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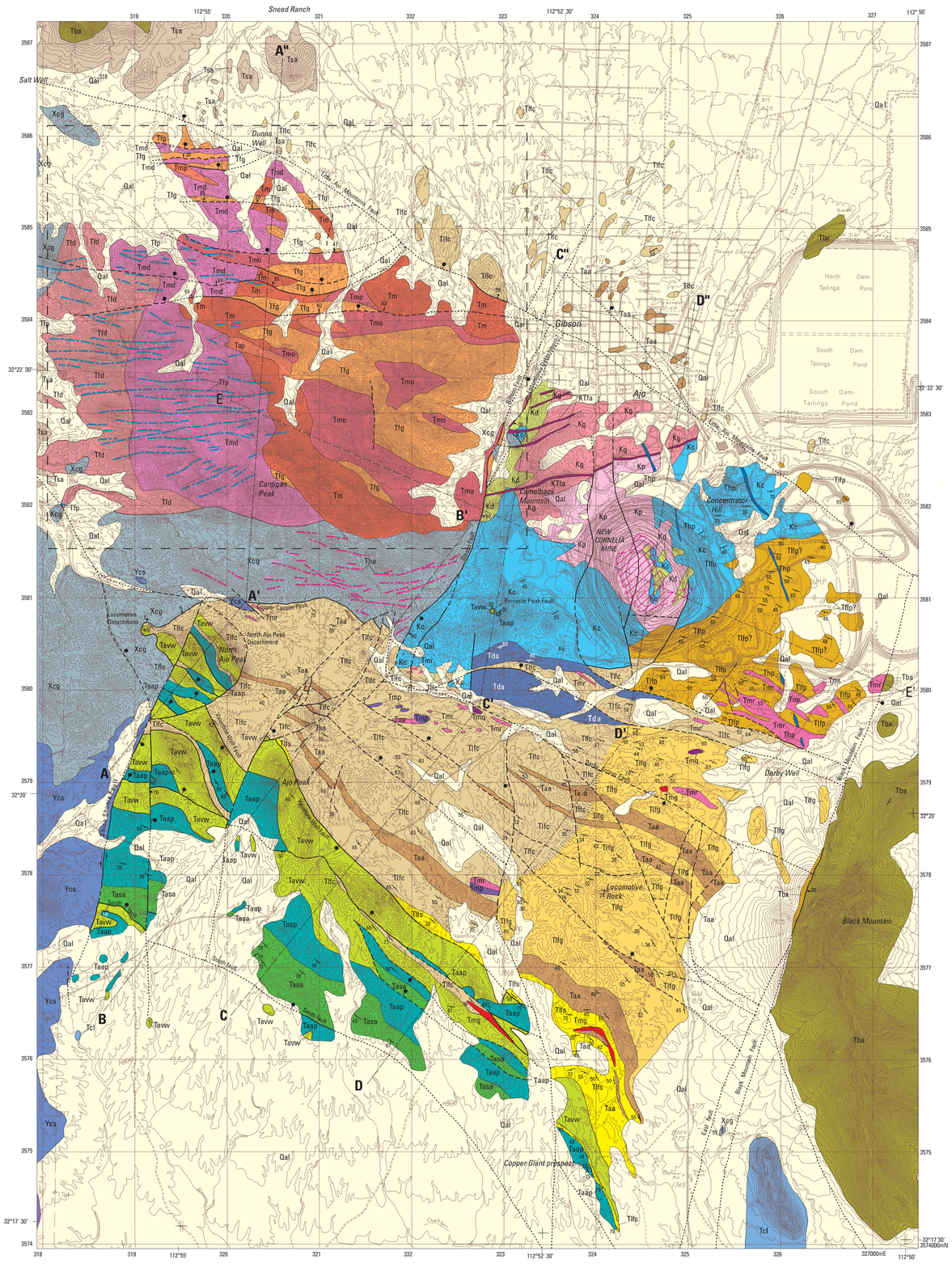
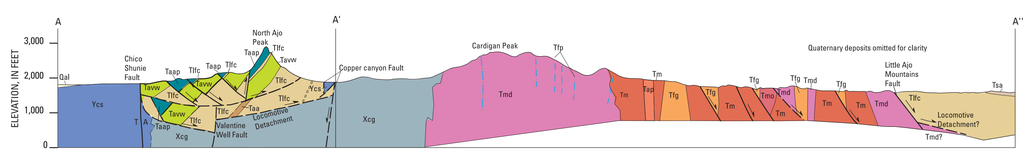
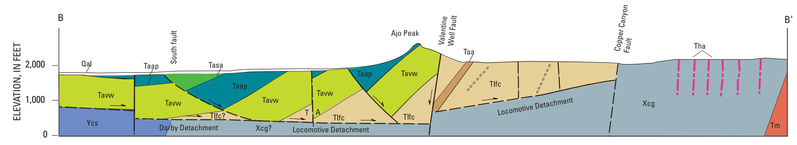
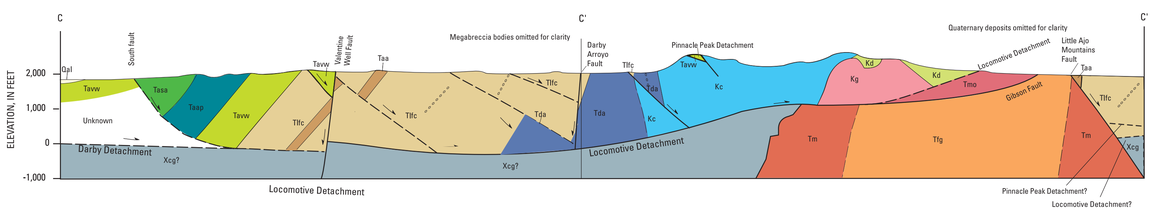
U.S. Department of Interior
U.S. Geological Survey

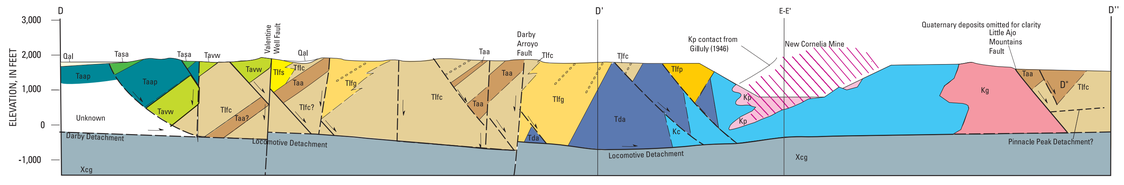
Professional Paper 1733
Plate 1

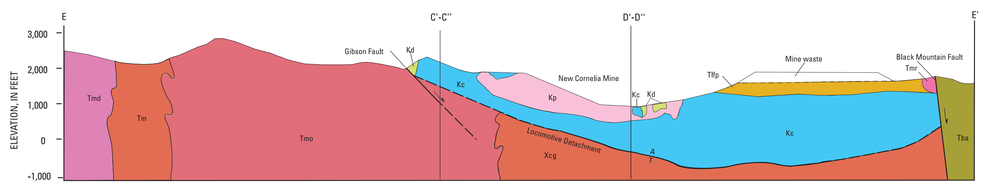




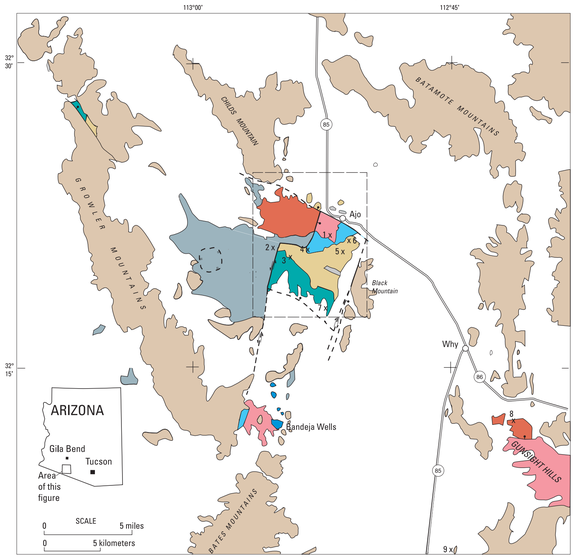








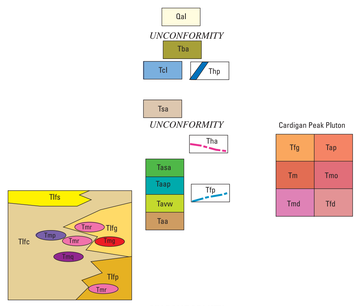
GEOLOGY AND MINERAL DEPOSITS AND OCCURRENCES IN THE AJO DISTRICT AND SURROUNDING REGION



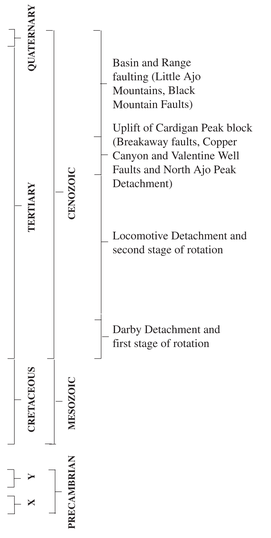
EXPLANATION

- Surficial deposits
- Upper Tertiary volcanic and sedimentary rocks
- Tertiary granitic rocks
- Lower Tertiary volcanic rocks
- Lower Tertiary fanglomerate
- Cretaceous granitic rocks
- Cretaceous (?) volcanic rocks
- Paleozoic metasedimentary rocks
- Precambrian metamorphic and granitic rocks
- Contacts
- Faults, dashed where inferred
- Normal faults, ball on downthrown side, dashed where inferred
- Strike-slip faults
- Detachment faults, ticks on hanging wall
- 1 x Mineral deposit or occurrence with number (see table 7)
- Area of geologic map at left

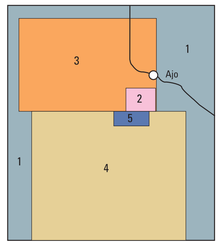
CORRELATION OF MAP UNITS



TECTONIC EVENTS



SOURCES OF DATA



1. Gilluly, 1937, 1:12,000, 1: 62,500
2. Phelps Dodge Corp., courtesy of Ron Gibbs, 1983, 1:10,000
3. Cox and Ohta, 1984, 1:25,000
4. Cox, BHP Minerals, unpublished report, 1997, 1:24,000
5. Force, 1997a, 1: 24,000

SCALE 1:24 000

KILOMETERS 1 .5 0 1 2
METERS 1000 0 1000 2000
MILES 1 .5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 20 FEET

Base from U.S. Geological Survey 7½ ' quadrangles: Childs Mountain, Ajo North, Chico Shunie, and Ajo South.
Coordinates in UTM.

List of Map Units

Qal **Surficial deposits (Quaternary)—**Terrace gravels, talus, and alluvium

Tba **Batamote Andesite (Miocene**, 14-15 Ma)—Flows and flow-breccias

Tcl **Childs Latite (Miocene,** 18 Ma)—Augite latite flows with abundant large plagioclase phenocrysts in flows, Tc, and dikes, Thp.

Thp **Hospital porphyry (Miocene)—**Augite latite dikes with abundant large plagioclase phenocrysts

Tsa **Sneed Andesite (Miocene)**—Dacite and hornblende andesite flows, Rhyolite ignimbrite in uppermost part. K-Ar biotite age of 22.0 ± 0.7 Ma (Gray and Miller, 1984). An ^{40}Ar-^{39}Ar date of 21.7 Ma was obtained from sanidine in the ignimbrite

Tha **Hornblende andesite (Miocene?)—**Dikes with small phenocrysts of hornblende

Cardigan Peak Pluton (Miocene)—Diorite to granitic rocks, zoned from east to west

Tfg **Fine-grained granite and monzogranite**

Tap **Monzogranite porphyry with aplitic groundmass**

Tmo **Monzogranite with oikocrystic quartz and K-feldspar**

Tm **Monzogranite—**Hornblende and biotite K-Ar ages of 20.1 ± 3.5 and 19.6 ± 1.3 Ma, respectively (McDowell, 1971), and biotite, 21.6 ± 1.8 Ma (Hagstrom and others,1987). Zircon U-Pb ages of 23.7 ± 0.2 Ma, (Wooden, this paper)

Tfp **Feldspar porphyry dikes (Miocene)—**Dikes with prominent plagioclase phenocrysts

Tmd **Hornblende-biotite quartz monzodiorite—** Hornblende and biotite K-Ar ages of 21.6 ± 1.8 and 23.0 ± 0.7 Ma, respectively (Hagstrom and others,1987)

Tfd **Fine-grained diorite and quartz monzodiorite**

Ajo Volcanics (Miocene)

Tasa **South Ajo member—**Welded tuff with small phenocrysts of plagioclase and hornblende

Taap **Ajo Peak member—**Plagioclase hornblende welded tuff, dark gray groundmass, locally with small clasts

Tavw **Valentine Well member—**Plagioclase-biotite dacite tuff with large subangular clasts in gray, tan-weathering, groundmass. K-Ar biotite and whole rock ages of 23.8 ± 0.8 and 25± 2.7 Ma, respectively (Gray and Miller, 1984)

Taa **Lower andesite member—**Dark gray brown-weathering andesite with small phenocrysts of plagioclase and hornblende, commonly containing small white rock fragments

Tlfs **Locomotive Fanglomerate (Oligocene-Miocene)—** Coarse, red-weathering conglomerate with rounded cobbles and boulders **Upper sandstone and conglomerate beds**

Tlfg **Fanglomerate composed predominantly of granodiorite clasts**

Tlfc **Fanglomerate composed predominantly of clasts of Chico Shunie Quartz Monzonite**

Tlfp **Fanglomerate composed predominantly of granodiorite porphyry clasts**

Tmr **Landslide megabreccia composed of aphyric rhyolite**

Tmp **Landslide megabreccia composed of quartz feldspar porphyry**

Tmg **Landslide megabreccia composed of granodiorite, aplite, or pegmatite**

Tmq **Landslide megabreccia composed of quartzite**

Tda **Darby Arroyo Formation (age unknown)—**Coarse, gray to maroon colored conglomerate with pebbles and cobbles of volcanic rocks in a volcaniclastic matrix. Some clasts of dacitic porphyry have unaltered phenocrysts of plagioclase and sanidine. Minor interbeds of sandstone and shale. A cobble of rhyolite yielded a K-Ar date of 35.2 ± 0.9 Ma on sanidine (Force, 1997a)

Cornelia Pluton (Upper Cretaceous)

KTfa **Feldspathic andesite dikes (Cretaceous and Miocene ?)—**Feldspar porphyry dikes east of Gibson Fault

Copper Mineralization—Chalcopyrite, bornite, magnetite, and pyrite. Approximate outline of Cu grade > 0.5 wt.% Cu at the 1,000-foot level. From Gilluly (1946, plate 25)

Kp **Granodiorite porphyry—**Quartz, plagioclase, and biotite phenocysts in a microaplitic quartz-K-feldspar groundmass. Biotite K-Ar age of 62.9 ± 1.9 Ma (Hagstrom and others, 1987)

Kg **Granodiorite and biotite tonalite—**Biotite K-Ar ages of 63.8 ± 1.9 to 65.2 ± 1.9 Ma (McDowell, 1971)

Kd **Fine grained diorite and quartz diorite**

Kc **Concentrator Volcanics (Cretaceous ?)—**Andesite and dacite flow breccia, lapilli tuff, and ignimbrite. Zircon age of 71.6 ± 0.6 Ma, by U-Pb (Wilkinson, 1998)

Ycs **Chico Shunie Quartz Monzonite (Precambrian Y)—**Red-weathering coarse-grained K-feldspar porphyritic monzogranite, minor pegmatite. 1,400 Ma (Gray and others, 1988)

Xcg **Cardigan Gneiss (Precambrian X)—** Quartz-feldspar-biotite-hornblende gneiss

- 35 Strike and dip of bedding
- 75 Strike and dip of overturned bedding
- Contact, dashed where approximately located
- Gradational contact over 50 m
- 45 Normal fault with dip, ball on downthrown side, long dashes where approximately located, short dashes where inferred, dotted where concealed
- Strike-slip fault showing relative movement.
- 5 Detachment fault with dip, ticks on upper plate, dashed where approximately located, dotted where concealed
- T A On cross section, relative movement shown by **T** (toward) and **A** (away from viewer)
- Tbx Fault breccia
- Outline of figures 14 and 16.

Geologic Map and Cross Sections of the Ajo Mining District, Pima County, Arizonia

By

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2006

Cox, D.P., Force, E.R., Wilkinson, W.H., More, S.W., Rivera, J.S., and Wooden, J.L., 2006, The Ajo mining district, Pima County, Arizona—evidence for middle Cenozoic detachment faulting, plutonism, volcanism, and hydrothermal alteration: U.S. Geological Survey Professional paper 1733.