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WALLOWA BATHOLITH, BLUE MTS.,OREGON.

W.H.Taubeneck,1962, Explosion breccias and injection breccias in Wallowa batholith,Wallowa Mts.,northeastern Oregon. GSA Spec,Pap 73, Abstracts for 1962, 253-254.

Maximum age of granitic rocks 149 m.y.K-Ar.intruded by cordierite trondhjemite assoacied with explosion breccias and injection breccias, K-Ar age 95 m.y.149 = Callovian,base of Upper Jurassic. 95 = Cenomanian.

Blue Mts: Structure coincides with Spieker's notion.

Refs.:(East to West):

USGSB 846A,1933

J.Gilluly, J.C.Reed & C.F.Park Jr.Some mining districts of E Oregon/ 138
R.W.Ross :Geology of part of the Wallowa Mts. Ore.Bur.Mines & Geol. 3
B.N.Moore:Non-metallic resources of Eastern Oregon.USGSB875,137
D.F.Hewett:Zonal Relations of Lodes of Sumpter Quad.TAIME 1931,305-46
J.T.Pardee,D.F.Hewett:Geollogy & Min.Res.of Sumpter Quad.,Ore.Ore. Bur.Mines & Geol. v.1,No.6,1914
J.Gilluly:Geology & Mineral Resources of Baker Quad.,Ore.USGSB 879,1937

Older:W.Lindgren,Gold Belt of Blue Mts.of Oregon.USGS 22nd AR,pt.2,551-776, 1901.

G.E.Goodspeed:Geology of Gold Qtz.Veins of Cornucopia.TAIME 44,1941, 172-189.

Map of Blue Mts

Seds.etc.in Eardley's Pacific archipelago volcanic assemblage.
In Pacific trough,lower Ju,land(geanticline,upper Ju.No K expected)
Ju? hnfls,cgls land thruout K.
Trias. Ls,limy seds IB with volcs.
Permian? Greenstone etc.
Carb? Argillite,tuff,chert,greenstone.Ls lenses
Penn? Cgls,ss,black slate
? Burnt River schist,qtzite,ls.

String of stocks aligned roughly E-W,N part of district:diorite,qtz. diorite etc.Gabbro,mainly sills in volcanic assemblage as uaual.

Blue Mts.an island in Columbia R.lavas.

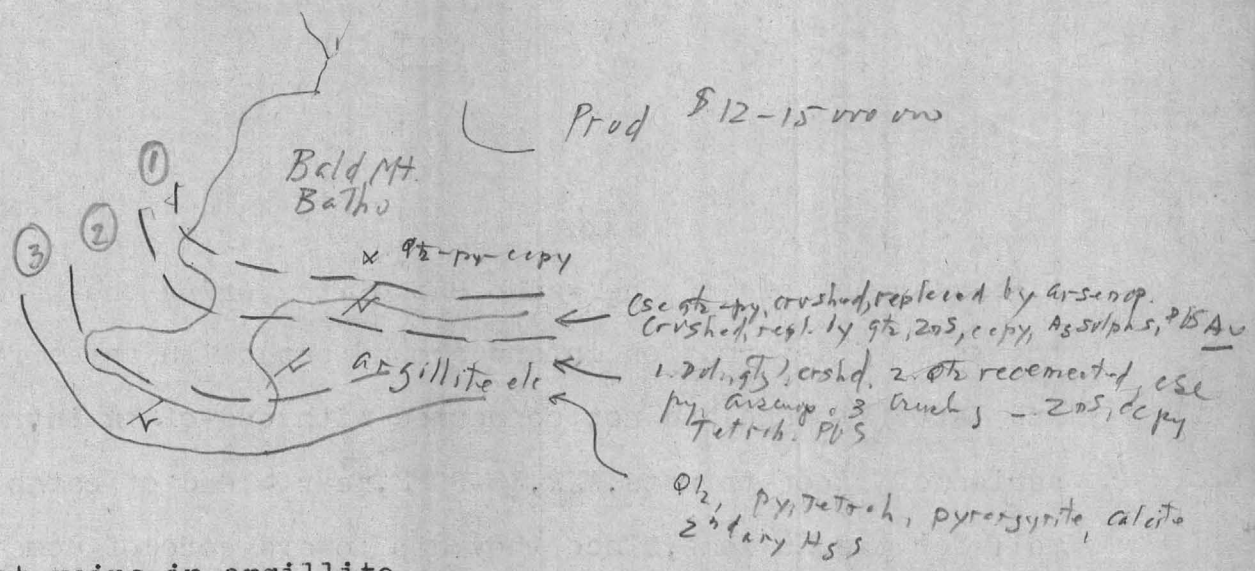
E End:Wallowa Mts: Ross thinks no exposed rks are pre-Carb. Folding strong: N26E in Mts.,N part,swing going S to S50W. Strong folding,end Paleo.Marine Trias., Ju marine sedsaccompanied by volcs. Post Ju folding,intrusion of th bathos and uplift forming Wallowa Mts.

Baker Quad.: Intense E-W folding of pre-Tertiary rocks (thru Permian?) S.N.foothills type. Goes for Sumpter Quad.

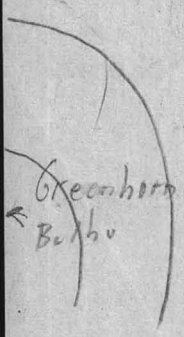
Ore Deposits: Marked relation to intrusives, Cornucopia,NE part,gold-qtz.veins in GD batholith,which according to Goodspeed formed by metasomatism. Batholith invaded meta-seds and -volcanics.Veins along planes of recurrent fracture travsresing both metas and GD. Curious thing is,both GD and vein matter replaced under shearing stress.Veins replacements along narrow shear zones,repeated shearing,qtz formed,it shattered,brecciated, host for ore .

Microscope used to find ore:microbfecciation goes so definitely with ore, and has affected the ore-bearing veins so completely,that where vein qtz in thin-section is turbed,muddy,unclear,due to abundant vacuole inclusions,that vein NG;where a vein splits,miners do not know which to follow,both being barren at split, the one that shows microbrecciation is followed. Early py not connected with ore shoots;gold with base sulphs and in tellurides.

Sumpter:




Most veins in argillite




Sumpter

Bald Mt.

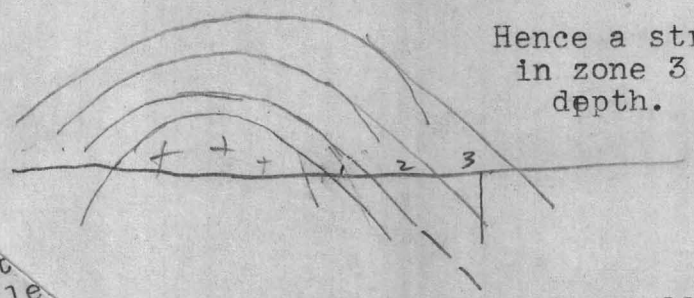
Summary of Zones: Inner, abundant py, arsenop, somewhat less ZnS, ccpy, PbS, a all as cse-xx grains; successively outward zones contain the sulphs in decreasing quantity and in minuter xx. Inner zone veins, unweathered, ha have little free gold, and that free is extremely fg. In successive outer zones free gold increases steadily until in outermost zone gold mainly free, amalgamates.

Greenhorn: Middle, outer zones present. Less well-defined.

Soft argillite unfavorable for fossures staying open; but early barren qtz replaced the phyllite along fracture zones; later movements brecciated the brittle qtz. recemented by later qtz, rebrecciated, more qtz and ore minerals entered.

Same ore guide as Cornucopia, but megascopic here: "Veins of clear white qtz. free of sulphide minerals rarely can be mined as gold ore; gold and sulphides largey confined to the parts of the veins that have been crushed or the strands of quartz that have been deposited late in the history of the vein. It should be the aim of mining operations to recognize and follow such parts of the veins." Similar intramineral brec. at Alleghany, Mother Lode, Grass Valley, Canada.

Hewett thiks zones like layers of an onion:




Hence a strong fissure exposed now in zone 3 should reach zone 2 at depth.

Disti
do not
paralle
is faste
open, late

ingly unstable at time of metallization. Many districts notable micrbrecciation; movements here largely shearing ; where walls pull apart, simple banded vein if pulling osition of vein matter; but if pulling slower, vein ripped may cross earlier bands.

INSERT

A.L.Anderson,Role of the Idaho Batholith during the Laramide Orogeny thinks main deformation in and around batholith dates from Laramide and later(Miocene)and not connected with end-of-Ku intrusion. Shows series of minor thrusts,WNW,35-60°S,near S end of batholith.These check well for the Ku dome,since they dip toward core of dome and the direction of movement of upper plate is away from axis of dome.Concentric thrusts.

If,as Blue Mts.seems to suggest,mid-K belt of folding does turn W as shown on Ku map,,active portion of geanticline was egg or dome shaped,apex in central Nevada. First principal of deformation,at least for upper crustal layers: if deformations of any size are reproduced by maps and sections of the same size,they look alike. This supposed mid-K dome should if fractured,have a fracture system like that of Ophir or Lost Soldier Dome.It should fracture radially,and/or concentrically.

Note on the Tectonic Map W US the remarkable NE line of deformation traversing the Idaho batholith:locus for intrusion and ore deposits;dikes and small elongated masses,SW end,Casto arch with granitic core,NE end. While most of the intrusives came in in Eocene (BB) or Miocene(Idaho porphyry belt,earlier intrusions within the batholith toward SW end of zone probably came in in "early Laramide" times. Suggestion strong that th this is a great radial fissure on the Mid-K dome. (over under stretching, ~~could~~ ~~not flow~~ held Idaho batholith as a brittle plug; batho could not flow, had to crack.

11/17/51 INSERT

Just south of the Idaho line is a series of stocks along an E-W line, and the biggest,Contact stock, is elongated E-W contrary to general grain of the region. This may well represent another radial fissure. Map in progress showing folding and faulting in Nevada suggests roughly radial arrangement,S flank of this dome.

Yellowstone Plateau.- W.T.Thom Jr.,Relation of deep-seated faults to surface structural features of central Montana,Bull.AAPG 7,1923,1-13,says present Yellowtsone Plateau(now volcanic) uplifted as early as K1.

Central Montana.- Scene of older deformations,mainly E-W:

Pre-Penn:Big Horn,Big Snowy areas
Pre-Ju : Big Snowies,Little Rockies
Late Ju,earliest K,Big Horns.ight uplift
Early Ku:inception of Crazy Mt.,Bull Mt.synclines along crest of great arch,NW of WNW.

Tectonic Map W.U.S.shows E-W series assymetric domes,anticlines:Cat Cre Creek,Devil's Basin anticlines;Big Snowy Mts.dome,Big Elk dome etc. Drilling for petrol.on Cate Creek anticline shows latter passes down to a normal fault,striking parallel to anticlinal axis,in the basement:

Blue Mountains District, Oregon.
From "Gold Ores of Washington and Oregon" by F:C:Lincoln,
EMJ 7-1-1911 p.13 ff.

Location. Cracker Creek District, 6 miles north of Sumpter.

Stratigraphy. Conformable sediments, probably Paleozoic (Carboniferous?) Cherts and clay slates, grading into each other or interlaminated. 600' of interbedded greenstone. Intrusive granodiorite to N and NW. Altered feldspar porphyry dikes cut both the granodiorite and the sediments. A few aplitic dikes and serpentine masses.

Mineralization. The North Pole lode is a mineralized shear zone in hard, black, siliceous argillite. Date of the mineralization is probably early Cretaceous. The waters contained $CO_2$ andalkaline carbonates. A linked lode. Strikes NE-SW but is curved. Traced for 4 miles, it occupies a normal fault which extends beyond the limits of the district. Dip is 70°SE, displacement of the country rock 400' vertical, 1800' horizontal. Line of movement pitches gently SW. Lode is 5-500' wide, averaging 25'. However, the walls are well-defined. Fractures and fissures of the lode were filled. Some comb-structure.

Alteration. The slates were pyritized and slightly silicified. The porphyry dikes sericitized and carbonated.

There is some post-mineral faulting within the vein.

Ores. $6-15 in gold. 6%-50% gaold-silver amaalgam. The country rock pyrite is always poor in gold and silver. Ore mainly cavity fillings. There are four oreshoots, several hundred feet long and 2-12' wide, separated by long barren stretches. Two of these oreshoots pitched 20°-30° SW, the same direction as the movement on the fault. Within the large shoots the ore is in smaller, more definite shoots, 1-4' wide. These may cross from wall to wall, or form several distinct stringers. These are lenticular and often overlap. They are bounded by fault-planes filled with thin-laminated, striated black gouge.

Paragenesis. The sulphides are confined to the ore. They are finely divided in quartz-- much arsenopyrite, marcasite, pyrite. Minor ccpy, galena, sphalerite. A little cinnabar, tetrahedrite, mercurial tetrahedrite, stibnite, hessite, sylvanite, native gold, copper and pyrargyrite. The gangute consists of quartz and a little calcite. Some chrome-and vanadium mica. The primary quartz and arsenopyrite were crushed and recemented by quartz containing sharp pyrite pyritohedrons. In narrow cracks of the quartz of both ages occur calcite, pyrite and arsenopyrite. The finely distributed sulphides are usually rich in gold. Little native gold. The rich pockets contain pyrite, ccpy, tetrahedrite, native gold, a little telluride, in a gangue of quartz and roscoelite (vanadium mica.) At the North Pole mine the rich ore shows hessit filling cavities in quartz whixh are sometimes lined, next the quartz, with native gold, sometimes with pale yellow telluride. Quartz, gold andtelluride are contemporaneous. At the Columbia mine native gold is intergrown with sphalerite and tetrahedrite also rosecoelite, but never with pyrite.

W.Lindgren(1901):Gold belt of the Blue Mts.of Oregon.USGS 22nd A.R.,pt.2,

p.12 E to W:G.E.Goodspeed(41):Geol. (1933) of gold-qtz.veins Cornucopia.TAIME 144 MZ 189
J.Gilluly,J.C.Reed,C.F.Park Jr.:Some mining districts of eastern Oregon.
USGS Bull.846A.

p.13 C.P.Ross(1938):Geology of part of the Wallowa Mts.,Ore.Ore.Bur.Mines & Geol.
Bull.No.3

p13 J.Gilluly(1937): Geol.& Min.Res.of Baker Quad.,Ore.USGS Bull.879.
B.N.Moore(1937):Non-metallic res.E Ore.USGS Bull.875.
p13 D.F.Hewett(1931):Zonal relations of lodes of Sumpter Quad.TAIME'31,305-346.
J.T.Pardee,D.F.Hewett(14):Geo.& Min.Res.Sumpter Quad.Ore. Ore.Bur.Mines &
Geol.v.1,No.6.

Show map of Blue Mts. { Area near axis of Permian Trough; in Triassic Trough
Area within Pacific or Calif.trough,Lower Ju. Land,

orogenic part of geanticline, Upper Jurassic;land throughout K.

Typical Pacific assemblage:
Ju? Hornfels, cgls.
Trias Ls and limy seds.IB with volcanics
Permian? Greenstone etc.
Penn? Cgl.,ss,black slate
? Burnt River schist,qtzite.,ls.

Gabbro,serp.etc.as sills in volcanic assemblage. String of diorite,QD stocks E-W across N part of district. Complex history:in E part at least, strong folding,end of Paleo.Marine Trias,Jur.seds.with volcanics.Post-Ju folding,intrusion of batholiths and uplift formed Wallowa Mts. Folds N26E, N part,swing N50W on S. Roughly parallel W edge geanticline of Ku.
May have been embayment as in SW Nev., Tr-Ju.
Baker, Sumpter quads on W,strong E-W folding,Sierra Nevada foothills type.

~~Overturning to~~

---

Gold deposits show marked relation to plutons.Cornucopia,E part of district, gold-qtz.veins in GD batho,formed according to Goodspeed by replacement of metaseds,metavolcs. Veins along planes of recurrent fracture cutting both metas and GD.Both GD and vein matter effected replacement under shearing stress.Qtz formed,sheared and shattered,brecciated,received ore.Microbrecciation coextensive almost with ore.

Under-ore distr.

Sumpter Quad.,ore zones around Bald Mt.batholith;megascopic inyramineral brecciation.

PREPRINT.—American Institute of Mining and Metallurgical Engineers.

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ROTCH BUILDING
CAMBRIDGE, MASS., U. S. A.

# Zonal Relations of the Lodes of the Sumpter Quadrangle*

BY D. F. HEWETT,† WASHINGTON, D. C.

(New York Meeting, February, 1931)

CONTENTS

| | PAGE |
|---|---|
| Introduction | 1 |
| Geologic features of eastern Oregon | 2 |
| Geology of the Sumpter quadrangle | 2 |
| Rocks older than the ore deposits | 3 |
| Rocks younger than the ore deposits | 8 |
| Lodes of the Sumpter quadrangle | 8 |
| Areal distribution | 8 |
| Geologic distribution | 9 |
| Major features of the veins | 9 |
| Mineralogy and texture of the veins | 13 |
| Ore deposits zonally disposed around the Bald Mountain batholith | 13 |
| Summary of mineralogy and texture | 32 |
| Zonal relations | 33 |
| Ore deposits zonally disposed around Greenhorn Mountain batholith | 36 |
| Zonal relations | 37 |
| Relation of textural features to zonal arrangement of veins | 37 |
| Summary of zonal relations | 38 |
| Comparison with similar districts | 39 |
| Outlook for the district | 40 |

## INTRODUCTION

IN an earlier report on the Sumpter quadrangle[1] it was briefly stated

66–67.

[10] W. Lindgren: *Op. cit.*, 579–582.