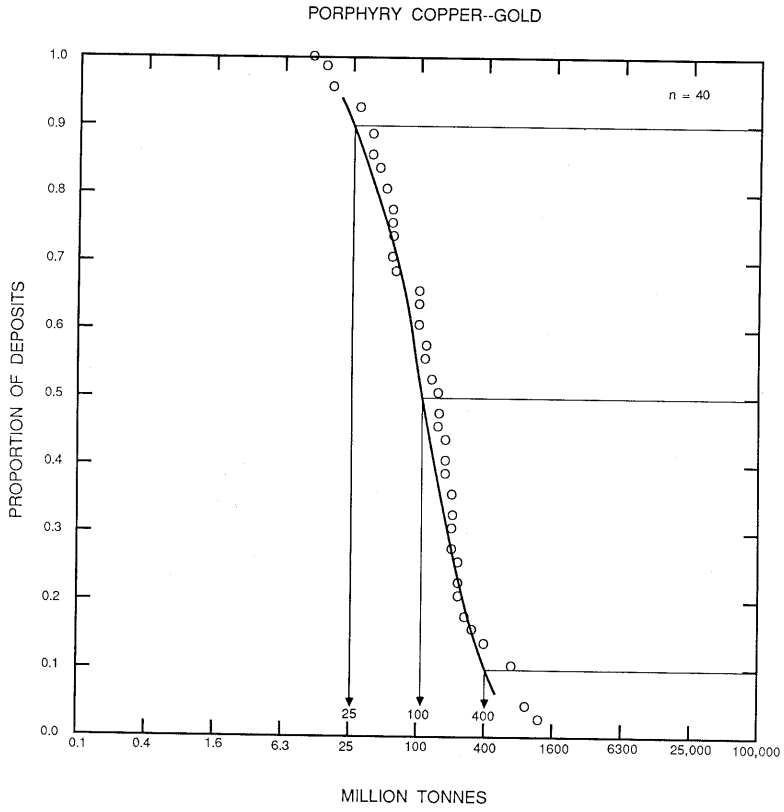

Figure 78. Tonnages of porphyry Cu-Au deposits.

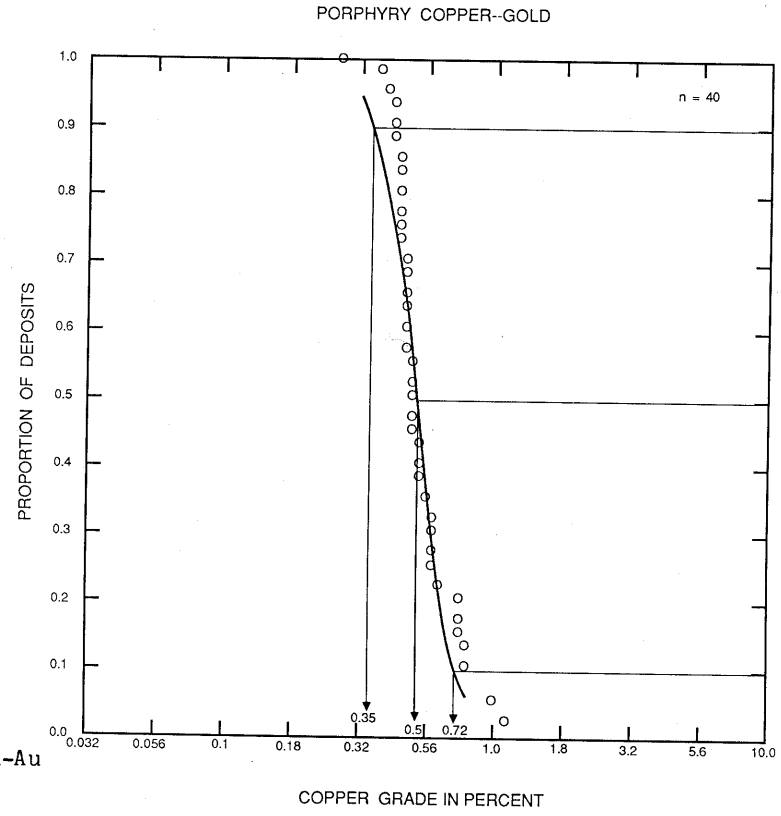

Figure 79. Copper grades of porphyry Cu-Au deposits.

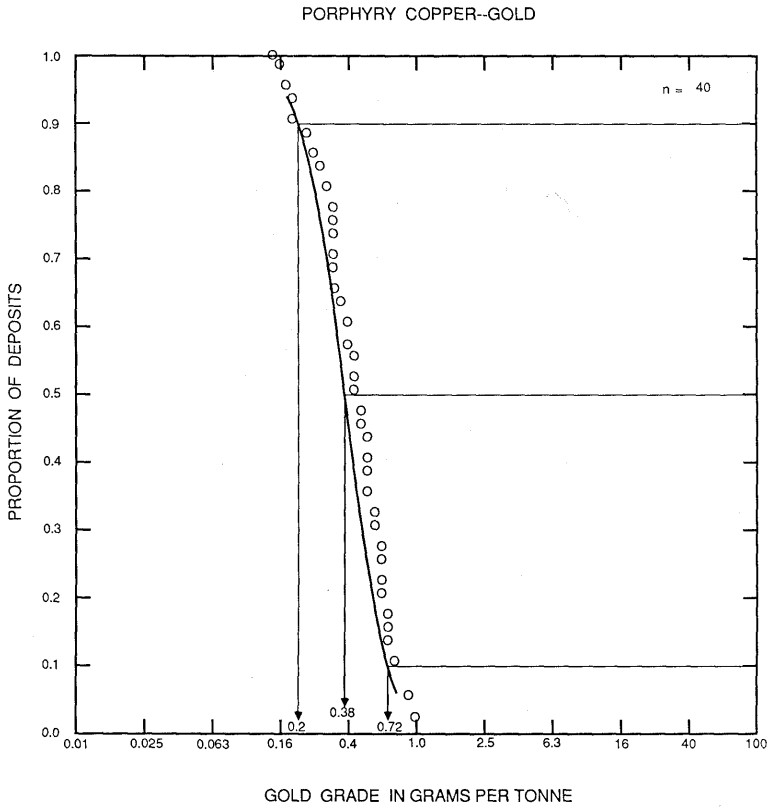

Figure 80. Gold grades of porphyry Cu-Au deposits.

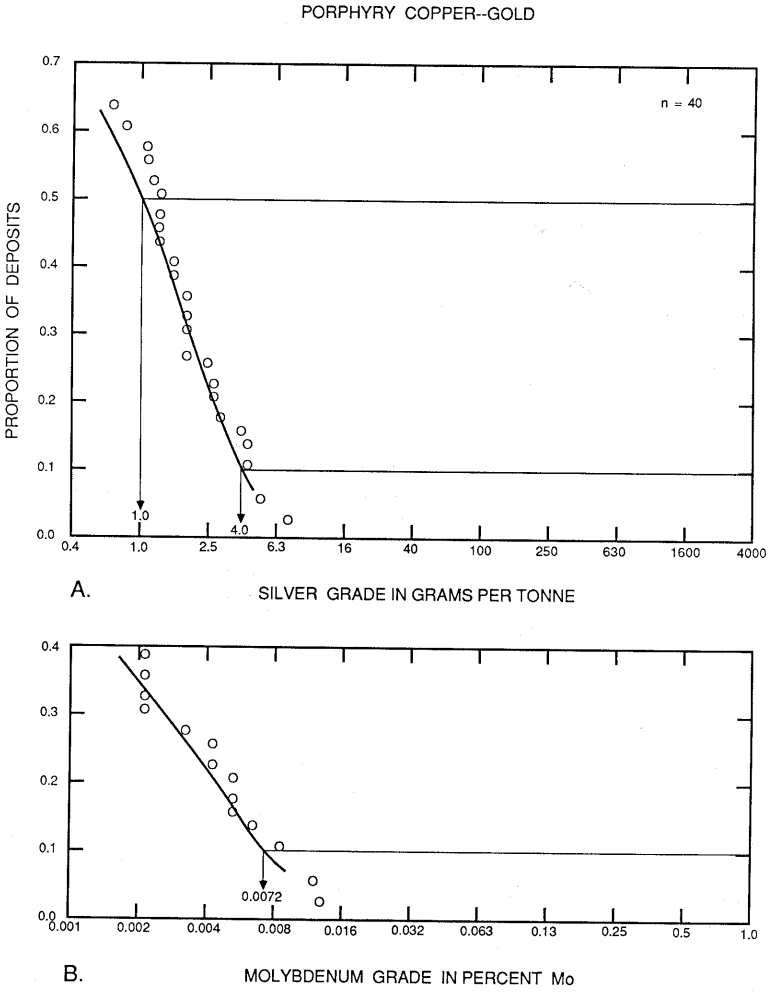

Figure 81. By-product grades of porphyry Cu-Au deposits. A, Silver. B, Molybdenum.