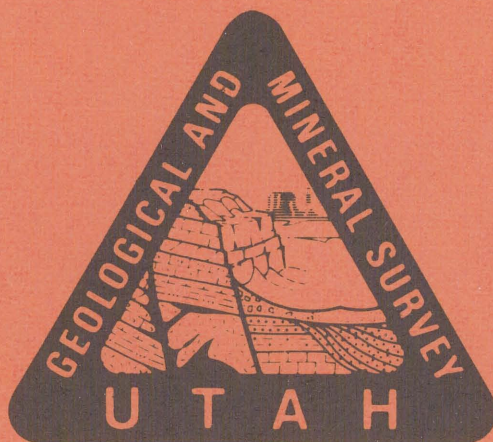


# MINERALS AND MINERAL LOCALITIES OF UTAH

*by Kenneth C. Bullock*



UTAH GEOLOGICAL AND MINERAL SURVEY  
*a division of the*  
UTAH DEPARTMENT OF NATURAL RESOURCES  
BULLETIN 117 JANUARY 1981



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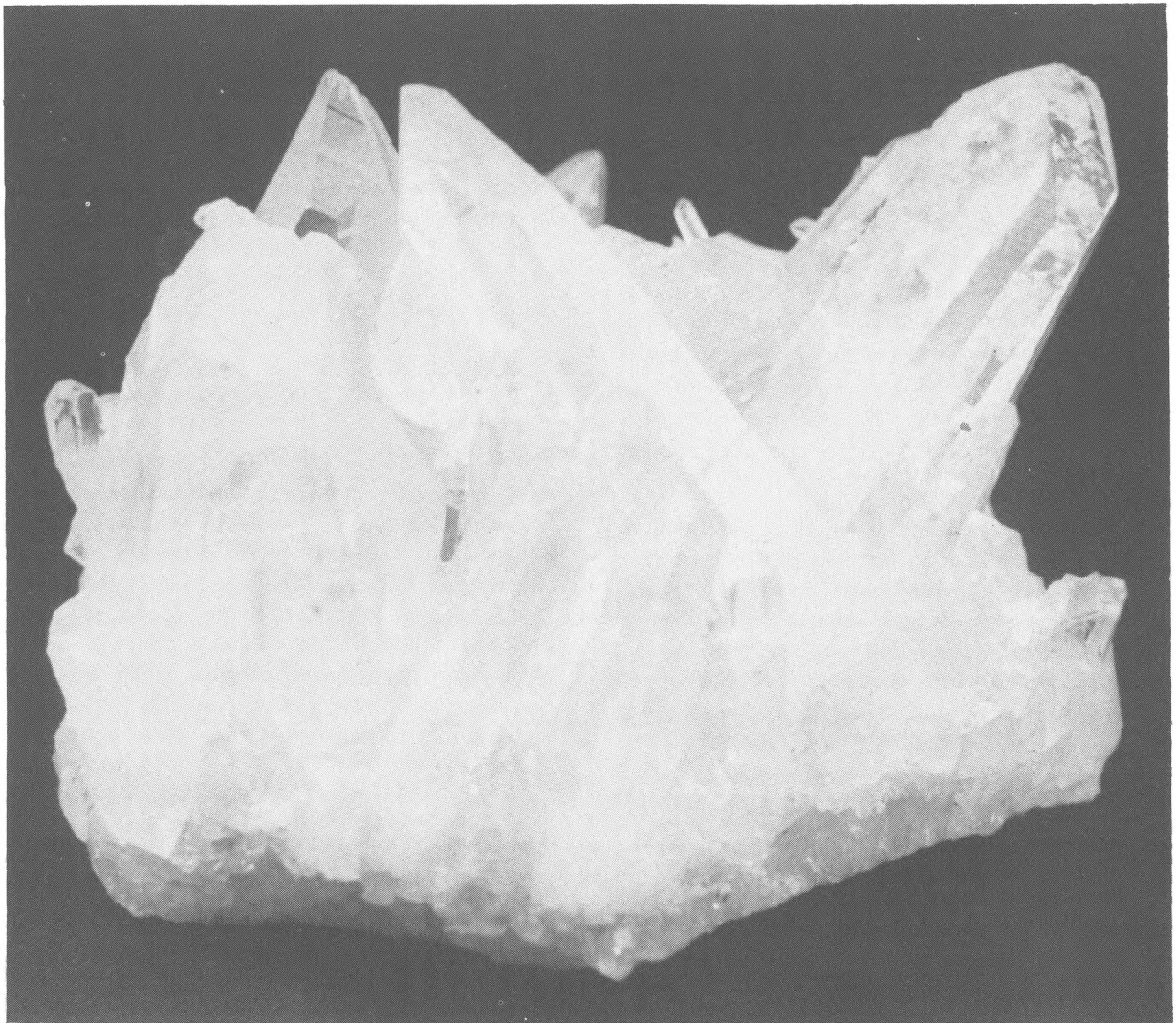
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# MINERALS AND MINERAL LOCALITIES OF UTAH

*by Kenneth C. Bullock*



Nature displays her most common mineral, quartz, in this beautiful crystal cluster.

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# MINERALS AND MINERAL LOCALITIES OF UTAH

by *Kenneth C. Bullock*<sup>1</sup>

## INTRODUCTION

There has long been widespread interest by mineralogists and geologists in the minerals of the State. This interest is increasing both because of renewed activity in old mining camps and because of Utahns and tourists who seek relaxation and adventure out-of-doors. Evidence of this interest is the organization of many rock and mineral societies.

This current publication of the minerals of the state was preceded by my two earlier compilations: "Minerals and Mineral Localities of Utah", 1960, and "Minerals of Utah", 1967. The present volume is the result of updating to the year 1980, and revisions and enlargements of the earlier editions. Mineral listings of the state have increased to 706 of which 134 are duplicate names. A few hydrocarbons and a few rock terms such as obsidian have been included, but coal, petroleum, and natural gas are not listed. Minor occurrences of many minerals have been omitted, and only a few rock-forming mineral occurrences are included. The main helium and carbon dioxide occurrences are listed.

In Chapter I mining districts are listed alphabetically both for each county and for the State.

Chapter II is devoted to county listings of mining districts, mines, and mineral localities, with the minerals found at each mine or locality. Most mining districts and mineral localities in the county lists are large enough to warrant further subdivision into mines and specific mineral localities. Minerals which are characteristic of the entire locality are listed as occurring in the locality as a whole, along with those for which the specific area (mine, for instance) is not known. Other minerals, however, that occur in a particular part of a larger district or locality, are listed only under the area specified.

Chapter III consists of an alphabetical listing of 706 minerals found in Utah including a brief description of each mineral, followed by a listing of the occurrences of each mineral in the State.

Following the Bibliography is an Appendix, including six subdivisions with alphabetical listing of minerals under the following headings: (a) minerals of the state; (b) minerals by each county; (c) crystal system, (d) chemical class; (e) selected metallic minerals of the state; (f) selected metallic minerals of each county.

## CHAPTER I

### MINING DISTRICTS OF COUNTIES AND THE STATE OF UTAH

The districts listed below are used in an informal sense. Areas and districts as they appear in other publications may-be inter-changed.

#### COUNTY LISTINGS

##### BEAVER COUNTY

Antelope District (Mineral Range).  
Beaver Lake District (Beaver Lake Mountains).  
Bradshaw District (Mineral Range).  
Fortuna District (Tushar Mountains).  
Gordon District (Tushar Mountains).  
Granite and North Granite Districts (Mineral Range).  
Indian Peak District (Needle Range).  
Lincoln District (Mineral Range).  
McGarry District (Mineral Range).  
Newton District (Tushar Mountains).  
Pine Grove District (Wah Wah Mountains).  
Pruess (Newhouse) District (San Francisco Mountains).  
Rocky District (Rocky Range).  
San Francisco (Frisco) District (San Francisco Mountains).  
Star and North Star Districts (Star Range).  
Sterling District (Red Buttes).  
Sulphur District (Wah Wah Mountains).  
Washington District (Needle Range).

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**BOX ELDER COUNTY**

Ashbrook District (Grouse Creek Mountains).  
 Box Elder District (Wasatch Mountains).  
 Crater Island District (Crater Island).  
 Lucin District (Pilot Range).  
 Newfoundland District (Newfoundland Mountains).  
 Park Valley District (Raft River Mountains).  
 Promontory District (Promontory Mountains).  
 Rosebud District (Grouse Creek Mountains).  
 Sierra Madre District (Wasatch Mountains).  
 Willard District (Wasatch Mountains).

**CACHE COUNTY**

Paradise District (Bear River Range).  
 Richmond District (Bear River Range).

**CARBON COUNTY**

Tidewell and Rideout District (West Tavaputs Plateau).

**DAGGETT COUNTY**

No Organized Mining Districts.

**DAVIS COUNTY**

Farmington District (Wasatch Mountains).

**DUCHESNE COUNTY**

Castle Peak District (Uinta Basin)

**EMERY COUNTY**

Cedar Mountain District (Cedar Mountain).  
 Emery (Lost Springs) District (Red Plateau).  
 Green River District (S. W. Green River).  
 San Rafael District (San Rafael Swell).

**GARFIELD COUNTY**

Colorado River District (Colorado River).  
 Coyote Creek (Antimony) District (Escalante Mountains).  
 Little Rockies District (Henry Mountains).  
 North Wash District (Henry Mountains).  
 Trachyte District (Henry Mountains).

**GRAND COUNTY**

La Sal District (North Mountain, La Sal Mountains).  
 Little Grand District (S.E. Green River).  
 Miners Basin District (North Mountain, La Sal Mountains).  
 Polar Mesa District (Polar Mesa).  
 Richardson District (Waring Creek).  
 Thompsons District (S. E. Thompsons).  
 Wilson Mesa (Wheeler Desert) District (Wilson Mesa).  
 Yellow Cat District (W. part of Thompsons District).

**IRON COUNTY**

Escalante District (Mt. Escalante).  
 Gold Springs District (Hamlin Valley).  
 Iron Springs District (Iron and Granite Mountains, Three Peaks).  
 Pinto Iron (Silver Belt) District (Pinto).  
 Stateline District (Hamlin Valley).

**JUAB COUNTY**

Deseret (Desert Mountain) District (Desert Mountain).  
 Detroit (Drum, Joy) District (Drum Mountains).  
 Fish Springs District (Fish Springs Mountains).  
 Juab District (Wasatch Mountains).  
 Mona District (Long Ridge).  
 Mt. Nebo (Timmons) District (Wasatch Mountains).  
 North Tintic District (East Tintic and Boulter Mountains).  
 Spring Creek District (Deep Creek Mountains).  
 Tintic District (East Tintic Mountains).  
 Trout Creek (Johnson Peak) District (Deep Creek Mountains).  
 West Tintic District (West Tintic Mountains).

**KANE COUNTY**

Colorado River District (Colorado River).

**MILLARD COUNTY**

Detroit (Drum, Joy) District (Drum Mountains).  
 Gordon District (Pavant Mountains).  
 Leamington (Oak City) District (Canyon Mountains).  
 Saw Back District (W. of Sevier Lake).

**MORGAN COUNTY**

Argenta District (Wasatch Mountains).  
 Hardscrabble (Mill Creek) District (Wasatch Mountains).  
 Morgan District (Wasatch Mountains).



**PIUTE COUNTY**

Gold Mountain (Kimberly) District (Deer Creek, Tushar Mountains).  
 Marysvale District (Marysvale Uranium Area).  
 Mt. Baldy District (Cottonwood Creek, Tushar Mountains).  
 Ohio District (Bullion Canyon, Tushar Mountains).

**RICH COUNTY**

Swan Creek (Garden City) District (Bear River Range).

**SALT LAKE COUNTY**

Big Cottonwood District (Wasatch Mountains).  
 Bingham (West Mountain) District (Oquirrh Mountains).  
 Hot Springs (Adams) District (Wasatch Mountains).  
 Little Cottonwood (Alta) District (Wasatch Mountains).  
 Lower Placer District (Oquirrh Mountains).  
 Smelter District (Oquirrh Mountains).

**SAN JUAN COUNTY**

Big Indian District (Big Indian Wash-Lisbon Valley Area).  
 Cottonwood Canyon District (N. of Bluff).  
 Monticello (Blue Mountain) District (Abajo Mountains).  
 Monument Valley (Monumental) District (Monument Valley).  
 Paradox Valley District (Paradox Valley).  
 Red Canyon District (Red Canyon).  
 White Canyon District (White Canyon).

**SANPETE COUNTY**

No Organized Mining Districts.

**SEVIER COUNTY**

Henry District (Antelope Range).  
 Salina Creek District (Salina Creek).

**SUMMIT COUNTY**

Marble (Silver Creek) District (Wasatch Mountains).  
 Park City (Uinta) District (Wasatch Mountains).

**TOOELE COUNTY**

Bingham (West Mountain) District (Oquirrh Mountains).  
 Blue Bell District (Sheeprock Mountains).  
 Columbia District (N.E. Sheeprock Mountains).  
 Dugway District (Dugway Range).  
 East Erickson District (W. Sheeprock Mountains).  
 Erickson (Black Crook) District (Simpson Mountains).  
 Free Coinage District (Stansbury Mountains).  
 Gold Hill (Clifton) District (Deep Creek Mountains).  
 Granite Mountain District (Granite Mountain).  
 Grantsville (Third Term) District (Stansbury Mountains).  
 Greeley District (Topliff Hill).  
 Lakeside District (Lakeside Mountains).  
 Mercur (Camp Floyd) District (Oquirrh Mountains).  
 North Tintic (Boulter, Caledonia, Oasis) District (Boulter Mountains).  
 Ophir District (S. W. Oquirrh Mountains).  
 Osceola District (Thorpe Hills).  
 Rush Valley (Stockton) District (W. Oquirrh Mountains).  
 Silver Island (Silver Islet) District (Silver Island Mountains).  
 Tooele District (W. Oquirrh Mountains).  
 Willow Springs District (Deep Creek Mountains).

**UINTAH COUNTY**

Brush Creek District (Uinta Mountains).  
 Carbonate District (Uinta Mountains).  
 Green River District (Cub Creek).  
 Uteland Knoll District (Ouray).

**UTAH COUNTY**

Alpine District (Wasatch Mountains).  
 American Fork District (Wasatch Mountains).  
 East Tintic District (East Tintic Mountains).  
 Lehi District (Lake Mountain).  
 North Tintic (Caledonia, Oasis) District (East Tintic Mountains).  
 Payson District (Wasatch Mountains).  
 Provo District (Wasatch Mountains).  
 Santaquin District (Wasatch Mountains).  
 Silver Lake District (Wasatch Mountains).  
 Spanish Fork District (Wasatch Mountains).  
 Utah District (Long Ridge).

**WASATCH COUNTY**

Blue Ledge District (Bald Mountain).  
 Elkhorn District (E. Keetley).



Rhodes Plateau (Woodland) District (Uinta Mountains).  
Snake Creek (Howland, White Pine) District (Wasatch Mountains).

#### WASHINGTON COUNTY

Bull Valley District (Bull Valley).  
Santa Clara District (Santa Clara).  
Silver Reef (Harrisburg) District (Leeds).  
Tutsagubet District (Beaver Dam Mountains).

#### WAYNE COUNTY

Miners Mountain District (Miners Mountain).

#### WEBER COUNTY

Fremont Island District (Fremont Island).  
Sierra Madre District (Wasatch Mountains).  
Weber (Junction) District (Wasatch Mountains).

## CHAPTER II

### MINING DISTRICTS OF UTAH

NUMBER	NAME OF DISTRICT	COUNTY
1.	Adams (See Hot Springs) Alpine . . . . .	Utah
2.	Alta (See Little Cottonwood) American Fork . . . . .	Utah
3.	Antelope . . . . .	Beaver
4.	Argenta . . . . .	Morgan
5.	Ashbrook . . . . .	Box Elder
6.	Beaver Lake . . . . .	Beaver
7.	Big Cottonwood . . . . .	Salt Lake
8.	Big Indian . . . . .	San Juan
9.	Bingham . . . . . Black Crook (See Erickson)	Salt Lake, Tooele
10.	Blue Bell . . . . .	Tooele
11.	Blue Ledge . . . . . Blue Mountain (See Monticello) Boulter (See North Tintic)	Wasatch
12.	Box Elder . . . . .	Box Elder
13.	Bradshaw . . . . .	Beaver
14.	Brush Creek . . . . .	Uintah
15.	Bull Valley . . . . . Caledonia (See North Tintic) Camp Floyd (See Mercur)	Washington
16.	Carbonate . . . . .	Uintah
17.	Castle Peak . . . . .	Duchesne
18.	Cedar Mountain . . . . . Clifton (See Gold Hill)	Emery
19.	Colorado River . . . . .	Garfield, Kane
20.	Columbia . . . . .	Tooele
21.	Cottonwood Canyon . . . . .	San Juan
22.	Coyote Creek . . . . .	Garfield
23.	Crater Island . . . . .	Box Elder
24.	Deseret . . . . . Desert Mountain (See Deseret)	Juab

25.	Detroit . . . . .	Juab, Millard
	Drum (See Detroit)	
26.	Dugway . . . . .	Tooele
27.	Elkhorn . . . . .	Wasatch
28.	Emery . . . . .	Emery
29.	East Erickson . . . . .	Tooele
30.	East Tintic . . . . .	Utah
31.	Erickson . . . . .	Tooele
32.	Escalante . . . . .	Iron
33.	Farmington . . . . .	Davis
34.	Fish Springs . . . . .	Juab
35.	Fortuna . . . . .	Beaver
36.	Free Coinage . . . . .	Tooele
37.	Fremont Island . . . . .	Weber
	Frisco (See San Francisco)	
	Garden City (See Swan Creek)	
38.	Gold Hill . . . . .	Tooele
39.	Gold Mountain . . . . .	Piute
40.	Gold Springs . . . . .	Iron
41.	Gordon . . . . .	Beaver, Millard
42.	Granite . . . . .	Beaver
43.	Granite Mountain . . . . .	Tooele
44.	Grantsville . . . . .	Tooele
45.	Greeley . . . . .	Tooele
46.	Green River . . . . .	Emery
47.	Green River . . . . .	Uintah
48.	Hardscrabble . . . . .	Morgan
	Harrisburg (See Silver Reef)	
49.	Henry . . . . .	Sevier
50.	Hot Springs . . . . .	Salt Lake
	Howland (See Snake Creek)	
51.	Indian Peak . . . . .	Beaver
52.	Iron Springs . . . . .	Iron
	Johnson Peak (See Trout Creek)	
	Joy (See Detroit)	
53.	Juab . . . . .	Juab
	Junction (See Weber)	
	Kimberly (See Gold Mountain)	
54.	Lakeside . . . . .	Tooele
55.	La Sal . . . . .	Grand
56.	Leamington . . . . .	Millard
57.	Lehi . . . . .	Utah
58.	Lincoln . . . . .	Beaver
59.	Little Cottonwood . . . . .	Salt Lake
60.	Little Grande . . . . .	Grand
61.	Little Rockies . . . . .	Garfield
	Lost Springs (See Emery)	
62.	Lower Placer . . . . .	Salt Lake
63.	Lucin . . . . .	Box Elder
64.	Marysvale . . . . .	Piute
65.	McGarry . . . . .	Beaver
66.	Marble . . . . .	Summit
67.	Mercur . . . . .	Tooele



	Mill Creek (See Hardscrabble)	
68.	Miners Basin . . . . .	.Grand
69.	Miners Mountain . . . . .	.Wayne
70.	Mona . . . . .	.Juab
71.	Monticello . . . . .	.San Juan
72.	Monument Valley . . . . .	.San Juan
	Monumental (See Monument Valley)	
73.	Morgan . . . . .	.Morgan
74.	Mt. Baldy . . . . .	.Piute
75.	Mt. Nebo . . . . .	.Juab
76.	Newfoundland . . . . .	.Box Elder
	Newhouse (See Pruess)	
77.	Newton . . . . .	.Beaver
	North Granite (See Granite)	
	North Star (See Star)	
78.	North Tintic . . . . .	.Juab, Tooele, Utah
79.	North Wash . . . . .	.Garfield
	Oasis (See North Tintic)	
	Oak City (See Leamington)	
80.	Ohio . . . . .	.Piute
81.	Ophir . . . . .	.Tooele
82.	Osceola . . . . .	.Tooele
83.	Paradise . . . . .	.Cache
84.	Paradox Valley . . . . .	.San Juan
85.	Park City . . . . .	.Summit
86.	Park Valley . . . . .	.Box Elder
87.	Payson . . . . .	.Utah
88.	Pine Grove . . . . .	.Beaver
89.	Pinto Iron . . . . .	.Iron
90.	Polar Mesa . . . . .	.Grand
91.	Promontory . . . . .	.Box Elder
92.	Provo . . . . .	.Utah
93.	Pruess . . . . .	.Beaver
94.	Red Canyon . . . . .	.San Juan
95.	Richardson . . . . .	.Grand
96.	Richmond . . . . .	.Cache
97.	Rhodes Plateau . . . . .	.Wasatch
98.	Rocky . . . . .	.Beaver
99.	Rosebud . . . . .	.Box Elder
100.	Rush Valley . . . . .	.Tooele
101.	Salina Creek . . . . .	.Sevier
102.	San Francisco . . . . .	.Beaver
103.	San Rafael . . . . .	.Emery
104.	Santa Clara . . . . .	.Washington
105.	Santaquin . . . . .	.Utah
106.	Saw Back . . . . .	.Millard
107.	Sierra Madre . . . . .	.Box Elder, Weber
	Silver Belt (See Pinto Iron)	
	Silver Creek (See Marble)	
108.	Silver Island . . . . .	.Tooele
	Silver Islet (See Silver Island)	
109.	Silver Lake . . . . .	.Utah
110.	Silver Reef . . . . .	.Washington

111.	Smelter . . . . .	.Salt Lake
112.	Snake Creek . . . . .	.Wasatch
113.	Spanish Fork . . . . .	.Utah
114.	Spring Creek. . . . .	.Juab
115.	Star . . . . .	.Beaver
116.	Stateline . . . . .	.Iron
117.	Sterling . . . . .	.Beaver
	Stockton (See Rush Valley)	
118.	Sulphur . . . . .	.Beaver
119.	Swan Creek . . . . .	.Rich
	Third Term (See Grantsville)	
120.	Thompsons . . . . .	.Grand
121.	Tidewell and Rideout . . . . .	.Carbon
	Timmons (See Mt. Nebo)	
122.	Tintic . . . . .	.Juab
123.	Tooele. . . . .	.Tooele
124.	Trachyte . . . . .	.Garfield
125.	Trout Creek. . . . .	.Juab
126.	Tutsagubet . . . . .	.Washington
	Uinta (See Park City)	
127.	Utah . . . . .	.Utah
128.	Uteland Knoll. . . . .	.Uintah
129.	Washington . . . . .	.Beaver
130.	Weber . . . . .	.Weber
	West Mountain (See Bingham)	
131.	West Tintic. . . . .	.Juab
	Wheeler Desert (See Wilson Mesa)	
132.	White Canyon . . . . .	.San Juan
	White Pine (See Snake Creek)	
133.	Willard . . . . .	.Box Elder
134.	Willow Springs . . . . .	.Tooele
135.	Wilson Mesa . . . . .	.Grand
	Woodland (See Rhodes Plateau)	
136.	Yellow Cat. . . . .	.Grand

## MINERAL LOCALITIES LISTED BY COUNTY

### BEAVER COUNTY

ANTELOPE DISTRICT (Mineral Range) barite, calcite, galena, magnetite, malachite.

BEAVER (near) - hyalite.

BEAVER LAKE DISTRICT (Beaver Lake Mountains) - andalusite, barite, diaspore, plancheite.

*Bat Ridge* - calcite, garnet, magnetite,

*Beaver Copper, Copper Mountain Mines* - azurite, malachite.

*Beaver-Harrison, OK mines* - azurite, bornite, chalcocite, chalcopyrite, chrysocolla, copper, covellite, cuprite, jasper, limonite, malachite, molybdenite, powellite, pyrite.

*Black Rock mine* - specular hematite.

*Galena mine* - galena.

*Iron Mountain Pass deposits* - hematite.

*Skylark mine* - azurite, calcite, chalcopyrite, chrysocolla, copper, cuprite, diopside, garnet, hematite, malachite, magnetite, muscovite, pyrite.

*West Spring* - brucite, clinohumite, ludwigite, szaibelyite.

### BLUE MOUNTAINS.

*Black Jack (Skougard) claims* - pyrolusite, rhodochrosite.

*Susie Q (Iron Lily) claims* - calcite pyrolusite, rhodochrosite.

*T. 29 S., R. 12 W.* - hematite, magnetite.



BLUE VALLEY - black agate with blue bands.

BRADSHAW DISTRICT (Mineral Range) - amethyst, clinozoisite, tourmaline, tremolite, wollastonite.

*Cave mine* - anglesite, aragonite, argentite, aurichalcite, cerussite, chalcopyrite, cuprite, galena, gold, limonite, magnetite, malachite, pyrite, sphalerite, sulfur.

*Hecla mine* - argentite, chalcopyrite, galena, gold, pyrite.

*Jolly Boy mine* - gold, limonite.

*Nip and Tuck mine* - argentite, chalcopyrite, galena, gold, pyrite.

*2 R's group* - epidote, fluorite, garnet, idocrase, malachite, scheelite, serpentine.

ENGLISH SPRING (Wah Wah Mountains) - hematite, limonite.

FORTUNA DISTRICT (Tushar Mountains).

*Rocky Hollow* - gold, limonite, pyrite.

FRISCO DISTRICT (See SAN FRANCISCO DISTRICT)

GORDON DISTRICT.

*Sulphurdale* - epsomite, marcasite, pyrite, sulfur.

GRANITE and NORTH GRANITE DISTRICTS (Mineral Range).

*Beaver View mine* - argentite, cerussite, chrysocolla, galena, gold, smithsonite, sphalerite.

*Big Pass (Pass Canyon) group* - argentojarosite, aurichalcite, barite, calcite, cerussite, epidote, fluorite, galena, garnet, gold, idocrase, jarosite, limonite, malachite, molybdenite, pyrite, scheelite, tremolite, wollastonite.

*Bismuth (Major) mine* - amphibole, bismuthinite, fluorite, idocrase, molybdenite, pyrite, scheelite.

*Burnt Hollow group* - epidote, galena, hematite, limonite, magnetite, scheelite.

*Contact group* - barite, bornite, chalcopyrite, epidote, fluorite, garnet, gold, hematite, molybdenite, scheelite.

*Garnet group* - almandite, epidote, fluorite, gold, malachite, scheelite.

*King-of-the-Hills group* - hematite, malachite, scheelite.

*Major Fault group* - scheelite.

*Miller mine* - apatite, beryl, helvite, thulite, topaz.

*Molly group* - epidote, garnet, pyrite, scheelite.

*Oak group* - epidote, garnet, idocrase, scheelite.

*Oak Basin group* - epidote, garnet, idocrase, scheelite.

*Rattler group* - calcite, epidote, garnet, idocrase, scheelite.

*Scheelite group* - beryl, epidote, garnet, scheelite.

*Sunrise property* - thorium, rare earths.

*Ward group* - epidote, garnet, idocrase, scheelite.

INDIAN PEAK DISTRICT (Needle Range) - argentite, cerussite, fluorite, galena.

*Big Pinto Spring* - alunite.

*Blue Bell, Cougar Spar, Dugout, JB, Nooday, Lost Sheep, Utah mines* - calcite, fluorite, quartz.

*Steelville, Spor properties* - pyrolusite.

LINCOLN DISTRICT (Mineral Range).

*Creole mine* - amethyst, anglesite, azurite, bornite, calcite, cerussite, chalcopyrite, chrysocolla, clinozoisite, copper pitch, epidote, fluorite, galena, garnet, hematite, idocrase, limonite, magnetite, malachite, opal, pyrite, quartz, tourmaline, tremolite, scheelite, wollastonite.

*Rattler Iron claim* - limonite, magnetite.

*Lincoln (Rawlins) mine* - anglesite, argentite, chalcopyrite, chrysocolla, galena, hematite, limonite, magnetite, malachite, pyrite, smithsonite, sphalerite.

MCGARRY DISTRICT (Mineral Range) - barite, calcite, galena, magnetite, malachite.

MILFORD (near) - opal

MOONEY SPRINGS - topaz.

NEWHOUSE DISTRICT (See PRUESS DISTRICT)

NEWTON DISTRICT (Tushar Mountains).

*Black Rock (Shotwell) deposit* - pyrolusite.

*Indian Creek* - autunite, fluorite, galena, gold, pyrite, tobernite.

*Louise claims* - huebnerite, quartz.

*North Creek (head)* - wolframite.

*Rob Roy mine* - gold, pyrite, quartz.

*Sheep Rock mine* - alunite, amethyst, argentite, calcite, cerargyrite, fluorite, limonite, pyrite, sericite, tellurium mineralization.

*Sniffer and Mystery claims* - autunite, fluorite, meta-torbernite, torbernite, uranophane.

NORTH STAR DISTRICT (See GRANITE DISTRICT).

NORTH STAR DISTRICT (See STAR DISTRICT).

PINE GROVE DISTRICT (Wah Wah Mountains) - alunite, anglesite, cerussite, galena, molybdenite, pyrite, pyrolusite.

*Blawn Peak* - alunite.

*Central Wah Wah Iron deposits* - limonite.

*Daisy mine* - autunite, fluorite, uraninite.

*Emma prospect* - hematite, limonite.

*Iron Duke (Iron Gloery, Ruby Iron) prospects* - hematite, limonite.

*Iron Queen (Mooney, Wilson, Last Chance) prospects* - alunite, fluorite, hematite, limonite.

*King Iron prospect* - hematite, limonite.

*Pine Grove Associates mine* - chalcopryrite, fluorite, galena, garnet, huebnerite, magnetite, molybdenite, sphalerite, topaz.

*Producer mine* - autunite, fluorite, uraninite.

*Staats (Monarch) mine* - autunite, calcite, fluorite, metatorbernite, quartz, unaininte, uranophane.

PRUESS (NEWHOUSE) DISTRICT (San Francisco Mountains).

*Blackbird group, Cactus mine* - anhydrite, azurite, barite, chalcopryrite, cosalite, goethite, limonite, magnetite, malachite, molybdenite, pyrite, quartz, sanidine, selenite, serpentine, siderite, stilbite, tetrahedrite, tourmaline, wollastonite.

*Cactus Gulch* - chalcopryrite, garnet, limonite, quartz, rutile, tourmaline.

*Copper Gulch* - garnet, tourmaline.

*Gold Reef mine* - barite, cerussite, galena, gold, pyrite.

*Indian Queen mine* - galena.

ROCK CORRAL (E. of) - albite, orthoclase, prase, smoky quartz.

ROCKY DISTRICT (Rocky Range).

*Adelia mine* - magnetite, wulfenite.

*Bawana mine* - azurite, bornite, chalcopryrite, diopside, garnet, kinoite, magnetite, malachite, stringhamite, tenorite, thaumasite.

*Copper Ranch mine* - azurite, garnet, magnetite, malachite, muscovite, scheelite.

*Little Rocky prospect* - huntite.

*Maria mine* - azurite, bornite, chalcopryrite, magnetite, malachite.

*Old Hickory mine* - apatite, bornite, chalcopryrite, diopside, garnet, magnetite, magnesite, pyrite, scheelite, thaumasite.

*Silver Shield Mining and Milling Company mine* - magnesite.

SAN FRANCISCO (FRISCO) DISTRICT (San Francisco Mountains) - apatite, augite, biotite, chlorite, chrysolite, goethite, hornblende, ilmenite, magnesite, manganite, pyrolusite, quartz, rare earths, rhodochrosite, rutile, thorium mineralization, titanite, zircon.

*Beaver Carbonate mine* - chalcopryrite, galena, pyrite,

sphalerite.

*Cupric mine* - chalcopryrite, diopside, fluorite, galena, garnet, pyrite, scheelite, sphalerite, wollastonite.

*Frisco Contact mine* - epsomite.

*Golden Reef mine* - gold, selenium mineralization.

*Horn Silver mine* - alunite, anglesite, argentite, azurite, barite, beaverite, bindheimite, brochantite, calamine, calcite, cerargyrite, cerussite, chalcantinite, chalcedony, chalcocite, chalcopryrite, chrysocolla, cosalite, covellite, dufrenoyite, galena, goslarite, gypsum, jamesonite, jarosite, kaolinite, linarite, malachite, melaconite, opal, plumbojarosite, proustite, pyrargyrite, pyrite, scorodite, smithsonite, stibnite, sulfur, wollastonite, wulfenite, wurtzite, zircon.

*Imperial mine* - chalcopryrite, copper, cuprite, galena, hematite, magnetite, malachite.

*King David mine* - galena, pyrite.

*Michigan group* - chalcopryrite, galena, gold, pyrite.

*Peacock Copper group* - galena, sphalerite.

*Washington mine* - chalcopryrite, galena, pyrite, sphalerite.

SOUTHERN SAN FRANCISCO MOUNTAINS

*Brimstone Mound* - opal, sulfur.

*White Mountain* - autunite, carnotite.

STAR and NORTH STAR DISTRICTS (Star Range) - aurichalcite, bismutite, cerargyrite, molybdenite, scorodite, rhodochrosite, saponite.

*Atlas mine* - libethenite.

*Brown Thrush, Cabin, Fluorine Ledge, Lucky Boy nos. 1-2, Manassa, Monte Cristo, Quartzite, North Virginia Extension, Virginia nos. 1-5 claims* - fluorite, quartz.

*Cedar-Talisman, Hoosier Boy Mines* - anglesite, azurite, calamine, cerussite, galena, malachite, smithsonite, troostite, willemite.

*Commonwealth, Kemple, Progressive, St. Mary's mines* - azurite, bismuthinite, bismutite, calcite, cerussite, chalcopryrite, garnet, limonite, malachite, pyrite.

*Copper King mine* - azurite, garnet, magnetite, malachite, scheelite.

*Dotson mine* - azurite, cerussite, galena, malachite.

*Emerson mine* - aurichalcite, cerussite, hemimorphite.

*Estelle mine* - anglesite, cerussite.

*Estelle, Mowitz, Vicksburg mines* - anglesite, cerussite, galena.

*Gold Crown mine* - anglesite, cerussite, malachite, smithsonite.

*Harrington-Hickory, Rebel, White Rock mines* - anglesite, azurite, cerussite, chalcopryrite, corkite, galena, limonite, malachite, pyrite, silver, sphalerite, tetrahe-



drite, vanadinite, wulfenite.

*Hub mine* - anglesite, cerussite, chalcopyrite, chlorite, fluorite, galena, magnetite, muscovite, plumbojarosite, pyrite, serpentine, sphalerite.

*Lady Bryan mine* - chalcopyrite, epidote, fluorite, hedenbergite, magnetite, muscovite, pyrite, pyroxene, tremolite.

*Little May Lilly Mine* - scheelite.

*Mammoth mine* - cerussite, limonite.

*Maud S. mine* - cerussite, chalcopyrite, smithsonite.

*Moscow mine* - amphibole, anglesite, cerussite, chalcopyrite, fluorite, galena, greenockite, hedenbergite, jarosite, plumbojarosite, pyrite, rhodochrosite, sericite, smithsonite, sphalerite.

*Red Warrior mine* - anglesite, azurite, cerussite, chalcopyrite, galena, jarosite, limonite, malachite, plumbojarosite, pyrite, smithsonite, sphalerite.

*Sundown mine* - cerussite, hemimorphite, malachite, manganite.

*Vicksburg mine* - cerussite, pyrite.

*Wild Bill mine* - anglesite, azurite, cerussite, chalcopyrite, chrysocolla, corkite, diopside, fluorite, galena, garnet, jarosite, magnetite, malachite, pyrite, specularite, sphalerite.

*Woodhouse mine* - cerussite, pyrite.

STERLING DISTRICT (Red Buttes) - no minerals reported.

SULPHUR DISTRICT (Wah Wah Mountains) - sulfur.

#### TUSHAR MOUNTAINS

*Sulfurdale area* - clinoptilolite in tuff.

*Three Creek Reservoir area* - clinoptilolite in tuff.

WAH WAH VALLEY - sulfur.

#### WAH WAH MOUNTAINS

*Blawn Peak* - alunite.

*NG subareas A, B, C, and D deposits* - alunite.

*SX deposit* - alunite.

*Violet claims* - hematite, quartz, red beryl, topaz.

#### WASHINGTON DISTRICT (Needle Range)

*Blue Bell, Cougar Spar, Doughout (Dugout), J. B., Lost Sheep, Noonday, Utah mines* - fluorite.  
*Orizaba Consolidated mine, Lucero claim* - yellow andradite.

WHITE MOUNTAIN - alunite.

*Grampian Hill* - magnesite, tremolite.

## BOX ELDER COUNTY

ASHBROOK DISTRICT (Grouse Creek Mountains) - diaspore.

*Bovine mine* - scheelite.

*Vipont mine* - anglesite, argentite, argyrodite, arsenopyrite, azurite, cerargyrite, cerussite, chalcocite, chalcopyrite, copper, covellite, cuprite, galena, gold, hematite, limonite, malachite, orpiment, pearceite, pyrrargyrite, pyrite, quartz, realgar, rhodochrosite, sericite, silver, sphalerite, tennantite.

BIRD ISLAND - guano.

BOX ELDER DISTRICT (Wasatch Mountains) - calcite, cerussite, galena.

CRATER ISLAND DISTRICT (Crater Island).

*Copper Blossom mine* - bornite, calcite, chalcopyrite, chrysocolla.

DRY LAKE MINE (E. Brigham City) - stibnite.

GREAT SALT LAKE (shores) - aragonite, bloedite, glauberite, halite, mirabilite, thenardite.

GROUSE CREEK RANGE - epidote, stolzite.

*Birch, Southern Conley, Western Grouse Creeks* - kyanite.

*Lone Pine, Magnitude, Rocky Pass mines* - scheelite.

GUNNISON ISLAND - guano.

LUCIN DISTRICT (Pilot Range).

*Copper Mountain mine* - alunite, anglesite, azurite, barite, cerussite, chrysocolla, copper, cuprite, galena, goethite, gold, halloysite, kaolinite, limonite, malachite, melaconite.

*Cunepah (Montello) tunnel* - cerussite, galena, limonite, smithsonite.

*Empire mine* - bismutite, variscite, wulfenite.

*Jeff-Doran mine* - azurite, limonite, malachite.

*Judson mine* - cerussite.

*Parkdale mine* - chrysocolla.

*Tecoma Hill mines* - alunite, anglesite, cerussite, chalcopyrite, galena, goethite, gold, halloysite, hemimorphite, hematite, kaolinite, limonite, plumbojarosite, pyrite, sericite, silver, smithsonite, sphalerite, wulfenite.

*Tri-State Minerals claim* - barite.

NEWFOUNDLAND DISTRICT (Newfoundland Mountains) - anglesite, bismuthinite, cerussite, galena.

*Copper Ridge* - azurite, bornite, chalcopyrite, chrysocolla, limonite, malachite, pyrite.

*Desert Peak, Pack Rat Canyon* - scheelite.

NORTH SHORE OF GREAT SALT LAKE asphalt, pyrite in shale and slate.

PARK VALLEY DISTRICT (Raft River Mountains).  
*Century, Susannah mines* - arsenopyrite, chalcopyrite, galena, gold, monazite, pyrite, sphalerite.

PROMONTORY DISTRICT ( Promontory Mountains).  
*Big Pine mining properties* - cerussite.  
*Lakeview, Lead Hill, North Side, Volunteer mines* - bornite, calamine, cerussite, chalcopyrite, gold, gypsum, limonite, malachite, pyrite, smithsonite.  
*Promontory Point* - obsidian, variscite.  
*Sunshine mining properties* - cerussite.

ROSEBUD DISTRICT (Grouse Creek Mountains) - barite, cerussite, chlorite, epidote, garnet, muscovite, quartz.

*A & W, Magnitude mines* - galena, scheelite, vanadinite, wulfenite.

*Mogul mine* - galena, gold.

*Red Buttes* - chalcopyrite, gold, pyrite.

ROZEL POINT - asphalt.

SALINE STATION (near) - smithsonite.

SIERRA MADRE DISTRICT (Wasatch Mountains) - See Weber County.

SNOWVILLE (near) - variscite.

UTAHLITE HILL ( 5 mi. N. W. Lucin) - lucinite, metavariscite, variscite, wardite.

WILLARD DISTRICT (Wasatch Mountains) - bindheimite, cyrtolite, stibnite.

*Consolidated group, Louise Consolidated mine, Silver Queen claim* galena.

*Gold Standard mine* - hematite, limonite.

*Mormon Girl claim* - azurite, magnetite, malachite, muscovite.

*Ogden Boilmakers claim* - azurite, bindheimite, galena, malachite, tetrahedrite.

*Overland claim* - azurite, chalcopyrite, gold, malachite, pyrite, tetrahedrite.

*Twin Pine claim* - magnetite.

*Wasatch Gold and Iron mine* - hematite, magnetite.

## CACHE COUNTY

HYRUM AREA (Blacksmith Fork).

*Lucky Star claim* - galena, malachite; silver.

*Moon claim* - gold, hematite, smithsonite.

*Pig Hole Hollow* - pyrolusite.

*Tip Top claim* - cerussite, galena, silver, smithsonite.

LA PLATA AREA (Davenport Creek).

*La Plata, Sunrise claims* - galena.

*Sundown claim* - malachite.

*Yellow Jacket claim* - cerussite, silver.

LOGAN AREA (Logan Canyon) - chalcotrichite, galena.

PARADISE DISTRICT (East Fork Little Bear River) - anglesite, azurite, cerussite, galena, malachite.

*Mineral Point* - hematite, quartz, siderite, specularite.

RICHMOND DISTRICT (Bear River Range) - galena, malachite.

SMITHFIELD AREA - cerussite, kaolinite, smithsonite.

## CARBON COUNTY

COAL (COLD) CREEK (20 mi. N. Price) - carnotite.

FARNHAM DOME - carbon dioxide.

GORDON CREEK - carbon dioxide.

PRICE (S.W.) - calcite.

SUNNYSIDE (5 mi. N.) - asphalt.

TIDEWELL and RIDEOUT DISTRICT (West Tavaputs Plateau).

*Winter Quarters mine* - copalite.

WHITMORE CANYON - ozocerite.

## DAGGETT COUNTY

BIRCH CREEK DEPOSIT - limonite.

DAGGETT CHIEF PROPERTY - pyrolusite.

RED CREEK (Browns Park).

*Yellow Canary uranium deposit* - azurite, bornite, brochantite, carnotite, chalcocite, chalcopyrite, gold, hematite, hyalite, malachite, tyuyamunite, volborthite.

RED CREEK COMPLEX (Uinta Mountains) - almandite, anthophyllite, apatite, beryl, hematite, hornblende, hyanite, muscovite, staurolite.

SPRING CREEK DEPOSIT - limonite, pyrolusite.

UINTA MOUNTAINS (N.E. flank) - glauconite in Cambrian Ladore Fm. colophane, carbonate apatite, fluorapatite, francolite, phosphorite in Permian Meade Peak phosphate shale.

## DAVIS COUNTY

ANTELOPE ISLAND (Great Salt Lake) - almandite, azurite, biotite, chalcopyrite, chlorite, chrysocolla, epidote, grossularite, hornblende, hematite, limonite, magnetite, malachite, microcline, oligoclase, quartz, sulfur, vermiculite, zoisite.

BEAR CANYON - tremolite.

FARMINGTON DISTRICT (Wasatch Mountains).

*Morning Star group* - azurite, chalcopyrite, cuprite, gold, malachite, pyrite.

*Parrish Canyon* - anglesite, azurite, bornite, chalcocite, chalcopyrite, gold, limonite, malachite, pyrite, specularite.

GREAT SALT LAKE (shores) - aragonite, bloedite, glauberite, halite, mirabilite, thenardite.

LUCKY BOY AND UTAH-PIOCHE MINES - scheelite.

WANDERING JEW MINE - azurite, galena, malachite.

## DUCHESNE COUNTY

ANTELOPE CANYON - wurtzilite.

AVINTAGUIN CANYON - wurtzilite.

CASTLE PEAK DISTRICT (Uinta Basin) - gilsonite.

DUCHESNE (S.W.) - albertite.

DUCHESNE IRON PROSPECT - hematite, red ocher.

GREEN RIVER FORMATION - acmite, analcite, anhydrite, bassanite, burbankite, colophane, crocidolite, dawnsite, eitelite, fluorapatite, hectorite, illite, leucospene, loughlinitite, magnesioarfvedsonite, magnesioriebeckite, nahcolite, norstrandite, northupite, pyrite,

reedmergnerite, riebeckite, searlesite, shortite, smectite, thermonatrite, trona.

INDIAN CANYON - sepiolite, wurtzilite.

LAKE FORK - anhydrite, gypsum.

MOON LAKE IRON DEPOSIT - hematite, red ocher.

MYTON (S.) - gilsonite.

RAT HOLE CANYON - wurtzilite.

RED CREEK - wurtzilite.

RED LEDGE and HILLTOP IRON CLAIMS - hematite, red ocher.

ROCK CREEK - gypsum, malachite.

TABBY CREEK - tabbyite.

UINTA MOUNTAINS (S. flank) - carbonate apatite, colophane, fluorapatite, francolite, phosphorite in the Permian Meade Peak phosphate shale.

## EMERY COUNTY

BARIUM INCORPORATED MINE - barite.

BLACK DRAGON CANYON - sulfur.

BOW KNOT AREA.

*Sevastopol, Riggs claims* - schroeckingerite.

CASTLE GATE (E.) - agate, azurite, chalcedony, epsomite, jasper, malachite, silicified bone and wood.

CASTLE VALLEY - agate, azurite, chalcedony, chert, epsomite, jasper, malachite, silicified bone and wood.

CEDAR MOUNTAIN DISTRICT (Cedar Mountain) - agate, anhydrite, carnotite, chalcedony, jasper, gypsum, pyrolusite, psilomelane, silicified bone and wood, sulfur, tyuyamunite, uraninite, wad.

EMERY (near) - brookite, cassiterite, dumortierite, ilmenite, monazite, zircon in Ferron Sandstone Member of Mancos Shale.

EMERY (LOST SPRINGS) DISTRICT (Red Plateau) - galena, gold, malachite, silver.



FULLERS BOTTOM - anhydrite, gypsum.

GREEN RIVER DISTRICT (10-12 mi. S. W. of town of Green River).

*Crabapple claim* - schroekingerite, uraninite.

*Denise no. 1 mine* - bassetite, coffinite.

*Mineral Ten claim* - metatorbernite, phosphuranylite, torbernite.

*Sodaroll claim* - zippeite.

*Ventura claims* - torbernite, uraninite.

*Yellow Queen claims* - carnotite, torbernite, uraninite.

GREEN RIVER.

*18 mi. W. of town of Green River* - carnotite, tyuyamunite.

*30 mi. S.W.* - agate, chalcedony, fibroferrite, jasper, silicified bone and wood.

*50 mi. S.* - carnotite, celestite.

HORN SILVER GULCH - anhydrite, gypsum.

LAST CHANCE DESERT - agate, chalcedony, jasper.

LOST SPRINGS DISTRICT - (See EMERY DISTRICT).

MEXICAN BEND - sulfur.

MUDDY RIVER - monazite in placers.

*Snow deposit* - manganite, psilomelane, pyrolusite.

PHILLIPS HUNTINGTON NO. 1 WELL - brookite, cassiterite, dumortierite, as detrital grains in the Ferron Sandstone.

ROCHESTER (near) - pyrolusite.

SAN RAFAEL DISTRICT (San Rafael Swell) - agatized wood, amethyst, chalcedony, galena, gypsum, jasper.

*Blue Bird prospect* - carnotite, chalcocite.

*Camp Bird no. 7 mine* - arsenic, carnotite, orpiment, realgar.

*Camp Bird no. 12 mine* - carnotite.

*Camp Bird no. 13 mine* - carnotite, uraninite.

*Calf Mesa:*

*Dalton group* - autunite.

*Dexter group* - alunogen, butlerite, chalcantite, chalcocite, chalcopyrite, copiapite, coquimbite, covellite, fibroferrite, diadochite, goldichite, halotrichite, melanterite, metzaeunerite, parabutlerite, pitchblende, pyrite, roemerite, sulfur, tennantite, tetrahedrite, voltaite, zeunerite, zippeite.

*Calyx mine* - Carnotite, cobaltomenite, coffinite, corvusite, ferroselite, galena, montroseite, pascoite, pitchblende, pyrite, sphalerite, thucolite.

*Copper Globe deposit* - anglesite, azurite, cerussite, galena, malachite, torbernite.

*Delta mine* - andersonite, autunite, azurite, bayleyite, becquerelite, beta-uranophane, boltwoodite, bravoite, brochantite, carnotite, covellite, fourmarierite, galena, gummite, gypsum, hematite, illite, johannite, kaolinite, malachite, meta-autunite, metatorbernite, metatyuyamunite, metazeunerite, phosphuranylite, pyrite, rutherfordine, schoepite, schroekingerite, torbernite, tyuyamunite, uraninite, uranophane, vandendriesscheite, volborthite, zeunerite, zippeite.

*Dirty Devil mines* - coffinite, galena, marcasite, metatorbernite, sphaerite, torbernite.

*Flat Top Mesa* - carnotite, chrome mica-clay, gypsum, hewettite, metatorbernite, rauvite, torbernite, uvanite.

*Green Vein Mesa:*

*Consolidated mine* - becquerelite, johannite, metazeunerite, schoepite, zippeite.

*Green Vein no. 5 mine* - metazeunerite.

*Original Green Vein mine* - metazeunerite.

*Little Susan mine* - marcasite, pyrite, uraninite.

*Lone Tree group* - autunite, zippeite.

*Lucky Strike mine* - becquerelite, chalcopyrite, fourmarierite, galena, marcasite, molybdenite, niccolite, pyrite, rabbitite, sphalerite, uraninite, zippeite.

*Lucky Strike no. 2 mine* - becquerelite, bieberite, cobaltocalcite, fourmarierite, galena, pitchblende, pyrite.

*Magor mine* - coffinite, uraninite.

*Maybe mine* - bornite, pyrite, pitchblende.

*Marshbank Canyon* - uraninite.

*Migliaccio mine* - carnotite, rauvite, uvanite.

*North Mesa nos. 1, 2, and 5 mines* - carnotite, corvusite.

*Pay Day mine* - boltwoodite, marcasite, metazeunerite, uraninite.

*Table Mountain* - carnotite.

*Temple Mountain* - ankerite, basaluminite, chrome mica-clay, carnotite, coffinite, dolomite, fernandinite, ferroselite, galena, hewettite, hummerite, illite, meta-aluminite, metatorbernite, metatyuyamunite, montroseite, pascoite, pitchblende, pyrite, rauvite, roscoelite, tennantite, tetrahedrite, thucolite, torbernite, tyuyamunite, uraninite, uvanite, zippeite.

*Fuemrol no. 2 mine* abernathyite, arsenic, bassetite, jarosite, meta-aluminate, metazeunerite, orpiment, pitticite, pyrite, realgar, sphalerite, scorodite.

*North Temple Mountain, Eagle's Nest prospect* - chrome mica-clay.

*Rex no. 2 mine* - corvusite, hewettite, montroseite, paramontroseite, pitchblende, uraninite.

*South Temple Mountain* - chrome micaclay.

*Temple Mountain mine* - basaluminite, coffinite, corvusite, ferroselite, galena, illite, meta-aluminite, metatyuyamunite, montroseite, pascoite, pyrite, rauvite, tennantite, tetrahedrite, uvanite.

*Wild Horse Canyon* - autunite, meta-autunite, phosphuranylite.

*Wild Horse claims, Dripping Springs* - autunite, phosphuranylite.

*Temple Rock, and South Temple Wash* - autunite, carnotite, corvusite, hewettite, meta-hewettite, metatorbernite, rauvite, tyuyamunite, uvanite.

*Vagabond mine* - carnotite, meta-hewettite, metazeunerite.

*Vanura claims* - coffinite, uraninite.

*West Little Horse Mesa* - carnotite.

*Wild Horse Canyon* - carnotite.

**SAN RAFAEL RIVER** (2 mi S. of bridge) - agate, anhydrite, carnotite, chalcedony, gypsum, jasper, selenite, sulfur.

*Tidwell Ranch* - alabaster, carnotite.

**SAUCE BASIN** - pyrolusite.

**SOUTHERN PART OF COUNTY** - cryolite, gold.

**WOODSIDE** (5 mi. S.) - agate, chalcedony, jasper, silicified bone and wood.

**WOODSIDE DOME** - helium.

## GARFIELD COUNTY

**ANTIMONY DISTRICT** (See COYOTE CREEK DISTRICT).

**BOULDER MOUNTAIN.**

*Pleasant Creek* - pyrolusite.

**CANNONVILLE** - bentonite, wheelerite.

**CIRCLE CLIFFS** - silicified wood.

*Acme mine* - autunite, azurite, gypsum, malachite, pyrite, torbernite.

*Black Widow mine* - autunite, azurite, carnotite, gypsum, torbernite, uraninite, uranophane.

*Blue Goose mine* - azurite, autunite, gypsum, malachite,

torbernite.

*Dream Prospect* - carnotite.

*Horse Canyon prospect* - zeunerite.

*Horse Head mine* - autunite, carnotite, torbernite, uraninite, uranophane.

*Lone B mine* - carnotite, pyrite.

*Rocky Mountain mine* - autunite, chalcopryrite, arsenopyrite, chrysocolla, gypsum, pyrite, torbernite.

*Steam Boat mine* - azurite, autunite, gypsum, torbernite.

*Stud Horse mine* - autunite, chalcopryrite, pyrite, uraninite, zeunerite.

**COLORADO RIVER DISTRICT** (Colorado River) - placer gold, magnetite.

**COYOTE** - ptilolite, amygdaloidal fillings in basalt.

**COYOTE CREEK (ANTIMONY) DISTRICT** (Escalante Mountains).

*Hampton mine* - alunogen, epsomite, gypsum, orpiment, realgar, senarmontite, stibnite, stibiconite, valentinite.

*Dirty Devil River south to Lake Canyon* - placer gold.

**ESCALANTE** (near) - agate, ilmenite, monazite, silicified bone and wood, zircon.

**HENRIEVILLE** - bentonite.

**HENRY MOUNTAINS** - bornite, betauranotile, jet, johannite, uranophane, vanoxite, zippeite.

*Bromide, Oro mines* - azurite, chalcopryrite, epidote, gold, ilmenite, laumonite, magnetite, pyrite, specularite.

*Crescent Creek* - bentonite, carnotite, meta-hewettite, pascoite, placer gold, tyuyamunite.

*Cuprum claim* - azurite, gold, magnetite, malachite.

*Starlight claims* - tyuyamunite.

*Southwestern Flanks* - ilmenite, monazite, zircon.

**HITE** - gold, platinum in placers.

**HUTCH PASTURE** - pyrolusite, wad.

**KAIPAROWITS PLATEAU** - monazite, in Straight Cliffs Sandstone six miles south of Escalante.

**LITTLE ROCKIES DISTRICT** (Henry Mountains).

*Del Monte group* - carnotite, vanoxite.

*Ekker mine, Shootering Canyon* - carnotite, vanoxite.

**MAMMOTH CREEK** (S. Hatch) - onyx (green travertine).

**NORTH WASH DISTRICT** (Henry Mountains).

*S.Y. Guthrie group* - carnotite, vanoxite.  
*V.C.A. deposits* - carnotite.

OAK CREEK PROSPECT (17 mi. N.F. Boulder) - pitchblende, torbernite.

PANGUITCH (N.W.) - pyrolusite.

SPOTTED DOG CLAIM - torbernite.

TABLE CLIFF PLATEAU.  
*Fullmer prospect* - pyrolusite.

TRACHYTE DISTRICT (Henry Mountains).  
*Blitz nos. 1-7, June Bell nos. 1-4, Minnie Pearl nos. 1-2, Straight Creek, Trachyte nos. 1-2, V.C.A. claims* - carnotite, vanoxite.  
*Trachyte Creek* - carnotite, tyuyamunite.

TROPIC - bentonite.

TUSHAR RANGE.  
*Hawkins claims* - pyrolusite.

WATER POCKET CANYON - anhydrite, gypsum.

## GRAND COUNTY

AGATE SWITCH - agate, amethyst, chalcedony, red jasper casts of fossils, satin spar, travertine.

BALD MESA - placer gold, pyrolusite.

BEAVER MESA.  
*Corvusite nos. 1-3 mines* - carnotite, coffinite, rauvite.

BLUE SPAR PROPERTY (near Colorado-Utah border) - fluorite.

CANE CREEK - anhydrite, carnallite, gypsum, halite, polyhalite, sylvite.

CISCO (near) - agate, agatized clams, chalcedony, calcite (onyx marble), silicified bone and wood, opalized wood.

*7 mi. S. - agate.*  
*Texas Gulf Potash mine* - anhydrite, braitschite, carnallite, gypsum, halite, polyhalite, sylvite.  
*Trader Smith's claims* - schroekinggerite.

COLORADO RIVER AREA - chromite, gold in placers.  
*Dolores River south to Amasa Back* - placer gold.

COURTHOUSE WASH - barite, calcite, limonite, pyrolusite.

CRESCENT JUNCTION - carnallite, sylvite.

FISHER VALLEY - anhydrite, gypsum.

GREEN RIVER - chromite in placers.

GREEN RIVER CROSSING (D. and R.G. Railroad) - aluminite.

GYPSUM HILLS - anhydrite, gypsum.

HARLEY DOME - carbon dioxide, helium.

HOOSIER MINE (near Brendel) - azurite, bornite, malachite, pyrite.

LA SAL DISTRICT (E. slopes of North Mountain, La Sal Mountains).

*Bornite mine* - azurite, bornite, malachite, pyrite.  
*Jack claim* - carnotite, corvusite, hewettite, ilsemannite.  
*McCoy mine* - azurite, bornite, chalcocopyrite, malachite.

LA SAL MOUNTAINS (North Mountain) - actionolite, aegirite, augite, biotite, hedenbergite, oligoclase.

LITTLE GRAND DISTRICT (S. E. Green River).  
*Black Bird claim* - pyrolusite.  
*Colorado Fuel and Iron Company mine* - barite, calcite, pyrolusite.  
*Desert Rock (Mongol) claim* - pyrolusite.  
*Dry Lake Wash* - pyrolusite.  
*Duma Point* - pyrolusite.  
*Needles* - barite, calcite, manganite, pyrolusite, rhodochrosite.  
*Salt Wash group* - celestite, chert, manganite, pyrolusite.  
*Tenmile Wash* - barite, calcite, psilomelane, pyrolusite.  
*White Wash deposits* - pyrolusite.

LITTLE VALLEY - limonite, pyrolusite.

MCCARTHY WELL - anhydrite.

MILL CREEK (N. Moab) - carnotite.

MINERS BASIN DISTRICT (W. slopes of North Mountain, La Sal Mountains).  
*Dewey mine* - actinolite, calcite, chalcedony, chrysocola, chalcocopyrite, fluorite, hedenbergite, hematite, malachite, limonite, quartz.

*Dillon mine* - gold, pyrite.

*High Ore mine* - azurite, calcite, chalcopryrite, chrysocolla, chalcedony, fluorite, goethite, hematite, limonite, malachite, quartz.

*McCormick mine* - calcite, malachite, siderite.

*M.I.F. mine* - actinolite, gold, hedenbergite, pyrite.

*Moab no. 1 mine* - azurite, chalcopryrite, malachite, pyrite.

*Placer Creek* - gold.

*Skylark mine* - chalcopryrite, chrysocolla, limonite, pyrite.

*Tornado deposit* - gold, pyrite.

*West Slope mine* - carnotite.

MOAB (5 mi. N.) - agate, chalcedony, silicified bone and wood.

MOAB VALLEY - anhydrite, calciovolborthite, carnotite, gypsum.

MORRISON FORMATION - volkonskoite.

MULESHOE WASH - pyrolusite.

ONION CREEK (La Sal Mountains) - anhydrite, chevinite in volcanic ash, gypsum.

PACK CREEK (La Sal Mountains) - autunite, carnotite, cuprodescloizite, metaheewettite, tyuyamunite.

PARADOX BASIN - anhydrite, carnallite, gypsum, halite, polyhalite, sylvite.

POISON SPRING CANYON - meta-autunite.

POLAR MESA DISTRICT (Polar Mesa) - ferverite, gypsum, hewettite.

*Elva M., Imp. Polar nos. 2-3, Rim Rock no. 2 claims* - carnotite.

PR SPRINGS - asphalt.

RICHARDSON DISTRICT (Waring Creek) - azurite, calciovolborthite, carnotite, galena, saponite, tyuyamunite, volborthite.

RYAN CREEK SCHEELITE PROSPECT - barite, fluorite, galena, scheelite, sphalerite.

SALT VALLEY AREA - anhydrite, azurite, carnallite, gold, gypsum, halite, limonite, malachite, polyhalite, psilomelane, pyrolusite, sylvite.

SEGER STATION - carnotite.

SEVEN MILE ANTICLINE - anhydrite, carnallite, gypsum, halite, polyhalite, sylvite.

SEVEN MILE CANYON.

*Shinarump nos. 1-3 claims* - becquerelite, boltwoodite, bornite, carnotite, chalcocite, chalcopryrite, lithiophorite, pitchblende, pyrite, schroeckingerite, uranite, zippeite.

SQUAW PEAK - pyrolusite.

THOMPSONS AREA - agate, anhydrite, dinosaur bone, carnotite, gypsum, jasper, metaheewettite, metarossite, rossite, roscoelite, selenite, tyuyamunite, vanoxite.

THOMPSONS DISTRICT (S.E. Thompsons).

*Black Ape mine* - liebigite, pascoite.

*Cactus Rat mines* - barnesite, carnotite, hewettite, metaheewettite, phosphuranylite, rauvite, rossite, roscoelite, steigerite, tyuyamunite, vanoxite.

*Cobalt no. 2 mine* - phosphuranylite.

*Flat Top no. 1 claim* - carnotite.

*Juniper mine* - corvusite, montroseite, melanovanadite, paramontroseite, uraninite.

*McCoy group* - schroeckingerite.

*Parco no. 23 mine* - andersonite, corvusite, grantsite, metatyuyamunite, metarossite, montroseite, rossite, roscoelite, schroeckingerite, selenium, tyuyamunite, uraninite, uranite, vanoxite, zippeite.

*Red Vanadium group* - carnotite.

*Skinny no. 1 mine* - andersonite.

*Thom claim* - autunite, meta-autunite.

WHEELER DESERT DISTRICT (See WILSON MESA DISTRICT).

WHITE HOUSE - pyrolusite.

WILSON MESA (WHEELER DESERT) DISTRICT (Wilson Mesa) - bentonite, gold, pyrolusite, sherwoodite.

YELLOW CAT DISTRICT (W. part of Thompsons District).

*Eli Malichs Lucky Day claim* - pitchblende.

*L.A. Sutherland Sock claim* - pitchblende.

*Uvaco (Yellow Jacket) mine* - carnotite.

*Yellow Cat group* - metaheewettite, schroeckingerite, tyuyamunite.

IRON COUNTY

ANTELOPE RANGE

*Black Jack (Gregory), Lucky Joe, Taylor claims* - pyrol-



usite.

*Newcastle area* - chalcedony geodes.

CEDAR BREAKS - agate.

CEDAR CANYON - anhydrite, carnotite, gypsum, selenite.

CEDAR MOUNTAIN.

*Black Hawk, Joe Louis claims* - pyrolusite.

CIMA (MARIETTA, STRATTON) MINE - cinnabar, opal, sulfur.

ESCALANTE DISTRICT (Mt. Escalante).

*Clove prospect* - pyrolusite.

*Escalante mine* - adularia, annabergite, barite, cerussite, chlorargyrite, descloizite, fluorite, galena, hematite, hemimorphite, limonite, malachite, mimetite, montmorillonite, mottramite, pyrolusite, pyromorphite, willemitite, wulfenite.

GOLD SPRINGS DISTRICT (Hamlin Valley).

*Aetna, Independence, Jennie, Jumbo, Little Buck, Snowflake mines* - adularia, argentite, gold, limonite, pyrite.

*Homestake mine* - adularia, cerargyrite, fluorite, garnet, gold, mercury, quartz, selenium and tellurium mineralization.

IRON SPRINGS DISTRICT (Iron mountain, Granite Mountain, Three Peaks).

*Granite Mountain (Ore bodies: Armstrong, Constitution, Desert Mound, Eclipse, Georgia, Iron Springs Arch, King, Little Allie, Little Jim, Little Mormon, Lindsay Hill, Lindsay South, Milner Pit, Pioche Pit, Section 2, State Section 2, Section 3, Section 4, Section 9, Short Line, Short Line Extension, Thompson, Twitchell Vermillion Pit, Walker)* - actinolite, albite, amethyst, azurite, apatite, barite, chalcedony, cinnabar, diopside, galena, hematite, lodestone, magnetite, limonite, malachite, mimetite, pyrite, siderite.

*Iron Mountain (Ore bodies: A and B, Black Hawk, Black Magnetic, Blowout Hill, Burke no. 2, Burke no. 3, Calumet, Chesapeake, Comstock, Crystal, Cyclone, Deer, Duluth, Duncan, Excelsior, Homestake, Last Chance, Lime Cap, McCahill, Milner Hill, Mountain Lion, Pinto, Pot Metals, Queen of the West, Rex, Sparta, The Last Chance, Tip Top, Wall Street, Yellow Jacket)* - actino-

lite, albite, amethyst, azurite, apatite, barite, chalcedony, cinnabar, diopside, galena, hematite, lodestone, magnetite, limonite, malachite, mimetite, pyrite, siderite.

*Blowout Hill* - metastrengite, rockbridgeite.

*Three Peaks (Ore bodies: April Fool, Ashton, Blackbird, Great Western, Irene, Jeanette, Jones, Marshall, McGarry, State Section 16, War Eagle, Zelma)* - apatite, hematite, lodestone, magnetite.

KANARRAVILLE - anhydrite, autunite, gypsum.

LUND - sulfur, N. end of Escalante Valley.

MODENA - alunite, 1 mile northwest, pyrolusite, rhodochrosite.

NEEDLES RANGE

*PV deposit* - alunite.

PARAGONAH - analcite, in andesite flows.

*Iron Peak* - andesine, augite, biotite, chlorite, damourite, magnetite.

PAROWAN (near) - niter.

PINTO IRON (SILVER BELT) DISTRICT (Pinto) - hematite, magnetite.

SAND SPRINGS - gold.

SILVER BELT DISTRICT (See PINTO IRON DISTRICT).

STATELINE DISTRICT (Hamlin Valley) - argentite, bog ore, cerargyrite, ferrimolybdate, gold, mercury, pyrite, selenium mineralization, sylvanite.

*Creole, Gold Dome, Johnny, Ofer, Phelps, Utah Spur mines* - adularia, cerargyrite, gold, hematite, jarosite, limonite, pyrolusite.

WAH WAH MOUNTAINS

*SX deposit* alunite.

JUAB COUNTY

ABRAHAM HOT SPRINGS - psilomelane.

**DEEP CREEK MOUNTAINS**

*Apex and Mary mines* - beryl, fluorite, scheelite.

*Gold Bond mine* - azurite, gold, malachite, pyrolusite.

*Heavenly Hills prospect* - silver.

*Hornet, MacMillan, Eastern Trout Creek mines* - scheelite.

*Johnson Canyon prospects* - azurite, galena, malachite, pyrolusite.

*Queen of Sheba and Jumbo mines* - beryl, gold.

*Red Hill mine* - gold.

*Singleton Canyon mine* - azurite, malachite, tenorite, pyrolusite.

*Trout Creek mine* - beryl, fluorite, psilomelane, scheelite, sphalerite.

*Water Canyon mine* - azurite, malachite.

**DESERET (DESERT MOUNTAIN) DISTRICT** (Desert Mountain). - antlerite, bornite, brochanite, fluorite, hematite, limonite, magnetite, pyrite, tetrahedrite.

*Miller mine* - cerussite, galena, quartz with liquid inclusions.

*Rockwell shaft* - barite, chalcopyrite, chrysocolla, malachite.

**DESERT MOUNTAIN DISTRICT** (See **DESERET DISTRICT**).

**DETROIT (DRUM, JOY) DISTRICT** (Drum Mountains) (See also **MILLARD COUNTY**) - agate, jarosite, jasper.

*Black Boy group (Staats and Pratt mines)* - psilomelane, pyrolusite, rhodochrosite.

*Charm, Copperhead, E.P.H., Ibex mines* - azurite, bismutite, cerargyrite, chalcedony, chalcopyrite, cuprite, galena, gold, jasper, hematite, malachite, pyrite, pyrolusite.

*Ibex mine* - gold in jasperoid.

*Iron Blossom mine* - goethite, limonite, psilomelane, pyrolusite, wad.

*Martha mine* - gold in jasperoid.

**DRUM DISTRICT** (See **DETROIT DISTRICT**).

**DUGWAY RANGE** - beryl, bixbyite, chalcedony, fluorite, garnet, topaz.

**EAST TINTIC DISTRICT** (See under **UTAH COUNTY**).

**EAST TINTIC MOUNTAINS** - phosphorite in basal Deseret Limestone.

**FISH SPRINGS DISTRICT** (Fish Springs Mountains).

*Carnation, Emma, Galena, Utah mines* anglesite, cerargyrite, cerussite, chalcopyrite, covellite, fluorite, galena,

limonite, magnesite, plumbojarosite, pyrite, sphalerite.

*Garrick mine* - barite.

**GOSHUTE INDIAN RESERVATION** - beryl, muscovite, orthoclase, quartz.

**HONEYCOMB HILLS** - autunite, bertrandite, fluorite, meta-uranocircite, montmorillonite, sklodowskite, soddyite, spodumene, uraninite, uranophane, uranospinite.

**IBAPAH MOUNTAINS.**

*Fifteenmile Canyon* - beryl (gem quality aquamarine).

**INDIAN CREEK** - autunite, fluorite.

**JERICO** - agate, chalcedony, jasper, labradorite.

**JOHNSON PEAK DISTRICT** (See **TROUT CREEK DISTRICT**)

**JOY DISTRICT** (See **DETROIT DISTRICT**).

**JUAB DISTRICT** (Wasatch Mountains) cerussite, galena.

**KEG (MCDOWELL) MOUNTAINS** - agate, labradorite, obsidian.

**MONA DISTRICT** (Long Ridge) - anhydrite, cerussite, galena, gypsum.

**MT. NEBO (TIMMONS) DISTRICT** (Wasatch Mountains).

*Ajaxto no. 2 prospect* - galena, sphalerite.

*Big Nebo mine* - argentite, cerussite, galena.

*Black Ledge claims* - chalcedony, pyrolusite.

*Blackett Tunnel* - argentite, galena.

*Eva (Privateer) mine* - argentite, barite, calcite, calamine, cerussite, cuprite, dolomite, galena, smithsonite, sphalerite.

*Freddie Lode* - argentite, barite, calamine, cerussite, galena, smithsonite, sphalerite.

*Highland mine* - calcite, galena, sphalerite.

*Santaquin Chief mine* - cerussite, galena, sphalerite.

*Santaquin King mine* - cerussite, galena.

*Syndicate (Bullock) Tunnel* cerussite, galena.

**NORTH TINTIC DISTRICT** (Boulter Mountains) (See also under Tooele and Utah Counties).

*Tintic Prince mine* - galena, jasper, pyrite.

**SAN PITCH MOUNTAINS.**

*Black Jack (Kendall-Duvall) claims* - agate, braunite, chalcedony, quartz, psilomelane.

*Chicken Creek, Levan, Nephi, Salt Creek* - anhydrite, gypsum, halite.

*Orme property* - calcite, opal, psilomelane, pyrolusite.

SPRING CREEK DISTRICT (W. side Deep Creek Mountains).

*Queen of Sheba mine* - albite, azurite, beryl, biotite, galena, garnet, limonite, muscovite, orthoclase, pyromorphite, quartz, tourmaline.

THOMAS RANGE - agate, bertrandite, beryl, chalcedony, clinoptilolite, fluorite, garnet, opal, pseudobrookite, quartz, specularite, topaz.

*Autunite no. 8 claim* - calcite, fluorite, opal, quartz, sanidine, weeksite.

*Buena no. 1 claim* - fluorite, opal.

*Good Will, Yellow Chief groups* - betauranophane, fluorite, schroëckingerite, uranophane, weeksite.

SPOR MOUNTAIN - bertrandite, clinoptilolite, fluorite, hectorite, morganite.

*Bell Hill mine* - carnotite, chalcedony, chalcopyrite, fluorite, hematite, magnetite, montmorillonite, pyrite, quartz.

*Blowout mine* - carnotite, fluorite, montmorillonite, quartz.

*Blue Queen prospect* - fluorite.

*Claybank, Blue Chalk, Fluro, Hogsback, Northend, Rainbow, Roadside claims, Tarus* bertrandite, calcite, chalcedony, clinoptilolite, fluorite, gel-bertrandite, montmorillonite.

*Dell no. 1 mine* - fluorite, quartz.

*Dell no. 5 mine* - carnotite, fluorite, montmorillonite, quartz.

*Eagle Rock prospect* - calcite, carnotite, fluorite, malachite, montmorillonite.

*Evening Star prospect* - fluorite, sanidine, quartz.

*Floride mine* - carnotite, fluorite, hematite, limonite.

*Floride no. 5 mine* - fluorite, montmorillonite.

*Fluorine Queen mine* - carnotite, chalcedony, fluorite, montmorillonite, pyrolusite.

*Fluorine Queen no. 4 prospect* - carnotite, fluorite, montmorillonite.

*Green Crystal mine* - chalcedony, fluorite.

*Harrisite mine* - calcite, carnotite, fluorite, montmorillonite.

*Hilltop mine* - carnotite, fluorite, quartz.

*Lost Sheep mine* - carnotite, chalcedony, fluorite, quartz.

*Lost Soul prospect* - fluorite.

*Lucky Louie mine* - carnotite, chalcedony, fluorite.

*Nonella prospect* - fluorite, opal, quartz.

*Oversight mine* - calcite, fluorite, quartz.

*Rainbow no. 2 prospect* - fluorite.

*Thursday mine* - calcite, fluorite.

TOPAZ MOUNTAIN - almandite, beryl, bixbyite, calcite, carnelian, carnotite, chalcedony, clinoptilolite, fluorite, garnet, hematite, morganite, hyalite, pseudobrookite, quartz, sanidine, schroëckingerite, specularite, spessarite, topaz, uranophane, weeksite.

TIMMONS DISTRICT (See MT. NEBO DISTRICT).

TINTIC DISTRICT (East Tintic Mountains) - arseniosiderite, arduinite, atacamite, cotunnite, pyrolusite, tennantite, siderotil, sicklerite, spangolite, zoisite.

*Ajax mine* - borickite, chalcophyllite, enargite, mixite, tyrolite.

*American Eagle mine* - conichalcite, chenevixite, erinite.

*Beck Tunnel mine* - cerussite, galena, jasper.

*Black Dragon mine* - galena, limonite, pyrite.

*Black Jack Empire mine* - gold, limonite, silver, pyrolusite, wad.

*Boss Tweed mine* - azurite, barite, bismite, bismuth, bismutite, brochantite, calamine, cuprite, malachite, mixite.

*Brooklyn mine* - crandallite.

*Bullion Beck mine* - anglesite, aurichalcite, azurite, calamine, cerargyrite, cerussite, gold, galena, marcasite, pearceite, silver, smithsonite, sphalerite.

*Carissa mine* - aurichalcite, azurite, barite, bismuth, bismutite, brochantite, calcite, chrysocolla, conichalcite, copper, cuprite, enargite, garnet, lettsonite, malachite, mixite, olivenite, pitticite, scorodite, utahite.

*Centennial Eureka mine* - azurite, barite, cerargyrite, chalcocite, chalcopyrite, conichalcite, copper, cornwallite, cuprite, enargite, erinite, galena, gold, malachite, metazeunerite, silver, zeunerite.

*Chief Consolidated mine* - cerargyrite, cerussite, enargite, galena, huntite on 1800 level, jasper, proustite, pyrrargyrite, pyrite, silver, smithsonite, sphalerite.

*Colorado mine* - calamine, cerussite, galena, geocronite, smithsonite, sphalerite.

*Dragon mine* - chrysocolla, galena, halloysite, limonite.

*Eagle and Blue Bell mine* - anglesite, bismite, bismutite, bismoclite, cerargyrite, cerussite, daubreeite, enargite, galena, jarosite, jasper, smithsonite.

*Emerald mine* - bismuth, calcite, hematite, limonite, psilomelane, wad.

*Eureka Hill mine* - anglesite, barite, brochantite, carphosiderite, cerussite, enargite, galena, gold, leadhillite, minetite, phosgenite, pyromorphite, sphalerite.

*Gemini mine* - anglesite, aurichalcite, azurite, calamine, cerargyrite, cerussite, galena, heulandite, hydrozincite, jasper, malachite, marasite, pearceite, silver, smithsonite.

*Godiva mine* - anglesite, cerargyrite, cerussite, galena, minium, smithsonite.

*Gold Chain mine* - barite, conichalcite, enargite, malachite, olivenite, pharmacosiderite, tyrolite.

*Grand Central mine* - barite, cerargyrite, chalcocite, chalcopyrite, connellite, covellite, enargite, galena, jasper, limonite, silver.

*Homestake and Shoebriidge mines* - enargite, galena.

*Humbug mine* - anglesite, cerussite, galena, stephanite.

*Iron mine* - cerargyrite, hematite, limonite.

*Iron Blossom mine* - adamite, aragonite, aurichalcite, azurite, barite, calcite, covellite, enargite, galena, jasper, malachite, pyrite, sphalerite.

*Lower Mammoth mine* - enargite, galena, pyrite, smithsonite, sphalerite, tetrahedrite.

*New Bullion mine* - smithsonite.

*Mammoth mine* - argentite, arsenobismite, barite, bindheimite, bismuthian bismuthinite, borickite, brochantite, cerargyrite, cerussite, chalcophyllite, clinoclase, enargite, erinite, famatinite, galena, gold, gypsum, letsomite, olivenite, pharmacosiderite, pyromorphite, silver, tyrolite.

*May Day mine* - aurichalcite, calamine, galena, gold, hydrozincite, smithsonite.

*Mintintic mine* - zunyite.

*Opohonga mine* - barite, enargite, olivenite.

*Packard Peak* - halloysite.

*Scotia mine* - bindheimite, jamesonite.

*Sioux mine* - azurite, dolomite, enargite, galena, malachite, quartz.

*Sunbeam mine* - anglesite, cerussite, limonite, malachite, pyrite.

*Swansea mine* - anglesite, arsenopyrite, barite, cerussite, enargite, galena, melaconite, melanterite, pyrite, silver, sphalerite, tenorite.

*Uncle Sam mine* - aurichalcite, smithsonite.

*Victoria mine* - ankerite, bismutite, calamine, enargite, galena, gold, jasper, manganite.

*White Cloud mine* - pyrolusite, wad.

*Yankee mine* - aurichalcite, smithsonite.

TROUT CREEK (JOHNSON PEAK) DISTRICT (E. side Deep Creek Mountains) - fluorite, gold, pyrrhotite, sphalerite.

*Apex mine* - beryl, quartz, scheelite.

*Bacon mine* - andalusite, scheelite.

*Trout Creek mine* - scheelite.

WEST TINTIC DISTRICT (West Tintic Mountains) - arsenopyrite, bismuthinite, enstatite, galena, idocrase, magnetite, molybdenite, pyrite, scheelite, sphene, talc, tremolite, wollastonite.

*88 mine* - anglesite, barite, cerussite, chrysocolla, fluo-

rite, galena.

*Iron King mine* - andradite, clinozoisite, epidote, grossularite, magnetite, pyrite, scheelite, specularite.

*Lockheed Iron property* - chalcopyrite, epidote, hematite, magnetite, malachite, pyrite.

*1903 mine* - barite, calamine, cerussite, chalcopyrite, chrysocolla, fluorite, galena, limonite, malachite, pyrite, sphalerite.

*Pyramid mine* - barite, galena, limonite, malachite.

*Scotia (Old Scotia) mine* - anglesite, arsenopyrite, azurite, barite, bindheimite, cerussite, chalcopyrite, chrysocolla, conichalcite, galena, gold, hematite, jamesonite, limonite, linarite, malachite, olivenite, pharmacosiderite, pyrite, scorodite, sphalerite.

*Tintic Western (Desert Tungsten) mine* - actinolite, andradite, azurite, calcite, chalcopyrite, chlorite, chrysocolla, clinozoisite, epidote, grossularite, limonite, magnetite, malachite, pyrite, quartz, scheelite, specularite, stibnite.

*War Eagle claims* - anglesite, aurichalcite, barite, bindheimite, calcite, cerussite, chalcedony, chalcopyrite, chrysocolla, galena, gold, hematite, limonite, malachite, pyrite, specularite, wad.

## KANE COUNTY

ALUM HILLS - aluminite.

BULLOCH CLAIMS - autunite, carnotite, torbernite, tyuyamunite.

CANNONVILLE - anhydrite, gypsum.

COLORADO RIVER DISTRICT - placer gold, magnetite.

GLENDALE - anhydrite, gypsum.

JOHNSON CREEK - anhydrite, gypsum.

KAIBAB FAULT - (W. side) - allophane, ammoniojarosite, ammonia alum.

KAIPAROWITS PLATEAU (S. part) - ilmenite, monazite, zircon.

*Crotten Canyon* - monazite in Straight Cliffs Sandstone.

*Rees Canyon* - monazite in Straight Cliffs Sandstone.

*Sunday Canyon* - monazite in Straight Cliffs Sandstone.

KANAB (near) - silicified wood.

KANAB CREEK - anhydrite, gypsum.



KIMBALL VALLEY - anhydrite, gypsum.

KITCHEN CORRAL CANYON - barite, calcite, chalcodony, limonite, pyrolusite.

ORDERVILLE - agate, anhydrite, calcite geodes, gypsum, silicified wood.

PARIA (PAHREAH) 9 mi. S.) - aluminite, autunite, anhydrite, carnotite, gypsum, uranospinite.

PARIA (PAHREAH) MINING COMPANY - azurite, cuprite, malachite.

PARIA RIVER - placer gold, in Shinarump clays, fifteen miles north of Utah-Arizona boundary.

VIRGIN RIVER - torbernite.

## MILLARD COUNTY

ANTELOPE SPRINGS - limonite, pyrite, altered to limonite.

BLACK ROCK (5 mi. N.) - red and black obsidian; flowering or snowflake obsidian.

CLEAR LAKE RAILROAD STATION - straw yellow labradorite in weathered andesite.

CRICKET MOUNTAINS - dolomite, hematite in ferruginous quartzite member of Prospect Mountain Quartzite.

DETROIT (DRUM, JOY) DISTRICT (LITTLE DRUM MOUNTAINS) (See also Juab County).

*Almond, Blue Bell, Major Drum mines* - azurite, bismutite, cuprite, chalcodony, chalcopyrite, malachite, pyrite, pyrolusite, rhodochrosite, wad.

*Black Diamond, Guy (Black Jack), Last Chance, Martha, Silica Plug mines* - jasper, manganite, pyrolusite, wad.

*Charm mine* - gold in jasperoid.

*Martha mine* - gold in jasperoid.

DRUM DISTRICT (See DETROIT DISTRICT).

FILLMORE (near) - anhydrite, gypsite, gypsum, niter.

GORDON DISTRICT (Pavant Mountains).

*Black, Philadelphia, Sulphur King mines* - gypsum, sulfur.

*Cove Creek* - gypsum, hematite, marcasite, pyrite, sulfur.

*Excelsior, Mariposa, New York, Prince Albert, Queen*

*Victoria mines* - gypsum, hematite, sulfur.

*Rain Bow mine* - fluorite.

*Victor Conqueror mine* - marcasite, pyrite, sulfur.

## HOUSE RANGE.

*Amasa Valley* - albite, biotite, diopside, garnet, gold, idocrase, molybdenite, pyrite, scheelite, tourmaline, tremolite, wollastonite.

*Granite Canyon* - placer gold.

*Horseshoe, Mt. Baldy, New Klondike, Pine Peak, Pinke Peak, South, South Pit, Sidespring mines* - diopside, garnet, idocrase, scheelite.

*Notch Peak* (intrusive and contact) - albite, biotite, diopside, garnet, gold, idocrase, microcline, molybdenite, oligoclase, orthoclase, pyrite, scheelite, tremolite, wollastonite.

*Painter Springs* - garnet, idocrase, microcline, orthoclase, muscovite, pyrite, scheelite.

*Rainbow mine* - diopside, fluorite, garnet, idocrase, scheelite.

JOY DISTRICT (See DETROIT DISTRICT).

KANOSH (near) - anhydrite, gypsite, gypsum.

LEAMINGTON (OAK CITY) DISTRICT (Canyon Range).

*Arbroath mine* - anglesite, cerussite, galena.

*Fool Creek Canyon* - azurite, limonite, malachite.

*Leamington Mining Company* - anglesite, cerussite, galena.

*Wood Canyon* - galena, sphalerite.

*Yellowstone mine* - anglesite, aragonite, cerussite, galena, gold.

OAK CITY DISTRICT (See LEAMINGTON DISTRICT)

SAW BACK DISTRICT (W. of Sevier Lake) - chalcopyrite, galena, garnet, molybdenite.

SEVIER LAKE (S. end) - corundum in angular masses in alluvium.

## SOUTH PAVANT RANGE

*Cove Fort* (N.E.) - fluorite, sulfur.

*Dog Valley* - chalcodony, fluorite.

TABERNACLE MOUNTAIN - guano.

## TUSHAR MOUNTAINS

*Cove Fort area* - clintoptilolite in tuff.

TWIN PEAK - andesine, apatite, augite, biotite, mag-

netite, martite.

*Black Diamond Iron prospect* - hematite, magnetite, martite.

WHITE MOUNTAIN - red and black obsidian, black obsidian.

## MORGAN COUNTY

ARGENTA DISTRICT (Wasatch Mountains).

*Carbonate Hill, Carbonate Gem mines* - anglesite, barite, cerussite, galena, jarosite, limonite, pyrite, smithsonite.

ARTHUR FORK - biotite, monazite, molybdenite, uraninite, xenotime.

HARDSCRABBLE (MILL CREEK) DISTRICT (Wasatch Mountains).

*Norway group* - hematite, limonite.

MILL CREEK DISTRICT (See Hardscrabble District).

MORGAN DISTRICT (Wasatch Mountains).

*Chicago-Utah, Iron King, Morgan Consolidated, Red Eagle mines* - azurite, gold, malachite, marcasite, pyrite.  
*Morgan Crescent mine* - azurite, chalcopyrite, chrysocolla, copper, cuprite, gold, malachite, tenorite.

ROUND VALLEY.

*Copper Mountain mine* - azurite, malachite.

STRAWBERRY MINE (near Gateway) - gold, silver.

## PIUTE COUNTY

ALUNITE RIDGE - alunite.

ANTELOPE RANGE - limonite, pyrolusite, torbernite.

CIRCLEVILLE MOUNTAIN - stellerite.

DEER TRAIL MOUNTAIN - alunite.

DRY CANYON - pyrolusite.

GOLD MOUNTAIN (KIMBERLY) DISTRICT (Deer Creek, Tushar Mountains) alunite, barite, garnet, gypsum.

*Annie Laurie mine* - argentite, cerargyrite, fluorite, galena, gold, limonite, pyrite, sphalerite.

*Keystone mine* - fluorite.

*Mill Creek on Signal Peak* - placer gold.

*Sevier mine* - adularia, argentite, amethyst, azurite, cerargyrite, fluorite, gold, limonite, pyrite.

## KIMBERLY DISTRICT (See GOLD MOUNTAIN DISTRICT)

MARYSVALE DISTRICT (Marysvale Uranium Area) - adularia, allphane, alum, alunite, albite, biotite, calcite, cobaltomenite, clinocllore, chlorite, cristobalite, dickite, halite, halloysite, manganocalcite, montmorillonite, nontronite, obsidian.

*Alum King mine* - potash alum.

*Al-Kee-Mee prospect* - alunite, natroalunite.

*Big Chief, Big Star, Manning Creek, Mary's Lamb, Marysvale Peak, North Star, Pittsburg, White Hills, Winkelman mines* - alunite.

*Blackbird, Blue Miami Moon no. 1 mines* - pyrolusite.  
*Buddy mine* - autunite, jordisite, lithiophorite, pitchblende.

*Bullion Monarch (Farmer John) mine* - autunite, barite, fluorite, ilsemannite, jordisite, johannite, lithiophorite, metatorbernite, schroeckingerite, torbernite, pitchblende, uraninite, uranophane, uranopilite, zippeite.

*Copper Butte mine* - autunite, torbernite, uranophane.

*Copper Cap mine* - jarosite.

*East Slope no. 2 prospect* - alunite, autunite, hematite, metatorbernite, schroeckingerite, uranophane.

*Freedom Lease, V.C.A. mine* - autunite, pitchblende.

*Freedom no. 1 mine* - autunite, fluorite, ilsemannite, jarosite, jordisite, lithiophorite, pitchblende, torbernite, schroeckingerite, umohoite.

*Freedom no. 2 mine* - autunite, betauranotile, fluellite, fluorite, gearksutite, ilsemannite, jordisite, lithiophorite, meta-autunite, metatorbernite, phosphuranylite, sabugalite, schroeckingerite, sklodowskite, torbernite, umohoite, uraninite, uranophane, zeuermite, zippeite.  
*J & L. alunite mine* - alunite, hyalite, opal, phosphuranylite.

*LaVita prospect* - fluorite, goethite, hematite, metatorbernite, meta-autunite, molybdenite, pyrite, rauvite, tyuyamunite.

*Papsy's Hope prospect* - meta-autunite, uranophane.

*Prospector no. 1 mine* - autunite, fluellite, fluorite, ilsemannite, jordisite, johannite, lithiophorite, pitchblende, torbernite, schroeckingerite, uraninite, uranophane, uranopilite, zippeite.

*Prospector no. 3. mine* - autunite, lithiophorite, pitchblende, torbernite, schroeckingerite.

*Quicksilver mine* - amethyst, argentite, cinnabar, ilsemannite, metacinnabar, mordenite, onofrite, quartz, selenite, tiemannite.

*Silica Hills* - alunite, celadonite, chabazite, goethite, jarosite, opal, natrolite, thomsonite.

*White Horse deposit* - alunite, kaolinite.

*Yellow Jacket mine* - alunite, jarosite.

**MOUNT BALDY DISTRICT** (Cottonwood Creek, Tushar Mountains).

*Aetna (Edna) mine* - alunite.

*Bradburn, Close In, Mineral Products, L and N, Sunshine mines* - alunite,

*Christmas mine* - alunite.

*Clyde mine* - chalcopyrite, malachite, pyrite, sphalerite, tetrahedrite, wurtzite.

*Crystal mine* - alunite, galena.

*Deer Trail mine* - anatase, anglesite, cerussite, fluorite, galena, gold, jarosite, limonite, leuchtenbergite, malachite, manganocalcite, octahedrite, pitchblende, plumbogjarosite, pyrite, pyrolusite, quartz, specularite, sphalerite, zircon.

*Green Eyed Monster mine* - limonite, pyrite.

*Lucky Boy mine* - barite, cinnabar, onofrite, tellurium mineralization, tiemannite.

*Pluto mine* - argentite, cerargyrite, cerussite, galena, gold, tellurium mineralization, wulfenite.

**MOUNT BELKNAP** - pyrolusite.

**OHIO DISTRICT** (Bullion Canyon, Tushar Mountains).

*Bully Boy and Webster mines* - azurite, barite, cerussite, chalcopyrite, fluorite, galena, gold, hydrozincite, limonite, pyrite, pyrolusite, quartz, selenium mineralization, sphalerite, sylvanite, tetrahedrite, wulfenite.

*Cascade mine* - azurite, cerussite, chalcopyrite, galena, gold, malachite, pyrite, tetrahedrite, sphalerite.

*Copper Belt, Iris, Shamrock mines* - azurite, cerussite, chalcopyrite, galena, malachite, pyrite, tetrahedrite.

*Dalton mine* - azurite, cerussite, gold, malachite, pyrite, rhodochrosite, tellurium mineralization, tetrahedrite.

*Gilbert claims* - pyrolusite.

*Great Western mine* - chalcopyrite, fluorite, galena, pyrite, sphalerite, tetrahedrite.

*Pine Gulch Creek* - placer gold.

*Shamrock mine* - chalcopyrite, fluorite, galena, sphalerite, tetrahedrite.

*Tunnel Extension No. 2 mine* - bismuthinite, cassiterite, chalcocite, chalcopyrite, covellite, cuprobismutite, emplectite, gold, tetradymite, tetrahedrite.

*Wedge mine* - adularia, azurite, gold, malachite.

**SEVIER CANYON** - alunite, anhydrite, gypsum, limonite.

**TUSHAR RANGE.**

*Dillon mine* - rhodochrosite.

**RICH COUNTY**

**BEAR RIVER RANGE.**

*Lakeview claims* - calcite, jasper, pyrolusite, rhodochrosite.

**CRAWFORD MOUNTAINS** - phosphorite, tyuyamunite.

**GARDEN CITY DISTRICT** (See SWAN CREEK DISTRICT).

**LAKETOWN CANYON** - phosphorite.

**SWAN CREEK (GARDEN CITY) DISTRICT** (Bear River Range).

*Victoria prospect* - azurite, barite, cerussite, galena, tennantite, wulfenite.

**WOODRUFF CREEK** - phosphorite.

**SALT LAKE COUNTY**

**ADAMS DISTRICT** (See HOT SPRINGS DISTRICT).

**ALTA DISTRICT** (See LITTLE COTTONWOOD DISTRICT).

**ALTA STOCK** - allanite, bornite, brucite, calcite, chalcopyrite, diopside, forsterite, garnet, hypersthene, ludwigite, magnetite, pyrite, tremolite in contact zone.

**ALUM POINT** - apjohnite, bushmanite, pickeringite.

**BIG COTTONWOOD CANYON** (near mouth) - large orthoclase crystals.

**BIG COTTONWOOD DISTRICT** (Wasatch Mountains) - actinolite, andradite, anglesite, asbestos, barite, dufrenoyite, orthoclase.

*Alta Tunnel and Transportation Company mine* - cerussite, galena, malachite, smithsonite.

*American Metals mine* - galena, pyrite, quartz, sphalerite.  
*Big Cottonwood mine* - bornite, brucite, chalcopyrite, ephesite, forsterite, galena, hydromagnesite, magnesio-ludwigite, magnetite, malachite, periclase, pyrite, susseite, xanthophyllite.

*Carbonate mine* - argentite, aurichalcite, cerussite, galena, limonite, malachite, pyrolusite, smithsonite.

*Cardiff mine* - cerussite, covellite, enargite, galena, limonite, malachite, plumbogjarosite, pyrite, pyrolusite, rhodochrosite, smithsonite, sphalerite, tetrahedrite.

*Columbus Rexall mine* - bornite, chalcopyrite, enargite, galena, pyrite, siderite, tetrahedrite.

*Confidence mine* - anorthite.

*Copper King mine* - cuprite, molybdenite.

*Eclipse mine* - azurite, anglesite, cerussite, galena,

goethite, malachite.

*Great Western mines* - lugwigite, (see Big Cottonwood and Mountain Lake mines).

*Howell-Baby McKee mine* - chalcopyrite, galena, pyrite, sphalerite.

*Kennebec mine* - cerussite, galena.

*Kentucky - Utah mine* - chalcopyrite, magnetite, pyrite.

*Lulu mine* - chalcopyrite, galena, siderite.

*Maxfield mine* - alaskaite, anorthite, dyscarasite, galena, pyrite, sepiolite, sphalerite, tetrahedrite, wollastonite.

*Mountain Lake mine* - bornite, brucite, chalcocite, chalcopyrite, diopside, epidote, ephessite, forsterite, garnet, hydromagnesite, magnesioludwigite, magnetite, malachite, muscovite, periclase, scheelite, sussexite, szaibelyite, xanthophyllite.

*Mountain View mine* - ludwigite.

*New State mine* - gold.

*Prince of Wales and Antelope mines* - azurite, cerussite, galena, malachite, smithsonite, sphalerite, wad.

*Reed and Benson mines* - cerussite, chalcopyrite, galena, goethite, hemimorphite, sphalerite, tetrahedrite.

*Silver Mountain mine* - cerussite, galena, pyrite, smithsonite, sphalerite.

*Steamboat mine* - chalcocite, forsterite.

*Tar Baby mine* - galena.

*Tungsten Tunnel mine* - huebnerite, powellite, scheelite.

*Woodlawn mine* - cerussite, chalcopyrite, galena, magnetite, malachite, pyrite, pyrolusite, sphalerite, wulfenite.

**BINGHAM (WEST MOUNTAIN) DISTRICT** (Oquirrh Mountains) - actinolite, bismuth, bismutite, bournonite, calcite, garnet, linarite, magnetite, massicot, mercury, pyrolusite, pyrrhotite, rutile, seligmannite, siderotil, tennantite.

*Bear Gulch* - placer gold.

*Bingham Canyon* - placer gold.

*Bingham Copper (Kennecott, Utah Copper) Pit* - allophane, apophyllite, bornite, chalcantite, chalcopyrite, chlorite, digenite, enargite, foshagite, gold, gyrolite, kaolinite, illite, malachite, molybdenite, nontronite, okenite, palladium, platinum, pyrite, quartz, sericite, selenium mineralization, stilbite, tellurium mineralization, thaumasite, thomsonite, tobermorite, turquoise, vivianite, wavellite.

*Boston Consolidated, Burning Moscow, Last Chance, Nast mines* - cerussite, chalcocite, chalcopyrite, galena, gold, pyrite, sphalerite.

*Broad Gauge mine* - cerussite, chalcantite, gold, hematite, pyrite.

*Brooklyn, Yosemite mines* - cerussite, chalcopyrite, galena, gold, pyrite, sphalerite.

*Butterfield mine* - azurite, cerussite, chalcopyrite, galena, gold, malachite, pyrite, rhodochrosite, sphalerite.

*Butterfield Canyon* - orpiment, realgar.

*Caledonia, Montezuma, Red Wing mines* - cerussite, galena, gold, pyrite,

*Carr Fork* - placer gold.

*Carr Fork mine* - bornite, chalcopyrite, galena, garnet, hematite, magnetite, molybdenite, pyrite, pyrrhotite, sphalerite.

*Colorado mine* - chalcopyrite, galena, pyrite.

*Columbia mine* - azurite, chalcocite, malachite, pyrite.

*Commercial mine* - azurite, chalcocite, chalcopyrite, copper, enargite, gold, malachite, pyrite, tellurium mineralization.

*Conger, Fortune mine* - chalcocite, chalcopyrite, galena, pyrite.

*Copper Center Tunnel* - bornite, chalcopyrite, pyrite.

*Dalton, Lark group* - azurite, cerussite, chalcopyrite, galena, gold, pyrite, silver, sphalerite.

*Eagle Bird lode* - arsenopyrite, barite, galena, rhodochrosite, sphalerite.

*Eighty Nine mine* - tetrahedrite.

*Frisco mine* - chalcopyrite, galena, pyrite, sphalerite.

*Galena, Old Jordan mines* - anglesite, azurite, bornite, cerussite, chalcantite, chalcocite, chalcopyrite, cuprite, enargite, galena, gold, goslarite, limonite, malachite, opal, pisanite, pyrite, quartz, sphalerite, tenorite, tetrahedrite, silver.

*Highland Boy, Yampa mines* - azurite, bornite, calaverite, chalcantite, chalcocite, chalcopyrite, copper, covellite, cuprite, enargite, galena, leverrierite, limonite, malachite, marasite, pyrite, racewinite, siderite, specularite, sphalerite.

*Jersey Blue mine* - cerussite, galena.

*Lucky Boy mine* - barite, luckite, melanterite, mallardite, rhodochrosite.

*Midland mine* - azurite, cerussite, galena, malachite, marcasite.

*Minnie mine* - chalcocite, pyrite.

*Neptune mine* - galena, pyrite, silver, sphalerite.

*Northern Chief lode* - covellite.

*Old Telegraph mine* - azurite, cerussite, chalcocite, chalcopyrite, galena, gold, malachite.

*Parnell mine* - gold.

*Petro mine* - cerussite, galena.

*Phoenix mine* - chalcocite, galena, pyrite.

*Queen lode* - argentite, galena.

*Queen mine* - argentite, barite, chalcopyrite, galena, rhodochrosite, sphalerite.

*Silver Shield mine* - chalcopyrite, galena, freibergite, tetrahedrite.

*Tiewaukee mine* - azurite, binnite, galena, malachite,



pyargyrite, pyrite, silver, sphalerite.

*U.S. and Lark mine* - azurite, cerussite, chalcopyrite, galena, gold, malachite, montmorillonite, pyrite, quartz, silver, sphalerite, talc.

*Winnamuck, Dixon mines* - cerargyrite, chalcocite, chalcopyrite, cubanite, dufrenoyite, galena, gold, goslarite, pyrite, pyrargyrite, rhodochrosite, sphalerite, tetrahedrite.

*York mine* - azurite, chalcopyrite, galena, malachite.

#### CAMP WILLIAMS

*Evans lime quarry* - calcite, pyrolusite.

CLAYTON PEAK STOCK - ankerite, bornite, brucite, calcite, chalcopyrite, diopside, forsterite, garnet, idocrase, magnesite, magnetite, monticellite, periclase, phlogopite, pyrite in contact zone.

DRY CANYON - phosphorite.

GREAT SALT LAKE (shores) - aragonite, bloedite, glauberite, gypsum, halite, mirabilite, thenardite.

HOT SPRINGS (ADAMS) DISTRICT (Wasatch Mountains) - cerussite, galena.

LAKE BONNEVILLE SHORELINE - thinolite as cement of gravels.

LITTLE COTTONWOOD (ALTA) DISTRICT (Wasatch Mountains) - allanite, chabazite, ferrimolybdite, heulandite, mesolite, orthoclase, prehnite, periclase, sepiolite, stilbite, zoisite.

*Albion mine* - argentite, barite, bournonite, cerussite, chalcopyrite, galena, pyrite.

*Alta mine* - actinolite, biotite, diopside, forsterite, garnet, tremolite, vesuvianite.

*Alta Consolidated mine* - cerussite, chalcopyrite, limonite, magnetite, pyrite, wulfenite.

*Alta - Gladstone vein no. 5* - molybdenite, pyrite.

*Bay State mine* - stibnite.

*Cabin mine* - cerussite, galena, limonite, plumbojarosite.

*Centennial Alta mine* - beaverite, enargite, tyrolite, wulfenite.

*City Rocks mine* - wulfenite.

*Columbus Consolidated and Wasatch Drainage Tunnel mine* - galena, pyrite, sphalerite, tetrahedrite.

*Columbus-Rexal mine* - bornite, chalcopyrite, enargite, galena, pyrite, siderite, tetrahedrite.

*Emma mine* - argentite, anglesite, azurite, cerussite, calamine, chrysocolla, cervantite, galena, limonite, malachite, massicot, pyrite, pyrolusite, siderite, smithsonite, stephanite, sphalerite, stolzite, tetrahedrite,

tungstenite, wulfenite, wolfframite.

*Flagstaff mine* - barite, cerussite, galena, limonite, plumbojarosite, wulfenite.

*Grizzly mine* - linarite.

*Little Emma mine* - anglesite, calamine, cerussite, cervantite, chrysocolla, galena, malachite, pyrite, pyrolusite, sphalerite, stephanite, tungstenite, wulfenite.

*Michigan-Utah (Continental Alta) mine* - anglesite, cerussite, galena, limonite, ludwigite, magnetite, pyrolite, rhodochrosite, wulfenite.

*Native Copper mine* - chalcopyrite, copper.

*Oxford, Geneva mines* - caledonite, chalcopyrite, dufrenoyite.

*Patsey Marley mine* - epidote.

*Peruvian Consolidated mine* - galena, pyrite, tetrahedrite.

*South Hecla mine* - (includes *Dwyer and Sells Tunnels*) - aikinite, busmite bismuth, bismuthinite, bornite, chalcopyrite, enargite, galena, garnet, ludwigite, magnetite, plumbojarosite, pyrite, scheelite, smithsonite, sphalerite, tetrahedrite, wollastonite.

*Superior mine* - chalcopyrite, galena, pyrite, sphalerite, tetrahedrite.

*Third Chance mine* - molybdenite.

*West Toledo mine* - cerussite.

LITTLE COTTONWOOD STOCK (Wasatch Mountains) - apatite, allanite, biotite, hornblende, magnetite, microcline, molybdenite, orthoclase, plagioclase, pyrite, quartz, sphene, sericite, scheelite, zircon.

LOWER PLACER DISTRICT (Oquirrh Mountains) - gold.

SMELTER DISTRICT (Oquirrh Mountains) - limonite, malachite.

WEST MOUNTAIN DISTRICT (See BINGHAM DISTRICT).

#### SAN JUAN COUNTY

ABAJO MOUNTAINS - placer gold on south flank.

ABE DAY'S VANADIUM CLAIM - carnotite.

BIG INDIAN DISTRICT (Big Indian Wash-Lisbon Valley Area).

*Big Buck mine* - becquerelite, coffinite, doloresite, montroseite, uraninite, vanadium hydromica.

*Big Indian Copper mine* - azurite, chalcocite, chalcopyrite, covellite, cuprite, malachite, pyrite.

*Cal uranium mine* - coffinite, carnotite, doloresite, montroseite, paramontroseite, uraninite, vanadium hy-

dromica.

*Homestake mine* - coffinite, doloresite, montroseite, paramontroseite, uraninite, vanadium hydromica.

*La Sal mine* - coffinite, doloresite, montroseite, uraninite, vanadium hydromica.

*Mi Vida (Utex) mine* - bayleyite, carnotite, cerussite, chalcocite, clausthalite, coffinite, doloresite, fluorite, galena, greenochite, liebigite, montroseite, paramontroseite, pascoite, pitchblende, sphalerite, tyuyamunite, uraninite, vanadium hydromica, vanoxite.

*Radon mine* - carnotite, celestite, coffinite, doloresite, montroseite, tyuyamunite, uraninite, vanadium hydromica, whewellite.

*Rattlesnake mine* - carnotite, coffinite, doloresite, montroseite, uraninite, vanadium hydromica.

BLUFF - placer gold in sands of San Juan River.

BLUE JAY MINE - boltwoodite.

BLUE MOUNTAIN DISTRICT (See MONTICELLO DISTRICT).

BROWNS HOLE AREA - carnotite.

BULL CANYON - carnotite.

“C” GROUP CLAIMS - rutherfordine.

CANE SPRINGS PASS.

*Bridger Jack Flat* - carnotite.

CANE WASH.

*Atomic King no. 2 mine* - andersonite.

CHESS RIDGE - carnotite.

CHINLE WASH - pyrope.

COLORADO RIVER - chromite, gold in placers.

*San Juan River Junction to Lees Ferry* - placer gold.

COMB RIDGE (near) - pyrope in volcanic vents.

COTTONWOOD CANYON DISTRICT.

*Basin, Big Hole, Birthday Shale, Blue Bird, East Bank, Found no. 2, Hangover nos. 1-2, Lost, Ridge nos. 1-2 claims* - carnotite.

DRY VALLEY - carnotite.

EAST CANYON - carnotite, tyuyamunite.

ELK RIDGE - andersonite, Bieberite, chalcantite, chalcocite, donkeyite, tyuyamunite, uranothallite.

*Avalanche no. 13 (Ransome) mine* - coffinite, erythrite, uraninite.

*Coral claim* - bayleyite, carnotite, swartzite.

*Horseshoe no. 1 mine* - coffinite, uraninite.

*King Edward mine* - chalcopyrite, coffinite, erythrite, ilsemannite, pyrite, siderite, uraninite.

*King James - Virgene mine* - ilsemannite, tennantite, uraninite, zippeite.

*Notch nos. 1 and 4 mines* - cuprosklodowskite, ilsemannite, jarosite, marcasite, meta-autunite, uraninite.

*Notch nos. 5 and 6 mines* - chalcopyrite, corvusite, galena, malachite, metzzeunerite, schroekingite, volbrothite.

*Oakie mine* - azurite, chalcopyrite, coffinite, malachite, uraninite.

*Payday mine* - bornite, chalcopyrite, galena, uraninite.

*Sandy no. 2 mine* uraninite.

*Sandy no. 3 mine* - allophane, alunite, chalcopyrite, metazeunerite, uraninite, uranophane.

*Western Payday mine* - coffinite, uraninite.

*Woodenshoe no. 3 mine* - azurite, malachite, uraninite.

GOLDEN QUEEN MINE - gold.

GYPSUM CREEK - anhydrite, gypsum.

INDIAN CREEK - carnotite.

JULIA CLAIMS - boltwoodite.

LA SAL MOUNTAINS - amethyst, azurite, bornite, carnotite, chalcocite, chrysocolla, covellite, limonite, malachite, manganite, molybdenite, torbernite.

*Middle Mountain, Brumley Ridge* - aegirite, apatite, augite, magnetite, noselite, orthoclase, sodalite, sphene.

*Point Lookout Placer* - gold.

LA SAL QUADRANGLE

*Angle mine* - carnotite, roscoelite, tyuyamunite.

*Black Hat mine* - coffinite, corvusite, melanovanadate, montroseite, pitchblende, pyrite, roscoelite.

*Brushy Basin no. 1 mine* - carnotite, tyuyamunite.  
*Brushy Basin no. 3 mine* - carnotite, schroekingite, tyuyamunite.

*Confusion mine* - carnotite, roscoelite, tyuyamunite.

*Elray mine* - carnotite, tyuyamunite.

*Evening Star mine* - carnotite, corvusite, hewettite, simplotite, tyuyamunite.

*Firefly-Pigmy mine* - carnotite, clausthalite, coffinite, corvusite, galena, montroseite, pyrite, roscoelite, tennantite, tyuyamunite, uraninite.

*Grey Dawn mine* - (see PARADOX VALLEY DISTRICT).

*Hesperus mine* - carnotite, corvusite, roscoelite, schroekingerite, tyuyamunite.

*Jackpot mine* - azurite, carnotite, malachite, tyuyamunite.

*Little Dawn mine* - carnotite, metatyuyamunite, roscoelite.

*Little Peter mine* - carnotite, corvusite, montroseite, pascoite, roscoelite, tyuyamunite, uraninite.

*Lucky no. 1 mine* - carnotite, roscoelite, tyuyamunite.

*Marjorie Ann mine* - carnotite, roscoelite, tyuyamunite.

*Maud mine* - carnotite, roscoelite, tyuyamunite.

*Morning Star mine* - carnotite, roscoelite, tyuyamunite.

*New Yellow Spot mine* - carnotite, roscoelite, tyuyamunite.

*Sumner mine* - carnotite, metatyuyamunite, roscoelite.

*Too High mine* - carnotite, metatyuyamunite, roscoelite.

*Uranium Girl mine* - carnotite, roscoelite, tyuyamunite.

*Valley View mine* - carnotite, corvusite, metatyuyamunite, montroseite, roscoelite.

*Vanadium Queen mine* - (See PARADOX VALLEY DISTRICT).

*Vista Grande mine* - carnotite, roscoelite, tyuyamunite.

*Wedge mine* - carnotite, metatyuyamunite, roscoelite.

*Yellow Bird mine* - carnotite, corvusite, montroseite, pitchblende, roscoelite, tyuyamunite.

*Yip Yip mine* - carnotite, roscoelite, tyuyamunite.

LISBON VALLEY - tyuyamunite.

*Climax nos. 1-2 claims* - azurite, carnotite, cuprite, malachite.

*Lisbon Coppermine* - azurite, cuprite, malachite.

MOAB VALLEY - anhydrite, carnallite, gypsum, halite, polyhalite, sylvite.

MONTEZUMA CANYON - carnotite.

*Bradford no. 5 mine* - carnotite.

*Cottonwood mine* - carnotite.

*Dixie no. 1 mine* - carnotite, roscoelite.

*Last Chance no. 1 mine* - carnotite.

*Lucky Boy mine* - carnotite, roscoelite.

*Rim Rock mine* - carnotite.

*Rock mine* - carnotite, roscoelite.

*Slum mine* - carnotite.

*Strawberry mine* - carnotite, roscoelite.

*Titus no. 3 mine* - carnotite.

*Verdure mine* - carnotite, roscoelite.

*West Cliff House no. 8 mine* - carnotite, pascoite, roscoelite.

MONTICELLO (BLUE MOUNTAIN) DISTRICT (Abajo Mountains) - anhydrite, carnotite, gypsum.

*Alma mine* - pyrite.

*Blue Bird, Danish Girl, Gold Queen mines* - chalcopryrite, galena, gold, pyrite, sphalerite.

*Brushy Basin, Spring Creek* - metarossite.

*Copper Queen mine* - azurite, bornite, chalcocite, chalcopryrite, chrysocolla, covellite, malachite, pyrite.

*Dream mine* - chalcopryrite, galena, gold, limonite, pyrite, sphalerite.

*Duckett mine* - calcite, gold, limonite, pyrite.

*Harts Draw, Lakes claim, Robertson Pasture, Shay Mountain, Shay Road, Sunshine mining claim properties* - metatyuyamunite.

*Log Cabin claim* - gold.

*Tuffy Copper mine* - azurite, chalcocite, malachite, pyrolusite.

MONUMENT VALLEY (MONUMENTAL DISTRICT (Monument Valley).

*Holiday Mesa* - uraninite.

*Mitten no. 1 mine* - corvusite, navajoite, tyuyamunite, uraninite.

*Oljeta mine* - autunite, azurite, malachite, tyuyamunite, uraninite, uranophane.

*Skyline mine* - autunite, azurite, malachite, metatorbernite, torbernite, tyuyamunite, uraninite, uranophane.

*Whirlwind mine* - azurite, chalcocite, calciovolborthite, malachite, tyuyamunite, uranophane.

MONUMENTAL DISTRICT (See MONUMENT VALLEY DISTRICT).

MORRISON FORMATION - volkonskoite.

MOSES ROCK - chlorite, corundum, grossularite garnet, kornerupine, pyrope garnet, rutile, spinel in dike rock.

MULE EAR - pyrope in alluvium.

NAVAJO RESERVATION - carnotite, pyrope.

PARADOX BASIN - anhydrite, gypsum.

PARADOX VALLEY DISTRICT (Paradox Valley) - carnallite, kieserite, sylvite.

*Grey Dawn mine* - azurite, beta-uranophane, beta-uranotil, carnotite, chalcocite, chalcopryrite, coffinite, corvusite, covellite, eucairite, galena, gummite, hewet-

tite, malachite, melanovanadate, meta-hewettite, meta-torbernite, metatyuyamunite, montroseite, novacekite, phosphuranylite, pitchblende, pyrite, roscoelite, saleite, sphalerite, torbernite, uraninite, uranophane, uranospathite.

*Vanadium Queen mine* - carnotite, coffinite, corvusite, hewettite, melanovanadate, montroseite, nolanite, paramontroseite, pitchblende, pyrite, roscoelite, selenium, simplotite, tyuyamunite, uraninite.

PETE NO. 6 CLAIM - boltwoodite.

PINTADO CANYON - pintadoite.

RED CANYON DISTRICT (Red Canyon) carnotite, chalcocite, covellite, malachite.

*Frey no. 4 mine* - becquerelite, cuprosklodowskite, johannite, jordisite, ilsemannite, schoepite, uraninite.

*Jerry group* - boltwoodite.

*Markey no. 3 mine* - alunite, chalcalthite, chalcopyrite, metatorbernite, metazeunerite, pyrite, torbernite, uraninite.

*Posey mine* - becquerelite, brochanite, cuprosklodowskite, johannite, phosphuranylite, pitchblende, schoepite, torbernite, uraninite, uranophane, zippeite.

SAN JUAN RIVER - anhydrite, chalcopyrite, copper, gold, gypsum, malachite.

*Montezuma Canyon west to Colorado River* - placer gold.

SPANISH VALLEY ANTICLINE - carnotite.

WHITE CANYON DISTRICT (White Canyon).

*Bell mine* - azurite, malachite, uranophane.

*Blue Lizard mine* - bornite, chalcopyrite, covellite, pyrite, uraninite.

*Four Aces mine* - azurite, carnotite, malachite.

*Fry no. 4 mine* - azurite, chalcalthite, chalcopyrite, jarosite, malachite, pickeringite, pyrite, uraninite.

*Gonaway-North Point claims* - phosphuranylite.

*Happy Jack mine* - allophane, antlerite, azurite, barite, becquerelite, bieberite, bornite, boltwoodite, brochantite, carnotite, chalcalthite, chalcedony, chalcocite, chalcopyrite, covellite, erythrite, galena, gersdorffite, goethite, greenochite, gypsum, hematite, hydromica, ilsemannite, jarosite, johannite, magnetite, malachite, marcasite, metatorbernite, metazeunerite, microcline, phosphuranylite, pitchblende, psilomelane, pyrite, quartz, sabugalite, schoepite, sepiolite, siderotil, smaltite, sphalerite, sulfur, torbernite, tourmaline, uraninite, uranopilite, uranophane, zippeite.

*Hideout mine* (Deer Flats) - azurite, bayleyite, becquerelite, bornite, brochantite, carnotite, chalcocite, chalcopyrite, covellite, johannite, malachite, phosphuranylite, pitchblende, schoepite, schroekingite, torbernite, uraninite, uranophane, zippeite.

*Jomac mine* - azurite, chalcalthite, chalcocite, chalcopyrite, coconinoite, hematite, jarosite, malachite, metazeunerite, pyrite.

*Notch mine* - uraninite.

*Posey mine* - antlerite, azurite, becquerelite, brochantite, chalcocite, cuprosklodowskite, malachite, meta-autunite, metatorbernite, phosphuranylite.

*White Canyon no. 1 mine* - bornite, carnotite, chalcopyrite, copper, covellite, marcasite, metatorbernite, pyrite, uraninite, uranophane, voglite.

*White Fawn, Yellow Circle claims* - carnotite.

*W.N. mine* (Deer Flats) - alunite, boothite, bornite, chalcalthite, chalcocite, chalcopyrite, covellite, metatorbernite, metazeunerite, pyrite, torbernite, uraninite, zippeite.

## SANPETE COUNTY

DRY CANYON (N. of) - galena, marcasite, pyrite, sphalerite, strontianite.

EPHRAIM (near) - limonite pseudomorphs after pyrite.

FAIRVIEW (near) - beidellite.

GUNNISON (S.E.) - anhydrite, gypsum, halite.

MANTI (near) - epsomite.

MAYFIELD (S.W.) - anhydrite, gypsum.

MT. PLEASANT (8 mi. N.W.) - jasper, pyrolusite.

R.A.J. PROSPECT - autunite, torbernite.

TWELVE MILE CANYON - anhydrite, gypsum, halite.

## SEVIER COUNTY

AURORA - bentonite, fuller's earth.

FISH LAKE - opal.

GLENWOOD (N.E.) - anhydrite, chalcedony geodes, gypsum, halite, selenite.

HENRY DISTRICT (Antelope Range).

*Georgia, Jumbo, Yellow Hornet properties* - pyrolusite.

*Iron Peaks property* - hematite, limonite, magnetite, pyrolusite, thorium mineralization.

*Krotke Iron (Iron Cap) mine* - hematite, limonite, pyrolusite, thorium mineralization.

*LaVeta Prospect* - fluorite, meta-autunite, metatorbernite, rauvite, tyuyamunite.

*Noonday claims* - pyrolusite.

*Trinity prospect (Monzonite Hill)* apatite, albite, antigorite, andradite, calcite, chalcantinite, chalcopyrite, chalcedony, diopside, epidote, grossularite, gypsum, galena, hematite, illite, kaolinite, microcline, muscovite, montmorillonite, magnetite, orthoclase, phlogophite, pyrolusite, penninite, prochlorite, quartz, rutile, serpentine, scapolite, specularite, tremolite, wollastonite.

MONROE CANYON - brockite, jarosite, monazite, thorite in vein.

PINE CANYON (S. of Koosharem).

*Black Hawk claims* - corundum, variety sapphire, hercynite.

REDMOND - bentonite, halite.

ROCK CANDY MOUNTAIN - alunite, illite, jarosite, limonite, montmorillonite, pyrite, selenite.

SALINA CREEK DISTRICT (Salina Creek).

*Ball mine* - azurite, chalcocite, chalcopyrite, galena, malachite, sphalerite.

*Lead Hill mine* - azurite, celestite, cerussite, chalcocite, galena, malachite, pyrite, sphalerite.

SEVIER CANYON - azurite, copalite, malachite.

SEVIER PLATEAU.

*Black Beauty claims (Forshea Mountain)* - pyrolusite, wad.

SIGURD - anhydrite, gypsum, halite, selenite.

SUMMIT COUNTY

BEAVER CANYON - psilomelane, pyrolusite.

BONANZA FLAT - grossularite.

COALVILLE (near) - manganite, psilomelane, pyrolusite, sulfur.

FRANSON CANYON - phosphorite.

MARBLE (SILVER CREEK) DISTRICT - galena, py-

rite.

PARK CITY (UINTA) DISTRICT (Wasatch Mountains) - barite, calcite, chabazite, chalcantinite, chlorite, epidote, goslarite, magnetite, massicot, mimetite, phosphorite, spinel, thaumasite.

*American Flag mine* - galena, tetrahedrite.

*California mine* - galena, jamesonite, pyrite, sphalerite.

*Comstock mine* - anglesite, cerussite, galena, malachite, pyrite, sphalerite.

*Creole mine* - cerussite, galena.

*Daly mine* - anglesite, azurite, bornite, cerargyrite, cerussite, chalcocite, chalcopyrite, chrysocolla, galena, malachite, montmorillonite, pyrite, pyrolusite, rhodochrosite, rhodonite, serpentine, sphalerite, tetrahedrite.

*Daly-Judge mine* - alisonite, azurite, balydonite, bournonite, chrysocolla, cuprite, gold, malachite, pyrite, quartz, sericite, sphalerite, tetrahedrite.

*Daly West mine* - argentite, azurite, bournonite, galena, malachite, quartz, pyrite, sphalerite, tetrahedrite, zinkenite.

*J.A.C. Tunnel* - chalcopyrite, pyrite.

*Jupiter mine* - azurite, cerussite, galena, malachite, garnet, quartz, specularite.

*Kearns-Keith mine* - chalcopyrite, galena, pyrite, quartz, sphalerite.

*Little Bell mine* - anglesite, cerussite, chrysocolla, cuprite, galena.

*Mayflower mine* - chalcocite, chalcopyrite, enargite, galena, gold, hematite, pyrite, sphalerite, tetrahedrite.

*Nail Driver mine* - anglesite, cerussite, galena, limonite, malachite, pyrolusite.

*New York mine* - azurite, cerussite, galena, gold, pyrite.

*Ontario mine* - anglesite, azurite, bornite, cerargyrite, cerussite, chalcocite, chalcopyrite, chrysocolla, galena, malachite, montmorillonite, pyrite, pyrolusite, rhodochrosite, rhodonite, serpentine, sphalerite, tetrahedrite.

*Ontario Tunnel* - magnesioferrite.

*Park - Bingham Tunnel* - halloysite.

*Park City Consolidated mine* - boulangerite, calaverite, covellite, manganodolomite, pyrargyrite.

*Quincy mine* - hemimorphite.

*Scottish Chief mine* - anglesite, cerargyrite, cerussite, chalcopyrite, chrysocolla, galena, malachite, silver, pyromorphite.

*Silver King (Coalition), Woodside mines* - anglesite, azurite, bindheimite, bournonite, brochantite, cerussite, chalcopyrite, chrysocolla, fluorite, galena, geochronite, gold, limonite, linarite, malachite, metastibnite, olivenite, pyrite, pyrolusite, quartz, sericite, sphalerite, stibnite, tetrahedrite.

*Silver King Consolidated mine* - azurite, galena, malachite, quartz, sericite, tetrahedrite, wulfenite.



*Wabash property* - chalcopyrite, gypsum, pyrite.

SILVER CREEK DISTRICT (See MARBLE DISTRICT)

UINTA DISTRICT (See PARK CITY DISTRICT).

## TOOELE COUNTY

AMATRICE HILL - chalcedony, crandallite, jasper, millisite, variscite, wardite.

BINGHAM (WEST MOUNTAIN) DISTRICT (Oquirrh Mountains). (See also under Salt Lake County).

*Carr Fork mine* - bornite, chalcopyrite, galena, garnet, hematite, magnetite, molybdenite, pyrite, pyrrhotite, sphalerite.

*May Flower mine* - boulangerite, galena, pyrite, sphalerite.

BLACK CROOK DISTRICT (See ERICKSON DISTRICT).

BLUE BELL DISTRICT (Sheeprock Mountains).

*Bennion Canyon mine* - galena, pyrite, quartz, sphalerite.

*Black Hawk mine* - cerussite, galena, silver.

*Bogan mine* - bismuthinite, galena, hematite, limonite, pyrolusite.

*Hidden Splendor mine* - galena.

*Little Valley mine* - pyrite.

*Morgan mine* - barite, cerussite, galena, pyrite, pyrolusite.

*The Iron mine* - halloysite, hematite, jasper, limonite.

BOULTER DISTRICT (See NORTH TINTIC DISTRICT).

CALEDONIA DISTRICT (See NORTH TINTIC DISTRICT).

CAMP FLOYD DISTRICT (See MERCUR DISTRICT).

CEDAR MOUNTAINS - calcite (onyx marble).

CLIFTON DISTRICT (See GOLD HILL DISTRICT).

COLUMBIA DISTRICT (N.E. Sheeprock Mountains).

*Benmore, Sharp mines* - cerussite, fluorite, galena, limonite, pyrite, pyrolusite, quartz, sphalerite, silver, wad.

*Iron Hope prospect* - quartz, specularite.

*Iron King mine* - specular hematite.

*Sultana mine* - galena, gold, limonite, pyrite, quartz, silver.

DEEP CREEK MOUNTAINS - agate, andalusite, cerussite, chalcedony, galena.

*Bonanza mine* - arsenopyrite, scorodite.

*Complex prospect* - azurite, malachite, scheelite.

*Congar Hill mine* - cinnabar, metacinnabar, pyrite, sphalerite, stibiconite, senarmontite, valentinite, stibnite.

*Cyclone and Leap Year mine* - aikenite, arsenopyrite, galena, chalcopyrite, chalcantite, sphalerite.

*Devils Pit, Oro del Rey, and Eagles Nest mines* - azurite, chalcocite, chalcopyrite, galena, gold, specularite, sphalerite, malacite, plumbojarosite.

*Dewey mine* - azurite, jarosite, malachite, pyrolusite, tetrahedrite.

*Fortuna prospect* - conicalcrite, malachite, pyrolusite.

*Iron Blossom prospect* - hematite, limonite.

*Laura prospect* - azurite, chalcopyrite, malachite.

*Midas mine* - arsenopyrite, chalcopyrite, garnet, pyrite, spadaite, vesuvianite.

*Midland mine* - arsenopyrite, galena, gold, jarosite, plumbojarosite.

*Monocco mine* - azurite, chalcopyrite, chrysocolla, galena, malachite, plumbojarosite.

*Monte del Rey mine* - arsenopyrite, chalcopyrite, galena.

*North Pass prospects* galena, jarosite, malachite, siderite, tetrahedrite.

*Overland and Gold Star prospects* - azurite, galena, malachite, sphalerite.

*Probert mine* - barite, cinnabar, conicalcrite, malachite, scheelite, stibnite.

*Prosperity prospect* - azurite, malachite, tenorite.

*Silver Queen prospect* - azurite, galena, jarosite, malachite, pyrite.

*Willow Springs prospects* - galena, tetrahedrite.

DEEP CREEK VALLEY - natron.

DUGWAY DISTRICT (Dugway Range) agate, amethyst, apatite, beryl, bixbyite, chalcedony, garnet, rosasite, topaz.

*Belcher claim* - azurite, chrysocolla, malachite, melaconite, tenorite.

*Bertha claim* - cerussite, chalcantite, chalcocite, chalcopyrite, chlorite, covellite, galena, gypsum, hematite, hydromica, hemimorphite, limonite, pyrite, smithsonite, sphalerite, tennantite, tetrahedrite.

*Black Dragon claim* - chrysocolla, cuprite, hematite, limonite, malachite.

*Black Maria claim* - azurite, chrysocolla, fluorite, malachite.

*Boston claim* - cerussite, siderite, wulfenite.

*Bryan claim* - anglesite, calcite, cerussite, chlorite, chrysocolla, fluorite, galena, hematite, hemimorphite,

hydrozincite, limonite, smithsonite, sphalerite.

*Buckhorn mine* - barite, cerargyrite, cerussite, copper, cuprite, fluorite, galena, magnetite, prosopite, silver, sphalerite, sulfenite.

*Bullion Canyon* (head) - aragonite, barite, galena, hemimorphite, pyrite, siderite, wulfenite.

*Confidence property* - azurite, barite, calcite, cerussite, chrysocolla, fluorite, hematite, jarosite, limonite, malachite.

*Eureka claim* - fluorite.

*Four Metals mines* - barite, cerargyrite, cerussite, chalcantite, chlorite, copper, cuprite, fluorite, galena, gold, gypsum, hematite, hydrozincite, jarosite, limonite, pyrite, silver, smithsonite, sphalerite, wulfenite.

*Francis property* - barite, cerussite, galena, smithsonite, sphalerite.

*Golconda property* - fluorite.

*Great Eastern, Nautilus, Pride of the West claims* - barite, covellite, fluorite, siderite.

*Juno claim* - barite, smithsonite.

*Kellys Hole* - azurite, barite, calcite, cerussite, chalcantite, chalcopryrite, chrysocolla, cuprite, fluorite, galena, gypsum, hematite, jarosite, limonite, malachite, melaconite, pyrite, sphalerite, tenorite.

*Lauris claim* - barite, cerussite, fluorite, galena, hematite, limonite.

*Metal States (Cannon) mine* - azurite, chalcantite, chrysocolla, gypsum, limonite, malachite, melaconite, pyrite, tenorite.

*Morrell shaft* - hydrozincite.

*New Park claim* - chalcopryrite.

*Rainbow claim* - fluorite.

*Rattler property* - fluorite, quartz.

*Raymond-Bald Eagle property* - azurite, cerussite, galena, hematite, hemimorphite, limonite, malachite, smithsonite.

*Surplus Claim* - chalcopryrite, gypsum, melaconite, pyrite, sphalerite, tenorite.

*Yellow Jacket property* - cerussite, limonite.

**DUTCH MOUNTAIN** - augite, azurite, cerussite, fluorite, galena, malachite.

**EAST ERICKSON DISTRICT** (S. W. Sheeprock Mountains).

*Copper Jack mine* - chalcopryrite, chrysocolla, fluorite, limonite, malachite, pyrolusite, pyrite, turquoise.

*Dutch Peak (Park-Utah) mine* - galena, pyrite.

*Ekker Canyon prospect* - biotite, quartz, wolframite.

*Flying Dutchman mine* - chalcopryrite, fluorite, pyrite, uraninite.

*Green's Ridge* - chlorite, limonite, magnetite, pyrite, scheelite.

*Hard-to-beat-canyon* - beryl, chalcopryrite, fluorite, pyrite, topaz, samarskite, uraninite.

*Indianapolis mine* - galena, gold, pyrite, quartz, sphalerite, specularite.

*Jessel Bezzel mine* - azurite, chrysocolla, malachite, turquoise.

*Sheeprock Canyon* - beryl, chalcopryrite, fluorite, pyrite, scheelite, samarskite, uraninite.

*Silver King mine* - biotite, chalcopryrite, fluorite, pyrite, pyrolusite, quartz, samarskite, specularite, uraninite.

*Silver Shield (Flying Dutchman) mine* - chalcopryrite, chrysocolla, fluorite, limonite, malachite, pyrite, pyrolusite, turquoise.

*South Pine Canyon* - biotite, huebnerite, magnetite, monazite.

*Tintic-Delaware (Free Coinage) mine* - galena, hematite, pyrite, specularite, sphalerite.

**ERICKSON (BLACK CROOK) DISTRICT** (Simpson Mountains).

*Black Jack, Black Rock, Blain, Deer Trail (Black Cap), Indian Boy, May Farmer mines* - cerussite, fluorite, galena, pyrite, pyrolusite, sphalerite.

*Good Hope mine* - cerussite, fluorite, galena.

*Happy Jack mine* - cerussite.

*Highland Lassie no. 1 mine* - chalcopryrite, chrysocolla, limonite, malachite.

*Huber-Rydalch mine* - manganite, pyrolusite, psilomelane, wad.

*Indian Chief mine* - cerussite, galena.

*Last Hope no. 3 mine* - chalcopryrite, galena.

*OK mine* - cerargyrite, tetrahedrite.

*Queen Mary claims* - pyrolusite, wad.

*Silver Reef mine* - cerargyrite, chalcopryrite, limonite, pyrite, tetrahedrite.

*Utonia claim* - galena, pyrite, rhodonite, rhodochrosite, sphalerite.

**FAIRFIELD QUADRANGLE** - tridymite in volcanic rocks.

**FREE COINAGE DISTRICT** (Stansbury Mountains) - cerussite, galena, gold, pyrite.

**GOLD HILL (CLIFTON) DISTRICT** (Deep Creek Mountains) - agate, allanite, axinite, dolomite, erubescite, enstatite, ferrimolybdate, indium mineralization, huebnerite, scandium mineralization, rutile.

*Alvarado mine* - bornite, calcite, chalcantite, chalcodony, chalcocite, chalcopryrite, diopside, galena, garnet, gold, graphite, jarosite, limonite, magnetite, malachite, oligoclase, opal, pyrite, siderite, siderite, spadaite, vesuvianite, wollastonite, zoisite.

*B. Estell mine* - scheelite.

*Bonanza mine* - arsenopyrite, cerussite, galena, scorodite, sphalerite.

*Bonnemort claim* - calcite, chalcocite, chalcopyrite, diopside, wollastonite, zoisite.

*Boston mine* - arsenopyrite, cerussite, limonite, plumbojarosite, scorodite.

*Cane Springs mine* - andalusite, bornite, chalcocite, chalcopyrite, covellite, diopside, garnet, molybdenite, pyrite, sepiolite, spadaite, vesuvianite, wollastonite, zoisite.

*Calaveras mine* - amphibole, azurite, chalcedony, chalcopyrite, chrysocolla, garnet, humite, malachite, pyrite, specularite, tourmaline.

*Cash Boy mine* - anglesite, arsenopyrite, cerussite, galena, pyrite, sphalerite, wulfenite.

*Centennial and Enterprise mines* - amphibole, apatite, chalcocite, chalcopyrite, diopside, jefferisite, magnetite, malachite, scheelite, tourmaline.

*Christmas Mining Company mine* - barite, galena, tetrahedrite.

*Climax mine* - arsenopyrite, galena, pyrite, sphalerite.

*Copper Bloom mine* - apatite, azurite, bismuth, bismuthinite, bismutite, beidellite, chalcedony, chalcocite, chalcopyrite, copper pitch, covellite, cuprotungstite, gold, jarosite, malachite, pyrite, scheelite, tetrahedrite, tourmaline.

*Copper Hill mine* - azurite, malachite.

*Copperopolis mine* - azurite, bornite, chalcocite, chalcopyrite, diopside, garnet, malachite, scheelite.

*Copper Queen-Midland Mining Company mine* - arsenopyrite, azurite, chalcopyrite, galena, jarosite, malachite, plumbojarosite, pyrite, siderite, sphalerite.

*Cyclone mine* - aikinite, arsenopyrite, chalcantite, chalcopyrite, galena, jarosite, plumbojarosite, pyrite, wulfenite.

*Doctor mine* - apatite, bismuth, bornite, chalcopyrite, epidote, garnet, magnetite, malachite, pyrite, scapolite, scheelite, tourmaline.

*E.H.B. mine* - scheelite.

*Enterprise mine* - scheelite.

*Evans claim* - tetrahedrite.

*Fraction Lode mine* - epidote, garnet, quartz, scheelite.

*Frankie mine* - bornite, chalcopyrite, chrysocolla, clinozoisite, conicalcrite, copper pitch, diopside, epidote, garnet, humite, malachite, pyrite, scheelite, titanite, tourmaline, wollastonite.

*Garrison Monster mine* - barite, calamine, cerussite, galena, malachite, plumbojarosite, smithsonite.

*Gold Belt claim* - galena.

*Gold Bond mine* - biotite, chrysocolla, copper pitch, danburite, diopside, epidote, fluorite, hematite, mala-

chite, quartz, scapolite, specularite, sphalerite, tourmaline.

*Gold Hill (U.S.) mine* - adamite, aikinite, anglesite, arsenopyrite, austinite, azurite, beudantite, carminite, cerussite, chalcocite, chalcopyrite, chenevixite, chlorite, chrysocolla, clinoclase, conicalcrite, cornwallite, cuproadamite, ferrisymplectite, galena, gypsum, jamesonite, jarosite, malachite, mimetite, nontronite, olivenite, opal, pyrite, pyrrhotite, scorodite, siderite, sphalerite, stibnite, tennantite, tyrolite, wollastonite.

*Gold Hill (Western Utah) mine* - adamite, arsenosiderite, beaudanite, conicalcrite, natrojarosite, pharmacosiderite.

*Gold Hill Standard mine* - anglesite, arsenopyrite, galena, plumbojarosite, scorodite, wulfenite.

*Kena claim* - cuprotungstite, wulframite.

*Lucy L mine* - bismuth, bismuthinite, bismutite, calaverite, chalcopyrite, copper pitch, epidote, garnet, gold, malachite, scheelite, tremolite.

*Ida Lull mine* - azurite, bornite, chalcopyrite, covellite, diopside, garnet, malachite, scheelite.

*Mascot mine* - arsenopyrite, cerussite, scheelite, scorodite.

*Midas mine* - bornite, gold, siderite, vesuvianite.

*Midland prospect* - siderite.

*Minnehaha mine* - arsenopyrite, azurite, chrysocolla, malachite.

*Monoco mine* - anglesite, azurite, cerussite, copper pitch, chrysocolla, galena, malachite, opal, plumbojarosite.

*Monte Del Rey mine* - arsenopyrite, cerussite, scorodite.

*Napoleon mine* - chrysocolla, malachite.

*New Baltimore mine* - anglesite, arsenopyrite, azurite, cerussite, descolizite, galena, malachite, mimetite, plumbojarosite, pyrite.

*Ozark mine* - arsenopyrite, azurite, malachite, scorodite.

*Pole Star Copper Company mine* - azurite, chalcedony, conicalcrite, cuprite, cuprotungstite, ferberite, malachite, olivenite, pyrite, scheelite, tetrahedrite, tourmaline, wolframite.

*Rea mine* - azurite, calcite, malachite, tetrahedrite.

*Reaper mine* - actionolite, albite, amphibole, anatase, anorthoclase, barite, biotite, chalcopyrite, covellite, epidote, gold, galena, hematite, hornblende, ilmenite, kaolinite, leucoxene, molybdenite, serpentine, tetrahedrite, tourmaline, zircon.

*Red Jacket mine* - anglesite, cerussite, galena, mimetite, plumbojarosite, pyrite, wulfenite.

*Rodenhous Wash* - adularia, bertrandite, quartz.

*Rube mine* - anglesite, boulangierite, calcite, chalcopyrite, cerussite, chlorite, galena, gold, jarosite, molybdenite, plumbojarosite, pyromorphite, sphalerite, scapolite, spadaite, talc, zoisite.

*Shay claim* - plumbojarosite, wulfenite.

*Silver and Gold Mining Company mine* - arsenopyrite, cerussite, galena, limonite, pyrite, scorodite, sphalerite.

*Silver King mine* - anglesite, azurite, cerussite, chalcocite, chrysocolla, malachite, plumbojarosite, wollastonite.

*Spotted Fawn mine* - anglesite, cerussite, galena.

*Star Dust mine* - quartz, scheelite.

*Success mine* - arsenopyrite, galena, jarosite, plumbojarosite, pyrite, quartz, sphalerite, tennantite.

*Unadine mine* - arsenopyrite, azurite, chrysocolla, limonite, magnetite, malachite, nontronite, opal, scorodite, spinel, tetrahedrite.

*U. S. mine* - arsenopyrite, aikinite, cerussite, chalcopyrite, cobaltite, jamesonite, jarosite, monimolite, pyrite, pyrrhotite, sphalerite, scorodite, stibnite.

*Victory no. 1 mine* - apatite, azurite, chalcocite, chalcopyrite, chrysocolla, malachite, pyrite, quartz, tetrahedrite, tourmaline.

*Wilson Consolidated mine* - bismuth, bismite, bismuthinite, bismutite, orthoclase, scheelite, stolzite.

*Yellow Hammer mine* - actinolite, albite, apatite, azurite, chalcopyrite, copperpitch, gold, malachite, molybdenite, muscovite, orthoclase, powellite, scheelite, tourmaline.

#### GRANITE MOUNTAIN DISTRICT (Granite Mountain)

- albite, apatite, beryl, garnet, kaolinite, microcline, muscovite, orthoclase, plagioclase, samarskite, tourmaline, zircon.

*Blue Bell mine* - azurite, beryl, chalcopyrite, fluorite, galena, garnet, malchite, samarskite, tourmaline.

*Cannon Tank Canyon mine* - azurite, chalcopyrite, fluorite, galena, malachite.

*Desert, El Dorado, Mountain Queen mines* - azurite, chalcopyrite, fluorite, galena, gold, hematite, limonite, malachite, pyrite, quartz.

#### GRANTSVILLE (THIRD TERM) DISTRICT (Stansbury Mountains)

- cerussite, chalcopyrite, galena, malachite, pyrite.

*Timpie Valley, Ruby Crystal mine* - cinnabar, metacinnabar.

GREAT SALT LAKE (shores) - aragonite, bloedite, blauberite, gypsum, halite, mirabilite, thenardite.

GREAT SALT FLATS - halite, sylvite.

GREELEY DISTRICT (Topliff Hill) - cerussite, malachite, pyrite.

IBAPAH MOUNTAINS - barite, beryl (aquamarine variety), cinnabar.

JOHNSON PASS - calcite (onyx), galena.

KNOLLS - gypsite.

LAKESIDE DISTRICT (Lakeside Mountains) - anglesite, cerargyrite, cerussite, galena.

MERCUR (CAMP FLOYD) DISTRICT (Oquirrh Mountains) - aragonite, barite, lorandite, pharmacosiderite, psilomelane, quartz, rutile, scorodite, sulvanite, talc, tourmaline.

*Brickyard mine* - melanterite, orpiment, realgar, sulfur.

*Consolidated Mercur, Daisy (Normal),*

*La Cigale mines* - gold, jasper.

*Geyser - Marion mine* - arsenopyrite, calcite, cerargyrite, gold, jasper.

*Golden Gate mine* - arsenopyrite, calcite, cinnabar, gold, orpiment, realgar, stibnite, tellurium mineralization variscite.

*Hillside mine* - cinnabar, orpiment, sulfur.

*Mercur mine* - calcite, cinnabar, orpiment, realgar, selenite, variscite, zircon.

*Mineral Hill mine* - azurite, cerussite, chalcopyrite, galena, limonite, malachite, pyrite.

*Sacramento mine* - cinnabar, gold, jasper, orpiment, realgar, sulfur.

*Sparrowhawk mine* - cinnabar, jarosite, stibnite, variscite.

*Sunshine mine* - cinnabar, orpiment, sulfur.

NORTH TINTIC (BOULTER, CALEDONA, OASIS) DISTRICT (Boulter Mountains) (See also under Juab and Utah Counties).

*New Bullion mine* - anglesite, cerussite, galena, hemimorphite, pyrite, smithsonite, sphalerite.

*Scranton mines* - anglesite, aurichalcite, cerussite, galena, hemimorphite, hydrozincite, pyrite, pyromorphite, quartz, smithsonite, sphalerite.

OASIS DISTRICT (See NORTH TINTIC DISTRICT).

OPHIR DISTRICT (Oquirrh Mountains).

DRY CANYON AREA - apatite, barite, brochantite, calcite, chalcotrichite, chrysocolla, gold, quartz.

*Brooklyn mine* - azurite, cerussite, malachite, silver, smithsonite.

*Deseret mine* - paligorskite.

*Kearsarge mine* - aurichalcite, azurite, covellite, chalcopyrite, galena, hesite, jarosite, limonite, malachite, plumbojarosite, smithsonite.

*Mono mine* - azurite, cerargyrite, cerussite, chalcopyrite, copper, galena, jarosite, limonite, malachite, pyrite, sil-

ver, sphalerite, stephanite.

*Queen of the Hills mine* - azurite, cerussite, galena, limonite, malachite, tetrahedrite.

*Surprise mine* - argentite, chalcopyrite, galena, gold.

#### FOOTHILL AREA

*Lakes of Killarney mine* - cerargyrite, jasper, malachite.

LION HILL AREA - pyrolusite, sericite, stibiconite, utahite.

*Buffalo mine* - argentojarosite, aurichalcite, barite, cerussite, cerargyrite, chalcopyrite, fluorite, galena, gold, jarosite, jasper, limonite, malachite, pyrite, plumbojarosite, wad.

*Chloride Point* - argentojarosite, aurichalcite, barite, cerussite, cerargyrite, jasper, jarosite, limonite, malachite, plumbojarosite, pyrite, smithsonite, stibiconite, stibnite.

*Douglas, Lion, Zella mines* - barite, calcite, cerussite, cerargyrite, jasper, jarosite, plumbojarosite.

*East Side, Empire, Iron, Monarch, Northern Light, Woodruff mines* - cerussite, cerargyrite, gold, jarosite, plumbojarosite, wad.

*Three Metals mine* - cerussite, cerargyrite.

OPHIR HILL AREA - barite, tetrahedrite.

*Admiral Dewey prospect* - cerussite, galena, gypsum, jarosite, limonite.

*Chicago mine* - azurite, cerussite, limonite, malachite.

*Cliff mine* - aurichalcite, azurite, andradite, cerussite, chalcopyrite, diopside, epidote, galena, garnet, jarosite, limonite, malachite, plumbojarosite, pyrite, pyrolusite, smithsonite, sphalerite, talc, tremolite.

*Hidden Treasure mine* - actinolite, andradite, apatite, aurichalcite, azurite, beaverite, calamine, cerargyrite, cerussite, cuprite, diopside, epidote, galena, hedenbergite, hydrozincite, limonite, malachite, plumbojarosite, pyrite, smithsonite, sphalerite, topaz, wad, wollastonite.

*Jim Fisk mine* - argentite, cerargyrite, cerussite, pyrrhotite, silver.

*Ophir Hill Consolidated, Ophir Coalition (Montana) mines* - andradite, albite, argentite, apatite, anhydrite, bismuth, calcite, chalcantite, chalcocite, chalcopyrite, chlorite, clinzoisite, dolomite, diopside, epidote, fluorite, galena, grossularite, melanterite, phlogopite, psilomelane, pyrite, pyrolusite, pyrrhotite, quartz, sanidine, scheelite, sericite, siderite, sphalerite, titanite, tremolite, wad, wolframite, wurtzite, zircon.

*Sacramento mine* - argentite, aurichalcite, azurite, calamine, cerargyrite, cerussite, chalcopyrite, cuprite, galena, hydrozincite, limonite, malachite, plumbojarosite, py-

rite, smithsonite, sphalerite, wad, wollastonite.

#### OQUIRRH MOUNTAINS

*Manning Canyon Shale* - chlorite, gibbsite, kaolinite, illite, pyrophyllite, rectorite.

*Tickville Gulch* - hypersthene.

*S. part* - olivine.

OSCEOLA DISTRICT (Thorpe Hills) - cerussite, galena, pyrite.

OVERLAND CANYON - bismuthinite.

PINE CANYON - vesuvianite.

RUSH VALLEY (STOCKTON) DISTRICT (Oquirrh Mountains) - iddingsite, natrolite, phillipsite.

*Argent mine* - cerussite, galena, jarosite, limonite, plumbojarosite, pyrite.

*Ben Harrison mine* - arsenopyrite, cerussite, chalcopyrite, galena, gypsum, jarosite, limonite, malachite, plumbojarosite, pyrite, sphalerite.

*Calument mine* - cerussite, chalcopyrite, galena, jarosite, limonite, malachite, pyrite, sphalerite, sulfur, zoisite. *Galena King mine* - cerussite, chalcopyrite, galena, jarosite, limonite, malachite, plumbojarosite, pyrite, sphalerite.

*Honerine mine* - anglesite, apophyllite, aragonite, arsenopyrite, aurichalcite, beudantite, cerussite, chalcopyrite, clinzoisite, diopside, epidote, fluorite, galena, gold, jarosite, limonite, malachite, mimetite, nontronite, plumbojarosite, pyrite, pyromorphite, sepiolite, serpentine, smithsonite, sphalerite, tetrahedrite, wad, wollastonite.

*Mescatine mine* - cerargyrite, cerussite, galena, jarosite, limonite, plumbojarosite, sphalerite, pyrite.

*Muerbrook mine* - anglesite, cerussite, chalcopyrite, galena, gypsum, jarosite, limonite, malachite, melanterite, plumbojarosite, pyrite, sphalerite.

*Salvation-Hercules mine* - cerargyrite, cerussite, chalcopyrite, galena, jarosite, limonite, malachite, plumbojarosite, pyrite.

*Settlement Canyon* - analcite, actinolite, grossularite, pyrrhotite, thompsonite.

*Soldier Creek* - epidesmine, grossularite, hematite, wollastonite.

*Southport mine* - cerussite, malachite.

*Tip Top mine* - chalcopyrite, galena, pyrite, sphalerite.

SALDURO - bischofite, carnallite, halite, kainite, kieserite, polyhalite, sylvite.

SHEEP RIDGE (east of) - nepheline in basalts and sills.

**SILVER ISLAND (SILVER ISLET) DISTRICT** (Silver Island Mountains).

*Carrie Mack property* - azurite, barite, hindheimite, cerussite, galena, jamesonite, malachite, pyrite.

**SILVER ISLET DISTRICT** (See **SILVER ISLAND DISTRICT**).**STANSBURY MOUNTAINS**

*Amatrice Hill* - chalcedony, crandallite, jasper, millisite, variscite, wardite.

*Grantsville* (near) - calcite (onyx).

*Mack Canyon* - labradorite, olivine.

*Manning Canyon Shale* - chlorite, gibbsite, kaolinite, illite, pyrophyllite, rectorite.

*Muskrat Canyon* - labradorite, olivine.

*North Willow Canyon* - augite, biotite, labradorite.

*Salt Mountain* - labradorite, olivine.

**STOCKTON DISTRICT** (See **RUSH VALLEY DISTRICT**).

**TOOELE DISTRICT** (Oquirrh Mountains) - cerussite, galena, malachite, pyrite.

**WENDOVER** - bischofite, carnallite, halite, kainite, kieserite, polyhalite, sylvite.

**WEST MOUNTAIN DISTRICT** (See **BINGHAM DISTRICT**).**WILD CAT MOUNTAINS**

*Silver Queen (Wild Cat) mine* - barite, chalcopyrite, fluorite, gold, pyrite, silver, prosopite.

**WILLOW SPRINGS DISTRICT** (Deep Creek Mountains) - azurite, cerussite, galena, chalcopyrite, malachite.

**UINTAH COUNTY**

**ARGYLE CREEK** - argulite.

**ASHLEY CREEK** - carnotite.

*Woodside Iron prospect* - hematite.

**ASPHALT RIDGE** - asphalt.

**ASPHALT WASH** - gilsonite.

**BASSETT MINE** - galena.

**BLACK DRAGON MINE** - gilsonite.

**BONANZA MINE** - gilsonite, petroleum in gilsonite vein.

**BROWNS PARK AREA** - azurite, bornite, chalcocite, hematite, malachite, pyrite.

*Red Creek* - tyuyamunite.

**BRUSH CREEK** - collophane, carbonate apatite, fluorapatite, francolite, phosphorite, rare earths.

**BRUSH CREEK DISTRICT** (Uinta Mountains).

*Little Alta mine* - azurite, cerargyrite, malachite, smithsonite.

**BULLIONVILLE** - azurite, malachite.

**CARBONATE DISTRICT** (Uinta Mountains).

*Dyer mine* - azurite, bornite, chalcocite, hematite, malachite, pyrite.

*Jessie Ewing mine, Red Creek, Willow Creek* - azurite, malachite.

*Pope Iron mine* - hematite.

**EVACUATION CREEK** - asphalt.

**FORT DUCHESNE** - gilsonite.

**FRANDSON CANYON** - collophane, carbonate apatite, fluorapatite, francolite, phosphorite, rare earths.

**GREEN RIVER DISTRICT.**

*Cub Creek* - placer chromite, gold.

*Flaming Gorge Reservoir in Horseshoe Bend* - placer gold.

**GREEN RIVER FORMATION** - abelsonite, analcite, ankerite, barytocalcite, burbankite, calcite, dawsonite, dolomite, elpidite, garrelsite, illite, leucosphenite, nahcolite, neighborite, norstrandite, searlesite, shortite, smectite, pyrite, wurtzite.

**HELLS HOLE CANYON** - analcite, apophyllite.

**JENSON** - monazite in placer sands.

*Bonnie Bell claims* - autunite.

**LITTLE BRUSH CREEK** - collophane, carbonate apatite fluorapatite, francolite, phosphorite, rare earths.

**LITTLE SPLIT MOUNTAIN** - azurite, chalcocite, gold, malachite.

**PR SPRINGS** - asphalt.



RAINBOW MINE - gilsonite.

ROCK CREEK - collophane, carbonate apatite, fluoroapatite, francolite, phosphorite, rare earths.

SILVER KING MINE - cerussite.

SNOW CLAIMS - autunite, torbernite.

SPLIT MOUNTAIN - glauconite, in curtis Formation.

STEINAKER DRAW - gypsum.

UTELAND KNOLL DISTRICT (Ouray). - azurite, chalcocite, gypsum, halotrichite, ilsemannite, malachite, molybdenite, pyrite.

VERNAL (N.) - analcite in Chinle Formation; glauconite in Curtis Formation.

WHITE RIVER CANYON - analcite, apophyllite.

WHITEROCKS CANYON - asphalt, gypsum.

## UTAH COUNTY

ALPINE (2 mi. W.) - jasper.

ALPINE DISTRICT (Wasatch Mountains) - orthoclase, quartz.

*Alpine-Galena property* - argentite, cerussite, galena.  
*Lucky Chance mine* - galena, pyrite.

AMERICAN FORK DISTRICT (Wasatch Mountains) - molybdenite, monticellite, smithsonite, tetradyomite.  
*Bay State mine* - galena, kermesite, sphalerite.

*Bog mine* - barite, galena, quartz, pyrite, sphalerite, tetrahedrite.

*Dutchman (Wild Dutchman) mine* - barite, cerussite, chalcocopyrite, galena, limonite, pyrite, sphalerite.

*Lake Solitude* - spinel.

*Mary Ellen, Live Yankees mines* - chalcocopyrite, galena, jamesonite, pyrite.

*Miller mine* - argentite, azurite, cerussite, galena, limonite, malachite, plumbojarosite, wad, wulfenite.

*Pacific mine* - barite, galena, pyrite, sphalerite, tetrahedrite.

*Pittsburgh mine* - cerussite, galena, limonite, plumbojarosite, sericite.

*Silver Dipper mine* - galena, pyrite, sphalerite, tetrahedrite.

*Water Fall vein* - galena, pyrite, sphalerite, tetrahedrite.

*Yankee mine* - barite, chalcocopyrite, gold, galena, jamesonite, pyrite, sphalerite, tetrahedrite.

## BEVERLY HILLS

*Manning Canyon Shale* - chlorite, gibbsite, kaolinite, illite, pyrophyllite, rectorite.

## CALEDONIA DISTRICT (See NORTH TINTIC DISTRICT)

CEDAR VALLEY - kaolinite, pyrophyllite in Manning Canyon Shale.

CLAY CANYON (Oquirrh Mountains) - bedellite, crandallite, dehrnite, deltaite, dennisonite, davidsonite, englishite, gordonite, goyazite, kolbeckite, lehiite, lewistonite, millisite, montgoneryite, overite, pseudowavellite, sterrettite, variscite, wardite.

## COLTON

*Higgins, James Peak (Brown Bear), Kyune Canyon, Midnight, Miller, Pleasant Valley, Thomas Ranch, Town mines* - albertite, ingramite, nigrite, ozocerite.

EAST TINTIC DISTRICT (East Tintic Mountains) - altaite, albite, allophane, alumian, alunite, anatase, arsenopyrite, bayldonite, beaverite, beidellite, bilinite, bindheimite, bismuthinite, boehmite, bornite, calcite, celadonite, chalcantinite, chenevixite, cimotoite, claudetite, chalcocite, clinochlore, collophane, conichalcite, copiapite, copper, coquimbite, crednerite, cuprite, cuprogoslarite, delessite, diaspore, dolomite, endellite, epsomite, famantinite, faratsihite, ferrogoslarite, freibergite, gearsutite, gibbsite, goslarite, gunningite, halloysite, hydromica, heulandite, hisingerite, jamesonite, jenkinsite, kieserite, klaprothite, leucogene, leuchtenbergite, linarite, matildite, miargyrite, montmorillonite, mordenite, nontronite, okenite, olivenite, pargasite, penninite, pisanite, potash alum, rhomboclase, ripidolite, roemerite, rutile, saponite, sericite, serpophite, sylvanite, szomolnokite, tenorite, tetradyomite, thompsonite, voltaite, zoisite, zunyite.

*Apex Standard mine* - anglesite, argentite, azurite, cerargyrite, cerussite, enargite, galena, gold, hessite, malachite, pyrrargyrite, pyrite, pyrolusite, silver, sphalerite, tetrahedrite.

*Black Jack (Winberg), White Cloud claims* - pyrolusite.  
*Burgin mine* - anglesite, antlerite, argentite, argentojarosite, aurichalcite, barite, birnessite, brochantite, cerussite, chalcophanite, cryptomelane, dickite, galena, goethite, gold, hetaerolite, hollandite, hydromica, jaipaitite, jasper, jarosite, kaolinite, lanarkite, limonite, marasite, massicot, melanterite, mimetite, minium, nsutite,

polybasite, pyrite, pyrolusite, quartz, quenselite, rhodochrosite, siderite (manganoan), smithsonite, sphalerite, silver, szomolnokite, tetrahedrite.

*Eureka Bullion mine* - anglesite, azurite, cerussite, chalcocopyrite, enargite, galena, gold, malachite, pyrite, sphalerite, tetrahedrite.

*Eureka Lily mine* - acanthite, anglesite, argentojarosite, argentite, azurite, barite, bismite, bismuthinite, bornite, calaverite, cerargyrite, cerussite, chalcocite, chalcocopyrite, enargite, galena, gold, hemimorphite, hessite, jamesonite, malachite, petzite, plumbojarosite, polybasite, proustite, pyrite, silver, smithsonite, sphalerite, tetrahedrite.

*Eureka Standard mine* - anglesite, argentite, azurite, barite, bornite, calaverite, cerussite, chalcocite, chalcocopyrite, covellite, enargite, galena, gold, hessite, kaolinite, malachite, marcasite, petzite, proustite, pyrite, sphalerite, sylvanite (krennerite), tetrahedrite.

*Iron King mine* - argentite, barite, enargite, galena, gold, hematite, hessite, limonite, pyrite, pyrolusite, tetrahedrite.

*Larsen Clay pits* - allophane, alunite, endellite, gibbsite, halloysite, kaolinite, pyrite.

*North Lily mine* - anglesite, argentite, barite, billingsleyite, bismuthinite, cerussite, chalcocopyrite, cubanite, dickite, enargite, endellite, galena, gold, greenockite, hemimorphite, hessite, kaolinite, krennerite, luzonite, montmorillonite, pearceite, petzite, plumbojarosite, pyrite, smithsonite, sphalerite, tennantite, tetrahedrite, wurtzite.

*Tintic Standard mine* - argentite, argentojarosite, anglesite, azurite, barite, bismuthinite, cerargyrite, cerussite, chalcophanite, chalcocopyrite, coronadite, enargite, galena, gold, halotrichite, hematite, hessite, jarosite, kornelite, krennerite, limonite, luzonite, malachite, marcasite, pearceite, petzite, plumbojarosite, polybasite, psilomelane, pyrite, pyrolusite, rhodochrosite, siderite, sphalerite, stromeyerite, szomolnokite, tetrahedrite, tinctite, wad.

*Trixie mine* - anglesite, argentojarosite, argentite, azurite, bornite, cerussite, chalcocite, chalcocopyrite, covellite, enargite, galena, gold, hematite, hemimorphite, hydromica, jarosite, malachite, plumbojarosite, polybasite, proustite, pyrite, scorodite, smithsonite, sphalerite, stromeyerite, tennantite, tetrahedrite.

*Zuma mine* - barite, enargite, galena, pyrite, sphalerite.

FOX HILLS (S. end Lake Mountain) - endellite, halloysite, kaolinite, montmorillonite, olivine in basalts.

GILLULY (8 mi. N. W.) - asphalt.

JORDAN NARROWS, OREM, SARATOGA, SOLDIERS PASS QUADRANGLES - kaolinite, pyrophyllite in the Manning Canyon Shale.

LAKE BONNEVILLE SHORELINE - thinolite as a cement in gravels.

#### LAKE MOUNTAINS

*Manning Canyon Shale* - chlorite, gibbsite, kaolinite, illite, pyrophyllite, rectorite.

#### LEHI DISTRICT (Lake Mountain).

*Manning Canyon Shale* - chlorite, gibbsite, kaolinite, illite, pyrophyllite; rectorite.

#### PELICAN POINT AREA.

*Canyon, Foothill and Hilltop, Pelican and Utah Valley veins* - aragonite, calcite.

*Hutchings claim* - limonite pseudomorphs after pyrite.

*Philippine, Potter claims* - calcite, (onyx).

#### PFEIFFER CANYON AREA - calcite (onyx).

*Blue Rock claim* - pyrolusite.

#### WEST SLOPE AREA.

*Wildcat mine* - cryptomelane, wad.

LITTLE COTTONWOOD STOCK - apatite, allanite, biotite, hornblende, magnetite, microcline, plagioclase, orthoclase, quartz, sphene, zircon.

NORTH TINTIC (CALEDONIA, OASIS) DISTRICT (East Tintic Mountains) (See also under Juab and Tooele Counties).

*Blowhole Hill property* - cerussite, galena.

*Fields group (Fremont Canyon)* - jasper, pyrolusite.

*Lehi-Tintic, Tintic Empire, Tintic Paymaster mines* - anglesite, cerussite, galena, jasper, pyrite.

*North Tintic claims* - pyrolusite.

*Oxen mine, Tip Top tunnel* - psilomelane, pyrolusite, wad.

*Selma mine* - anglesite, cerussite, limonite, hematite, pyrite.

OASIS DISTRICT (See NORTH TINTIC DISTRICT).

#### PAYSON DISTRICT (Wasatch Mountains).

*Nelson mine* - galena, gold, limonite, pyrite.

*Snydicat mine* - barite, cerussite, galena, limonite, smithsonite, sphalerite.

#### PROVO DISTRICT (Wasatch Mountains).

*Monarch (Buckley) mine* - argentite, calcite, cerussite,

dolomite, galena, hematite, limonite, pyrite.

#### SANTAQUIN DISTRICT (Wasatch Mountains).

*Black Balsam vein* - calcite, chalcopyrite, fluorite, malachite, pyrite.

*Blue Eagle prospect* - calcite, cerussite, vanadinite.

*Copper Bullion prospect* - chalcopyrite, malachite, specularite, pyrite.

*Sally Ann prospect* - chalcopyrite, cuprite, malachite.

*Santaquin Central tunnel* - chalcopyrite, pyrite, specularite.

*Union Chief mine* - barite, calcite, cerussite, cerargyrite, galena, hematite, limonite, sulfur.

#### SILVER LAKE DISTRICT (Wasatch Mountains).

*Deer Creek* - brucite, coerdierite, garnet, gold, graphite, hematite, magnetite, molybdenite, olivine, prehnite, periclase, psilomelane, quartz, scheelite, siderite, sphene, wollastonite.

*Mayday Extension claim* - scheelite.

*Milkmaid mine* - actinolite, anglesite, andradite, argentite, barite, bornite, cerussite, chalcopyrite, epidote, galena, gold, grossularite, pyrite, scheelite, tetrahedrite, zircon.

*Ontario mine* - actinolite, anglesite, argentite, barite, cerussite, chalcopyrite, galena, gold, pyrite, sphalerite, tetrahedrite.

*Silver Creek* - andradite, brucite, cordierite, epidote, grossularite, graphite, hematite, magnetite, olivine, periclase, quartz, siderite, zircon.

#### SPANISH FORK CANYON.

*Diamond Fork* - sulfur.

*Little Diamond Fork* - phosphorite.

#### SPANISH FORK DISTRICT (Wasatch Mountains).

*Dream (Relief) mine* - no production of metals.

THISTLE JUNCTION - geodes containing asphalt.

THORPE HILLS - azurite, malachite, sulvanite, volborthite.

*Manning Canyon Shale* - chlorite, gibbsite, kaolinite, illite, pyrophyllite, rectorite.

#### UTAH DISTRICT (Long Ridge).

*Alpha, Emerald, Lucky Boy, Queen of the West, Spalding, Trotter mines* - gypsum, hematite, jasper, limonite, pyrolusite, psilomelane, wad.

#### WASATCH MOUNTAINS

*Manning Canyon Shale* - chlorite, gibbsite, kaolinite, illite, pyrophyllite, rectorite.

WELLS CANYON (S. Oquirrh Mountains) - calcite, eardleyite, quartz, smithsonite.

#### WASATCH COUNTY

##### BLUE LEDGE DISTRICT (Bald Mountain).

*Glencoe, McHenry, Valeo mines* - cerussite, galena, gold, pyromorphite, sphalerite.

*Mayflower mine* - bornite, chalcopyrite, galena, gold, pyrite, rhodochrosite, sphalerite, siderite, silver.

*Ontario tunnel* - magnesioferrite.

BONANZA FLAT - calcite, garnet, muscovite.

CLAYTON PEAK - chabazite, spinel, vesuvianite.

##### ELKHORN DISTRICT (Wasatch Mountains) -

*Crawford property* - cerussite, galena, gold, tetrahedrite.

*Nelson, Queen properties* - cerussite, galena, gold, tetrahedrite.

HOWLAND DISTRICT (See SNAKE CREEK DISTRICT).

KEETLEY AREA - alunite, dickite, halloysite, kaolinite, montmorillonite.

MIDWAY (N.) - phosphorite.

RHODES PLATEAU (WOODLAND) DISTRICT (Uinta Mountains).

*East Star no. 1, Gray Hawk properties* - pyrolusite.

*Ferry Iron deposit* - hematite, magnetite, red ocher, specularite.

SNAKE CREEK (HOWLAND, WHITE PINE) DISTRICT (Wasatch Mountains) - grossularite, penninite, phlogopite, muscovite.

*Revelator mine* - cerussite, galena, pyromorphite, sphalerite.

*West Quincy mine* - cerussite, galena, gold, sphalerite.

##### SOLDIER SUMMIT.

*Culmer Brothers, Soldier Summit, U. S. mines* - albertite, ingramite, nigrite, ozocerite.

STRAWBERRY AREA - barite, along Charleston Thrust Fault.

UINTA MOUNTAINS (S. W. flank) - carbonate apatite, collophane, fluorapatite, francolite, phosphorite.

WHITE PINE DISTRICT (See SNAKE CREEK DISTRICT).

WOODLAND DISTRICT (See RHODES PLATEAU DISTRICT).

## WASHINGTON COUNTY

BEAVER DAM MOUNTAINS - realgar, scheelite.

BEAVER DAM WASH - agate, silicified wood.

BULL VALLEY DISTRICT (Bull Valley) - calcite, gold.

*Bucky claim* - hematite.

*Big Mountain claims* - hematite, magnetite.

*Cove Mountain* - hematite.

*Emma claims* - hematite, magnetite.

*Enterprise claims* - hematite.

*Iron Rod claims* - hematite.

*Pilot claims* - hematite, magnetite, orpiment, realgar, stibnite.

*Redtop claims* - magnetite.

*Soft Iron claims* - hematite, red ocher.

CASTLE CLIFF (near) - agate, silicified wood.

CENTRAL (near) - chalcedony in basalt flows.

DRY CANYON - aurichalcite.

ENTERPRISE (near) - birnessite.

GUNLOCK (W.) - stibnite in silicified limestone.

HARRISBURG DISTRICT (See SILVER REEF DISTRICT).

HURRICANE CLIFFS - autunite.

## MINERAL MOUNTAIN.

*Beauty Knoll claims* - alunite, halloysite, kaolinite.

*Emma mine* - antigorite, azurite, brucite, chlorite, chrysocolla, forsterite, magnetite, malachite, magnetite, periclase, spinel.

*Gregerson mine* - brucite, chrysocolla, malachite, magnetite, serpentine.

*Picadilly mine* - limonite, magnetite, pyrite.

SANTA CLARA DISTRICT (Santa Clara) - autunite, carnotite, silicified wood.

*Black Beauty no. 1 claim* - celestite, gypsum, pyrolusite.

SILVER REEF (HARRISBURG) DISTRICT (Leeds) - aguilarite, bornite, calcite, chalcopyrite, cuprite, gypsum, jasper, kaolinite, montmorillonite, muscovite,

pyrite, quartz, selenium mineralization, tenorite.

*B. Reef mine* - volborthite.

*Barbee and Walker mine* - chalcocite, silver.

*Buckeye mine* - autunite, carnotite, malachite.

*Butte Reef mine* - carnotite.

*California mine* - argentite, cerargyrite.

*Cobb mine* - chalcocite, embolite.

*Doyle shaft* - carnotite.

*Duffin, Toquerville mines* - autunite, chalcocite.

*East Reef mine* - autunite, carnotite, malachite.

*Emily Jane mine* - chalcocite, malachite.

*Last Chance mine* - chalcocite.

*Leeds mine* - argentite, azurite, cerargyrite.

*Maud claim* - malachite.

*Newton mine* - azurite.

*Requa mine* - argentite, azurite, cerargyrite, malachite.

*Savage mine* - argentite, cerargyrite.

*Thompsons mine* - chalcocite, silver.

*Tecumseh Hill* - cerargyrite, chalcocite, volborthite.

*Wells pit* - volborthite.

ST. GEORGE (S.) - gypsum.

TOQUERVILLE - gypsum.

*Wallace claims* - pyrolusite.

TUTSAGUBET DISTRICT (Beaver Dam Mountains).

*Apex (Dixie) mine* - adamite, aurichalcite, azurite, cerussite, copper, cuprite, hydrozincite, jarosite, limonite, malachite, plumbojarosite, rosasite, smithsonite. *Paymaster mine* - cerussite, jarosite, malachite, plumbojarosite.

VIRGIN ANTICLINE (N. end) - autunite.

VIRGIN RIVER - gypsum, halite.

## WAYNE COUNTY

### CAINEVILLE.

*Basal Entrada Formation* - huge selenite crystals.

*T. 27 S., R. 9 E.* - anatase, monazite, staurolite, rutile, tourmaline, zircon in Ferron Sandstone.

CAPITOL REEF MONUMENT - carnotite, sideronrite, torbernite.

CAPITOL WASH - azurite, asphalt, malachite, uranocher.

CAPITOL WASH TO SHEETS GULCH - azurite, malachite, metatorbernite.

CHIMNEY ROCK to TANTLUS FLAT - alunite, brochantite, chalcantite, metatorbernite.

COLEMAN CANYON to OAK CREEK - carnotite, jarosite, metarossite, metatorbernite, schroeckingerite.

FREMONT RIVER.

*South Wash* - huge selenite crystals.

FRUITA (S.E. in Grand Wash).

*Oyler mine* - alunite, becquerelite, carnotite, chalcantite, chalcopryrite, gypsum, johannite, lepidrocite, metatorbernite, pitchblende, pyrite, schoepite, sklodowskite, torbernite, zippeite.

SPRING GULCH - pyrolusite.

FRUITA TO HANKSVILLE - agate, chert, silicified wood.

GRAND WASH TO CAPITOL WASH - alunite, asphalt, jarosite, malachite, metatorbernite, zippeite.

HANKSVILLE (N.) - carnotite.

HENRY MOUNTAINS.

*Mt. Ellen (N. end)* - carnotite.

*Coaly basin (N. W. Flank Mt. Ellen)* - jet.

LAST CHANCE GULCH - anhydrite, gypsum.

MINERS MOUNTAIN DISTRICT (Miners Mountain) - chalcopryrite, galena, pyrite.

*Old Faithful, Wonder Copper no. 1 mines* - azurite, limonite, malachite.

MUDDY RIVER - anhydrite, carnotite, gypsum.

NOTOM BENCH - carnotite.

POISEN SPRINGS - carnotite.

RABBIT VALLEY.

*Old Dixon prospect* - carnotite, jarosite, limonite, silicified wood.

TORREY (near) - agate, jasper, metazeunerite, silicified bone and wood.

*T. R. Lode no. 1 mine* - azurite, limonite, malachite.

UPHEAVAL DOME - carnotite.

WATERPOCKET FOLD - carnotite.

WEBER COUNTY

COLD WATER CANYON - azurite, barite, fluorite, gold, malachite.

FREMONT ISLAND DISTRICT (Fremont Island) - chalcopryrite, galena, gold, pyrite, silver.

HUNTSVILLE (10 mi. E.) - pyrolusite.

JUNCTION DISTRICT (See WEBER DISTRICT).

OGDEN - fluorite, above "W" on mountain.

OGDEN CANYON - garnet, hornblende, limonite, phosphorite, uraninite.

SIERRA MADRE DISTRICT (Wasatch Mountains) - epidote, garnet, hematite, molybdenite, quartz. *Eldorado property* - anglesite, bornite, calcite, cerussite, fluorite, galena, malachite.

*King Solomon vein* - chalcopryrite, gold, malachite, pyrite.

*Napoleon-Maghera group* - biotite, chalcopryrite, hornblende, pyrite.

STRONGS CANYON - garnet.

WEBER (JUNCTION) DISTRICT (Wasatch Mountains) - hematite, magnetite.

*New Azurite claim* - azurite, galena, malachite.

*Norman mine* - fluorite.

*Payday claims* - psilomelane, pyrolusite.

*Standard Mining Company mine* - galena, malachite.

CHAPTER III

MINERALS OF UTAH

ABELSONITE

Nickel porphyrin,  $C_{31}H_{36}N_4Ni$ . Triclinic. Aggregates of platy crystals. H. less than 3. G. 1.33-1.48. Semi-metallic to adamantine luster. Pink purple to dark reddish brown. Occurs in Mahogany zone of the Green River Formation.

*Uintah County* Green River Formation.

ABERNATHYITE

Hydrous potassium uranium arsenate,  $KUO_2AsO_4 \cdot 3H_2O$ . Tetragonal.

Crystals tabular, occur singly or in groups. H. 2-3. G. 3.7. Color yellow. Transparent. Luster vitreous. Fluoresces to moderately yellow-green color. Streak pale yellow. Occur as crystalline coating, lining fractures in sandstone.

*Emery County* San Rafael district: Temple Mountain, Fuenrol no. 2 mine.

#### ACANTHITE

Silver sulfide,  $\text{Ag}_2\text{S}$ . Orthorhombic. Prismatic crystals. Sectile. H. 2-2½. G. 7.2. Luster metallic. Color iron black.

*Utah County* East Tintic district: Eureka Lily mine.

#### ACMITE

Sodium iron silicate,  $\text{NaFeSi}_2\text{O}_6$ . Monoclinic. Crystals long prismatic, vertically striated. H. 6-6.5. G. 3.5. Cleavage distinct. Brittle. Color brownish, reddish brown, green. Luster vitreous. Found from cores and cuttings from the Green River Formation.

*Duchesne County* Carter Oil Company wells; Green River Formation; Sinclair Mortenson well.

#### ACTINOLITE

Calcium-magnesium-iron amphibole,  $\text{Ca}_2(\text{Mg, Fe})_5\text{Si}_8\text{O}_{22}(\text{OH})_2$ . Monoclinic. Crystals short or long bladed, columnar or fibrous, granular massive. H. 5-6. G. 3-3.2. Cleavage prismatic at angle of 56 degrees. Color bright green and grayish green. Commonly found in crystalline schists.

*Beaver County* Granite district: Bismuth mine; Star district: Moscow mine.

*Grand County* LaSal Mountains (North Mountain); Miners Basin district: Dewey, M.I.F. mines.

*Iron County* Iron Springs district: Granite Mountain, Iron Mountain.

*Juab County* West Tintic district: Tintic Western mine.

*Salt Lake County* Big Cottonwood district; Bingham district; Little Cottonwood district: Alta mine.

*Tooele County* Gold Hill district: Reaper, Yellow Hammer mines; Ophir district: Ophir Hill area-Hidden Treasure mine; Rush Valley district: Settlement Canyon.

*Utah County* Silver Lake district: Milkmaid, Ontario mines.

#### ADAMITE

A basic arsenate of zinc,  $\text{Zn}_2\text{AsO}_4\text{OH}$ . Orthorhombic. Occurs in small crystals, often grouped in crusts and granular aggregations. H.

3.5. G. 4.3. Cleavage good. Color honey-yellow, violet, rose-red, green, colorless. Luster vitreous. Brittle. A rare secondary mineral in oxidized ore zones containing primary zinc and arsenic materials.

*Juab County* Tintic district: Iron Blossom mine.

*Tooele County* Gold Hill district: Gold Hill (Western Utah) mine.

*Washington County* Tutsagubet district: Apex (Dixie) mine.

#### ADULARIA (See ORTHOCLASE)

#### AEGERITE (See WURTZILITE)

#### AEGIRINE (See AEGIRITE)

#### AEGIRITE

Sodium iron silicate,  $\text{NaFe}(\text{Si}_2\text{O}_6)$ . Monoclinic. Slender crystals with steep terminations. Often in fibrous aggregates. H. 6-6.5. G. 3.5. Comparatively rare rock-forming mineral in igneous rocks.

*Grand County* La Sal Mountains: North Mountain.

*San Juan County* La Sal Mountains: Middle Mountain, Brumley Ridge.

#### AEONITE (See WURTZILITE)

#### AGATE

(See CRYPTOCRYSTALLINE QUARTZ)

#### AGUILARITE

A silver sulfide and selenide,  $\text{Ag}_4\text{SeS}$ . Isometric. Skeleton dodecahedrons, often elongated, also massive. Cleavage none. Fracture hackly. Sectile. H. 2.5. G. 7.6 Luster metallic, brilliant. Color iron black. Opaque.

*Washington County* Silver Reef district.

#### AIKINITE

A lead, copper, bismuth sulfide,  $\text{PbCuBiS}_3$ . Orthorhombic. Acicular crystals, basal striations. Cleavage poor. H. 2-2.5. G. 6-7. Fracture uneven. Luster metallic. Color blackish lead gray; tarnishes brown or copper red, sometimes with a yellowish green coating. Streak grayish black. Opaque.

*Salt Lake County* Little Cottonwood district: South Hecla mine.

*Tooele County* Gold Hill district: Gold Hill (U.S.), U.S. mines. Deep Creek Mountains: Cyclone, Leap Year mines.



## ALABASTER (See GYPSUM)

## ALASKAITE

A lead, silver, copper bismuth sulfide,  $Pb(Ag,Cu)_2Bi_4S_8$ . Massive, compact, or with foliated structure. Indistinct cleavage. Brittle. H. 2.6. G. 6.8. Luster metallic. Color light lead-gray, may tarnish bronze. Streak gray. Opaque. *Salt Lake County* Big Cottonwood district: Maxfield mine.

## ALBERTITE

An asphaltic pyrobitumen. Occurs in veins and fillings in the Green River Formation.

*Duchesne County* near Duchesne.

*Utah County* Colton: Higgins, James Peak (Brown Bear), Kyune Canyon, Midnight, Miller, Pleasant Valley, Thomas Ranch, Town mines.

*Wasatch County* Soldier Summit: Culmer Brothers, Soldier Summit, U. S. mines.

## ALBITE

Sodium, aluminum silicate,  $NaAlSi_3O_8$ . Triclinic. Crystals tabular and elongated, polysynthetic twinning. H. 6. G. 2.6. Cleavage good, two directions. Brittle. Luster vitreous. Color white, gray.

*Beaver County* East of Rock Corral.

*Iron County* Iron Springs district: Granite Mountain, Iron Mountain.

*Juab County* Spring Creek district: Queen of Sheba mine.

*Millard County* House Range: Amasa Valley, Notch Peak intrusive.

*Piute County* Marysvale district.

*Sevier County* Henry district: Trinity prospect.

*Tooele County* Gold Hill district: Reaper, Yellow Hammer mines; Granite Mountain district; Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.

*Utah County* East Tintic district.

## ALISONITE (See GALENA)

## ALLANITE

Complex silicate,  $(Ca,Fe)_2R,Al,Fe)_3Si_3O_{12}OH$ . R = rare earths. Monoclinic. Commonly massive and in imbedded grains. H. 5.5-6. G. 3.5-4.2. Luster submetallic to pitchy. Color brown to pitch-black. Often coated with yellow-brown alteration product.

*Salt Lake County* Alta stock; Little Cottonwood district;

Little Cottonwood stock.

*Tooele County* Gold Hill district.

*Utah County* Little Cottonwood stock.

## ALLEVARDITE (See RECTORITE)

## ALLOPHANE

Hydrous aluminum silicate,  $Al_2SiO_5 \cdot nH_2O$ . Amorphous. In incrustations, sometimes stalactitic. H.3. G. 1.8. Brittle. Fracture imperfectly conchoidal. Luster vitreous to subresinous. Color pale sky-blue, green, brown, colorless. Translucent.

*Kane County* Kaibab fault, west side.

*Piute County* Marysvale district.

*Salt Lake County* Bingham district: Bingham Copper pit.

*San Juan County* White Canyon district: Elk Ridge: Sandy No. 3 mine; Happy Jack mine.

*Utah County* East Tintic district: Larsen clay pits.

## ALMANDINE (See SPINEL)

## ALMANDITE (See GARNET)

## ALTAITE

Lead telluride,  $PbTe$ . Isometric. Atomic structure like galena. Rarely in crystals, usually massive with cubic cleavage. H.e. G.8.1. Color tin-white, with yellowish tinge tarnishing to bronze-yellow.

*Utah County* East Tintic district.

## ALUMIAN

Aluminum sulfate,  $Al_2O_3 \cdot 2(SO_3)$ . Hexagonal. Massive. Microscopic crystals. White. H. 2-3. G. 2.7. Luster of crystals vitreous.

*Utah County* East Tintic district.

## ALUMINITE

Hydrous basic aluminum sulfate,  $Al_2(SO_4)(OH)_4 \cdot 7H_2O$ . May be monoclinic or orthorhombic. Occurs as reniform or nodular masses, composed of tiny needles or fibers. Fracture earthy. Friable. H. 1-2. G. 1.7. Luster dull, earthy. Color white. Opaque. Occurs as concretionary deposits in clays and marls.

*Grand County* Green River, Crossing of the D. and R. G. Railroad.

*Kane County* Alum Hills; Paria, 9 miles south.

*Piute County* Marysvale district.

## ALUNITE

Hydrous aluminum potassium sulfate,  $\text{KA1}_3(\text{SO}_4)_2(\text{OH})_6$ . Hexagonal. In rhombohedrons, resembling cubes. Massive, with fibrous organular texture. H. 3.5-4. G. 2.6-2.9. Cleavage distinct basal. Fracture uneven. Luster vitreous and pearly. Brittle. Color white, pink, gray.

*Beaver County* Indian Peak Range: Big Pinto Spring; Pine Grove district: Southern Wah Wah Mountains: Blawn Peak, NG Subareas A, B, C, and D deposits, SX deposit. Newton district: Sheep Rock mine; San Francisco district: Horn Silver mine; White Mountain.

*Box Elder County* Lucin district: Copper Mountain, Tecoma Hill mines.

*Iron County* Modena, 1 mile northwest; Needles Range: PV deposit; Southern Wah Wah Mountains: SX deposit.

*Millard County* Church Hills: Stevens prospect.

*Piute County* Deer Trail Mountain-Alunite Ridge; Gold Mountain district; Marysvale district: Al-Kee-Mee, Aluminum Bar, Aluminum Queen, Big Chief, Big Star, Close In, East Slope no. 2, J. and L. Alunite, Manning Creek, Mary's Lamb, Marysvale Peak, North Star, Pittsburg, Potash Butte, Silica Hills, White Hills, White Horse, Yellow Jacket mines; Mount Baldy district: Aetna, Alunite Ridge, Bradburn, Christmas mines, Close In, Crystal, L. and N., Mineral Products, Sunshine mines; Sevier Canyon.

*San Juan County* Red Canyon district: Markey no. 3 mine; White Canyon district: W. N. mine.

*Sevier County* Rock Candy Mountain.

*Utah County* East Tintic district, Larsen clay pits.

*Wasatch County* Keetley area.

*Washington County* Mineral Mountain: Beauty Knoll claims.

*Wayne County* Chimney Rock to Tantlus Flat; Fruita: Oyler mine; Grand Wash to Capitol Wash.

## ALUNOGEN

Hydrous aluminum sulfate,  $\text{Al}_2(\text{SO}_4)_3 \cdot 16\text{H}_2\text{O}$ . Triclinic. Usually in delicate fibrous masses, crusts, or in powder form. H. 1.5-2. G. 1.65-1.8. Cleavage perfect. Luster vitreous to silky. Colorless, white, yellowish, or reddish by impurities.

*Emery County* San Rafael district: Dexter group.

*Garfield County* Coyote Creek district: Hampton mine.

## AMATRICE (See VARISCITE)

## EMETHYST (See QUARTZ)

## AMMONIA ALUM

Hydrous ammonium aluminum sulfate,  $(\text{NH}_4)\text{Al}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ . Isometric. Occurs as fibrous or columnar masses, or as efflorescences. H. 1.5. G. 1.6. Fracture conchoidal. Luster vitreous, fibrous masses silky. Colorless to white. Taste sweetish and astringent.

*Kane County* Kaibab fault, west side.

## AMMONIOJAROSITE

Basic sulfate of ammonium and ferric iron,  $(\text{NH}_4)\text{Fe}_3(\text{SO}_4)_2(\text{OH})_6$ . Hexagonal. Occurs as small lumps and irregular flattened nodules, composed of microscopic tabular grains. G. 3.1. Color light yellow. Luster dull, waxy to earthy.

*Kane County* Kaibab fault, west side.

## AMPHIBOLE (See also ACTINOLITE, HORNBLLENDE, TREMOLITE)

Series of complex silicates of magnesium, iron, calcium, and aluminum or various combinations of these elements. Amphibole is a common rockforming mineral in both igneous and metamorphic rocks.

*Tooele County* Gold Hill district: Calaveras, Centennial and Enterprise, Reaper mines.

## ANALCIME (See ANALCITE)

## ANALCITE

Hydrous sodium aluminum silicate,  $\text{NaAlSi}_2\text{O}_6 \cdot \text{H}_2\text{O}$ . Isometric. Usually forms trapezohedrons, also massive granular, compact. H. 5-5.5. G. 2.2. Cleavage cubic. Fracture subconchoidal. Brittle. Luster vitreous. Colorless, white: occasionally gray, greenish, yellowish, or reddish. A zeolite.

*Duchesne County* Carter Oil Company wells; Green River Formation; Sinclair Mortenson well.

*Iron County* in andesite flows near Paragonah.

*Tooele County* Rush Valley district: Settlement Canyon.

*Uintah County* Chinle Formation near Vernal; Green River Formation south of Ouray. Hells Hole Canyon; White River Canyon.

## ANATASE

Titanium dioxide,  $\text{TiO}_2$ . Tetragonal. Commonly pyramidal crystals, also tabular. H. 5.5-6. G. 3.9. Cleavage perfect. Fracture subconchoidal. Brittle. Luster adamantine. Color various shades of brown, passing into indigo-blue and black; also greenish, blue-green, lilac, gray, and

rarely colorless. Streak colorless to pale yellow. Transparent.

*Piute County* Mount Baldy district: Deer Trail mine.

*Tooele County* Gold Hill district: Reaper mine.

*Utah County* East tintic district.

*Wayne County* Caineville.

#### ANDALUSITE

Aluminum silicate,  $Al_2SiO_5$ . Orthorhombic. Usually in coarse prismatic forms, also massive, sometimes radiated and granular. H. 7.5. G. 3.2. Cleavage good. Fracture uneven. Brittle. Luster vitreous. Color white, reddish, violet, gray, reddish-brown, olive-green. A metamorphic mineral.

*Beaver County* Beaver Lake district.

*Juab County* Trout Creek district: Bacon mine.

*Tooele County* Deep Creek Mountains; Gold Hill district: Cane Springs mine.

#### ANDERSONITE

Hydrous carbonate of sodium, calcium, uranium,  $Na_2Ca(UO_2)(CO_3)_3 \cdot 6H_2O$ . Hexagonal. Occurs in clusters of minute pseudo-cubic crystals. G. 2.8. Color bright green. Fluoresces bright green. Soluble in water.

*Grand County* Thompsons district: Parco no. 23, Skinny no. 1 mines.

*Emery County* San Rafael district: Delta mine.

*San Juan County* Cane Wash: Atomic King no. 2 mine; Elk Ridge.

#### ANDESINE

A mineral intermediate in the albite-anorthite series. Triclinic. Crystals tabular and elongated, twinned. H. 6. G. 2.6. Cleavage good. Fracture uneven. Luster vitreous to pearly. Colorless, white, gray. Constituent of many igneous rocks in Utah.

*Iron County* Paragonah: Iron Peak.

*Millard County* Twin Peaks.

#### ANDRADITE (See GARNET)

#### ANGLESITE

Lead sulfate,  $PbSO_4$ . Orthorhombic. Crystals prismatic, or tabular. Also massive, granular to compact, nodular, frequently earthy in concentric layers. H. 3. G. 6.4. Cleavage good. Fracture conchoidal. Brittle. Luster adamantine when pure, dull when earthy. Color white, tinged yellow, gray, green, blue. Found in oxidized zone of ore bodies.

*Beaver County* Bradshaw district: Cave mine; Pine Grove district; San Francisco district: Horn Silver mine; Lincoln district: Creole, Lincoln mines; Star district: Cedar-Talisman, Estelle, Gold Crown, Hoosier Boy, Harrington-Hickory, Hub, Moscow, Rebel, Red Warrior, White Rock, Wild Bill mines.

*Box Elder County* Ashbrook district: Vipont mine; Lucin district: Copper Mountain, Tecoma Hill mines; Newfoundland district.

*Cache County* Paradise district.

*Davis County* Farmington district: Parrish Canyon.

*Emery County* San Rafael district: Copper Globe mine.

*Juab County* Fish Springs district: Carnation, Emma, Galena, Utah mines; Tintic district: Bullion Beck, Eagle, Blue Bell, Eureka Hill, Gemini, Godiva, Humbug, Sunbeam, Swansea mines; West Tintic district: 88, Scotia, War Eagle mines.

*Millard County* Leamington district: Arbroath, Leamington Mining Company, Yellowstone mines.

*Morgan County* Argenta district: Carbonate Hill, Carbonate Gem mines.

*Piute County* Mount Baldy district: Deer Trail mine.

*Salt Lake County* Big Cottonwood district, Eclipse mine, Bingham district: Galena, Old Jordan mines; Little Cottonwood district: Emma, Little Emma, Michigan-Utah mines.

*Summit County* Park City district: Comstock, Daly, Little Bell, Nail Driver, Ontario, Scottish Chief, Silver King, Woodside mines.

*Tooele County* Dugway district: Bryan claim; Gold Hill district: Cash Boy, Gold Hill (U. S.), Gold Hill Standard, Monoco, New Baltimore, Red Jacket, Rube, Silver King, Spotted Fawn mines; North Tintic district: New Bullion, Sacramento mines; Rush Valley district: Honerine, Muerbrook mines; Lakeside district.

*Utah County* East Tintic district: Apex Standard, Burgin, Eureka Bullion, Eureka Lily, Eureka Standard, North Lily, Tintic Standard, Trixie mines; North Tintic district: Lehi Tintic, Tintic Empire, Tintic Paymaster, Selma mines; Silver Lake district: Milkmaid, Ontario mines.

*Weber County* Sierra Madre district: Eldorado property.

#### ANHYDRITE

Calcium sulfate,  $CaSO_4$ . Orthorhombic. Crystals not common, usually massive, granular. H. 3-3.5. G. 2.9. Cleavage good. Fracture uneven. Brittle. Luster vitreous to pearly. Color white, gray, bluish, reddish. Transparent to translucent. Occurs in association with gypsum. In southeastern Utah it is found in the Paradox Member of the Hermosa Formation; in east-central Utah it occurs in the Carmel and Summerville Formation; in

central Utah in the Arapien Shale; in southwestern Utah it occurs in the Kaibab, Moenkopi, Carmel, and Curtis Formations; in northeastern Utah it occurs in the Thaynes, Green River, and Carmel Formations.

*Beaver County* Pruess district: Blackbird, Cactus mines.

*Duchesne County* Green River Formation; Lake Fork.

*Emery County* Cedar Mountains; Fullers Bottom; Horn Silver Gulch; San Rafael River.

*Garfield County* Water Pocket Canyon.

*Grand County* Cane Creek; Fisher Valley; Gypsum Hills; McCarthy well; Moab Valley; Onion Creek; Paradox basin; Salt Valley; Seven Mine Anticline; Texas Gulf Potash mine, Thompsons area.

*Iron County* Cedar Canyon; Kanarrville.

*Juab County* Mona district: San Pitch Mountains, Chicken Creek, Levan, Nephi, Salt Creek.

*Kane County* Cannonville; Glendale; Johnson Creek; Kanab Creek; Kimball Valley; Paria, 9 mi. south.

*Millard County* Fillmore; Kanosh.

*Piute County* Sevier Canyon.

*San Juan County* Gypsum Creek; Moab Valley; Monticello district; Paradox basin; San Juan River.

*Sanpete County* Gunnison; Mayfield; Twelve Mile Canyon.

*Sevier County* Glenwood; Sigurd.

*Tooele County* Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.

*Wayne County* Last Chance Gulch; Muddy River.

#### ANKERITE

Carbonate of calcium, magnesium, iron,  $\text{CaCO}_3 \cdot (\text{Mg, Fe})\text{CO}_3$ . Hexagonal. Crystals rhombohedral, also prismatic. Massive, fine to coarse granular, columnar. H. 3.5-4. G. 2.9. Cleavage rhombohedral, perfect. Brittle. Luster vitreous to pearly. Color gray, greenish, yellowish-brown, brown.

*Emery County* San Rafael district: Temple Mountain.

*Juab County* Tintic district: Victoria mine.

*Salt Lake County* Little Cottonwood district: Clayton Peak stock contact zone.

*Uintah County* Green River Formation.

#### ANNABERGITE

A hydrated arsenate of cobalt, nickel,  $\text{Ni}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$ . Monoclinic. Crystals rare, prismatic to acicular and flattened. Usually occurs as fine crystalline coatings or earthy. H. 1.5-2.5. G. 3. Cleavage good. Flexible. Sectile. Luster weakly adamantine, pearly; also dull, earthy. Color pink, rose, white, gray, applegreen.

*Iron County* Escalante district: Escalante mine.

#### ANORTHITE

Calcium aluminum silicate,  $\text{CaAl}_2\text{-Si}_2\text{O}_8$ . Triclinic. Crystals usually twinned. Cleavage good, two directions. Basal cleavage shows striations. H. 6. G. 2.7. Colorless, white, gray. An end member of the plagioclase series.

*Millard County* House Range: Notch Peak stock.

*Salt Lake County* Big Cottonwood district: Confidence, Maxfield mines.

#### ANORTHOCLASE

Sodium potassium aluminum silicate,  $(\text{Na,K})\text{AlSi}_3\text{O}_8$ . Triclinic. Form like that of ordinary feldspars. Twinning as in orthoclase; also polysynthetic twinning. H. 6. G. 2.6. Cleavage good, two directions. Color white, gray. Associated with acidic igneous rocks.

*Tooele County* Gold Hill district: Reaper mine.

#### ANTHOPHYLLITE

Basic magnesium silicate,  $(\text{Mg, Fe})_7(\text{Si}_8\text{O}_{22})(\text{OH})_2$ . An amphibole. Orthorhombic. Cleavage perfect prismatic. H. 5.5-6. G. 2.9-3.2. Luster vitreous. Color brownish gray, yellowish brown, greenish. Translucent.

*Daggett County* Red Creek Complex.

#### ANTHRAXOLITE (See GILSONITE)

#### ANTIGORITE

Basic magnesium silicate,  $\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4$ . A chlorite. Monoclinic. Crystals are tabular, usually six-sided. Commonly foliated or thin scales in aggregates. Cleavage perfect. H.1-2.5. G. 2.8. Luster pearly to dull. Color green. Occurs in contact metamorphic zones.

*Sevier County* Henry district: Trinity prospect.

*Washington County* Mineral Mountain: Emma mine.

#### ANTLERITE

Basic sulfate of copper,  $\text{Cu}_3(\text{SO}_4)(\text{OH})_4$ . Orthorhombic. Usually thick tabular crystals, cross-fiber veinlets, or acicular aggregates. Cleavage perfect. Brittle. H. 3.5. G. 3.9. Luster vitreous. Color emerald green to dark green, light green. Streak pale green. A secondary mineral.

*Juab County* Deseret Mountain district.

*San Juan County* White Canyon district: Happy Jack, Posey mines.

*Utah County* East Tintic district: Burgin mine.

## APATITE

Calcium phosphate,  $\text{Ca}_5(\text{F, Cl, OH})(\text{PO}_4)_3$ . Hexagonal. Commonly in crystals of long and short prismatic habit, also tabular. May be massive with structure granular to compact, H. 5. G. 3.2. Cleavage poor. Fracture conchoidal and uneven. Luster vitreous. Color green, white, yellow, gray, red, brown. Transparent and translucent.

*Beaver County* Granite district: Miller mine; Rocky district: Old Hickory mine; San Francisco district.

*Iron County* Iron Springs district: Granite Mountain, Iron Mountain, Three Peaks.

*Millard County* Twin Peaks.

*Salt Lake County* Little Cottonwood stock.

*San Juan County* La Sal Mountains: Middle Mountain, Brumley Ridge.

*Sevier County* Henry district: Trinity prospect.

*Tooele County* Dugway district; Gold Hill district: Centennial and Enterprise, Copper Bloom, Doctor, Victory no. 1, Yellow Hammer mines; Granite Mountain district; Ophir district: Dry Canyon area; Ophir Hill area - Hidden Treasure, Ophir Hill Consolidated, Ophir Coalition mines.

*Utah County* Little Cottonwood stock.

## APJOHNITE

A hydrated sulfate of aluminum and manganese,  $\text{MnAl}_2(\text{SO}_4)_4 \cdot 22 \text{H}_2\text{O}$ . Monoclinic. Occurs as masses and crusts, composed of fibrous or acicular crystals. H. 1.5. G. 1.8. Luster silky. Colorless to white, also tinted rose, pale green, yellow.

*Salt Lake County* Alum Point.

## APOPHYLLITE

Hydrous calcium potassium fluosilicate,  $\text{KCa}_4\text{Si}_8\text{O}_{20}(\text{F, OH}) \cdot 8\text{H}_2\text{O}$ . Tetragonal. Usually occurs as crystals. H. 4.5 -5. G. 2.4. Cleavage perfect. Luster pearly, vitreous. Colorless, white, gray, may be shades of green, yellow, rose. Transparent to translucent.

*Salt Lake County* Bingham district: Bingham Copper pit.

*Tooele County* Rush Valley district: Honerine mine.

*Utah County* Hells Hole Canyon: White River Canyon.

## AQUAMARINE (See BERYL)

## ARAGONITE

Calcium carbonate,  $\text{CaCO}_3$ . Orthorhombic. Crystals often acicular. Also in slender prisms, columnar, fibrous, stalactitic, massive, globular, H. 3.5-4. G. 2.9. Cleavage good. Brittle. Luster vitreous. Color white, gray, brown,

yellow, green, violet. Transparent to translucent.

*Beaver County* Bradshaw district.

*Box Elder County* Great Salt Lake.

*Davis County* Great Salt Lake.

*Juab County* Tintic district: Iron Blossom mine.

*Millard County* Leamington district: Yellowstone mine.

*Salt Lake County* Great Salt Lake.

*Tooele County* Great Salt Lake; Mercur district; Rush Valley district: Honerine mine.

*Utah County* Lehi district: Pelican Point area - Canyon, Foothill and Hilltop, Pelican and Utah Valley veins.

## ARDUNITE

A zeolite containing lime and soda. Probably orthorhombic. Occurs in radiation fibrous aggregates. G. 2.3. Color red.

*Juab County* Tintic district.

## ARGENTITE

Silver sulfide,  $\text{Ag}_2\text{S}$ . Isometric. Crystals octahedral, also cubic. H. 2-2.5. G. 7.3. Cleavage poor. Very sectile. Luster metallic. Color blackish lead-gray. Streak blackish lead-gray, shining, opaque.

*Beaver County* Bradshaw district: Cave, Hecla, Nip and Tuck mines; San Francisco district: Horn Silver mine; Granite district: Beaver View mine; Indian Peak district; Lincoln district: Lincoln mine; Newton district: Sheep Rock mine.

*Box Elder County* Ashbrook district: Vipont mine.

*Iron County* Gold Springs district: Aetna, Independence, Jennie, Jumbo, Little Buck, Snowflake mines.

*Juab County* Mt. Nebo district: Big Nebo, Blackett tunnel, Eva, Freddie Lode mines; Tintic district: Mammoth mine.

*Piute County* Gold Mountain district: Annie Laurie, Sevier mines; Marysvale district: Quicksilver mine; Mt. Baldy district: Pluto mine.

*Salt Lake County* Big Cottonwood district: Carbonate mine; Bingham district; Little Cottonwood district: Albion, Emma mines.

*Summit County* Park City district: Daly West mine.

*Tooele County* Ophir district: Dry Canyon area - Surprise mine; Ophir Hill area - Jim Fisk, Ophir Hill Consolidated, Ophir Coalition, Sacramento mines.

*Utah County* Alpine district: Alpine-Galena property; American Fork district: Miller mine; East Tintic district: Apex Standard, Burgin mine; Eureka Lily, Eureka Standard, Iron King, North Lily, Tintic Standard, Trixie mines; Provo district: Monarch mine; Silver Lake district: Milkmaid, Ontario mines.

*Washington County* Silver Reef district: California,

Leeds, Requa, Savage mines.

#### ARGENTOJAROSITE

Basic sulfate of silver and iron,  $\text{AgFe}_3(\text{SO}_4)_2(\text{OH})_6$ . Hexagonal. Occurs in minute scales with hexagonal outline as fine grained masses and coatings. G. 3.6. Cleavage basal. Luster brilliant. Color yellow to brown. A secondary mineral.

*Beaver County* Granite district: Big Pass group.

*Tooele County* Ophir district: Lion Hill area - Buffalo mine, Chloride Point.

*Utah County* East Tintic district: Burgin, Eureka Lily, Tintic Standard, Trixie mines.

#### ARGULITE

An asphalt. Occurs as an asphalt-saturated sandstone. *Uintah County* Argyle Creek.

#### ARGYRODITE

Silver germanium sulfide,  $\text{Ag}_8\text{GeS}_6$ . Isometric, perhaps tetrahedral. Occurs as crystals, also massive, compact, or in botryoidal crusts. H.2.5. G. 6.2. Fracture uneven to conchoidal. Brittle. Luster metallic. Color black with blue to purple tone, steel gray on fresh surface.

*Box Elder County* Ashbrook district: Vipont mine.

#### ARSENIC

Native arsenic, As. Hexagonal. Rarely in crystals, generally granular massive, sometimes reticulated, reniform, stalactitic. Cleavage good. Fracture uneven. Brittle. H.3.5. G. 5.7. Luster nearly metallic. Color and streak tin-white, tarnishing to dark gray.

*Emery County* San Rafael district: Camp Bird No. 7, Fuemrol no. 2 mines.

#### ARSENOSIDERITE

Hydrous calcium iron arsenate,  $\text{Ca}_3\text{Fe}_4(\text{AsO}_4)_4(\text{OH})\cdot 6\cdot 3\text{H}_2\text{O}$ . Monoclinic. In fibrous concretions, also granular. H. 4.5. G. 3.6. Cleavage basal. Luster silky. Color yellowish brown and reddish brown. Streak ocher yellow.

*Juab County* Tintic district.

*Tooele County* Gold Hill district: Gold Hill (Western Utah) mine.

#### ARSENOBISMITE

Hydrous bismuth arsenate,  $\text{Bi}_2\text{AsO}_4(\text{OH})_3$ . Cubic.

Chemically hydrated bismuth arsenate, of uncertain formula. Occurs as friable or ocherous microcrystalline masses. Color yellowish brown to yellowish green. G. 5.7.

*Juab County* Tintic district: Mammoth mine.

#### ARSENOPYRITE

Iron sulfarsenide,  $\text{FeAsS}$ . Monoclinic. Crystals prismatic or flattened. Also granular or compact. H. 5.5-6. G. 5.9-6.2. Cleavage fair. Fracture uneven. Brittle. Luster metallic. Color silver white to steel gray. Streak dark gray.

*Box Elder County* Ashbrook district: Vipont mine; Park Valley district: Century, Susannah mines.

*Garfield County* Circle Cliffs: Rocky Mountain mine.

*Juab County* Tintic district: Swansea mine; West Tintic district: Scotia mine.

*Salt Lake County* Bingham district: Eagle Bird lode. *Tooele County* Deep Creek Mountains, Bonanza, Cyclone, Leap Year, Midas, Midland, Monte del Rey mines. Gold Hill district: Bonanza, Boston, Cash Boy, Climax, Copper Queen-Midland Mining Company, Cyclone, Gold Hill (U. S.), Gold Hill Standard, Mascot, Minnehaha, Monte Del Rey, New Baltimore, Ozark, Silver and Gold Mining Company, Success, Unadine, and U. S. mines; Mercur district: Geyser-Marion, Golden State mines; Rush Valley district: Ben Harrison, Honerine mines.

*Utah County* East Tintic district.

#### ASBESTOS (See SERPENTINE)

#### ASPHALT (See ASPHALTUM)

#### ASPHALTUM

Mixture of various hydrocarbons. Amorphous. G. 1-1.8. Luster like black pitch. Color brownish black, black. Odor bituminous. Burns with a bright flame.

*Box Elder County* north shore of Great Salt Lake; Rozel Point.

*Carbon County* Sunnyside.

*Uintah County* Asphalt Ridge; Evacuation Creek; PR Springs; Whiterocks Canyon.

*Utah County* Colton; Gilluly; Thistle Junction.

*Wasatch County* Soldier Summit.

*Wayne County* Capitol Wash; Grand Wash to Capitol Wash.

#### ATACAMITE

Basic chloride of copper,  $\text{Cu}_2(\text{OH})_3\text{Cl}$ . Orthorhombic.



Commonly in slender prismatic crystals, also tabular. Occurs as aggregates, also massive, fibrous, granular to compact. H. 3-3.5. G. 3.7. Color bright green. Luster adamantine to vitreous. Cleavage good. Brittle. Streak apple green. Secondary mineral.

*Juab County* Tintic district.

#### AUGITE

Aluminous pyroxene,  $(\text{Ca,Na})(\text{Mg},\text{Fe}^{++},\text{Fe}^{+++},\text{Al})(\text{Si},\text{Al})_2\text{O}_6$ . Monoclinic. Crystals prismatic. Cleavage good, prismatic, nearly right angles. H. 5-6. G. 3.3. Luster vitreous. Color dark green to black.

*Beaver County* San Francisco district; Star district: Lady Bryan mine.

*Grand County* La Sal Mountains: North Mountain.

*Iron County* Paragonah; Iron Mountain.

*Millard County* Twin Peaks.

*San Juan County* La Sal Mountains district: Middle Mountain, Brumley Ridge.

*Tooele County* Dutch Mountain; Stansbury Mountains: North Willow Canyon.

#### AURICHALCITE

Basic zinc copper carbonate,  $(\text{Zn},\text{Cu})_5(\text{OH})_6(\text{CO}_3)_2$ . Orthorhombic. Occurs in drusy incrustations, also tufted, feathery, or plumose forms. Cleavage good. H. 1-2. G. 3.6. Fragile. Luster silky to pearly. Color pale green, greenish blue, sky blue. Transparent.

*Beaver County* Bradshaw district: Cave mine; Granite district: Big Pass group; Star district: Emerson mine.

*Juab County* Tintic district: Bullion Beck, Carissa Gemini, Iron Blossom, May Day, Uncle Sam, Yankee mines; West Tintic district: War Eagle claims.

*Salt Lake County* Big Cottonwood district: Carbonate mine.

*Tooele County* Ophir district: Dry Canyon area - Kearsarge mine; Lion Hill area - Buffalo mine, Chloride Point; Ophir Hill area - Cliff, Hidden Treasure, Sacramento mines; Rush Valley district: Honerine mine; North Tintic district: Scranton mine.

*Washington County* Dry Canyon; Tutsagubet district: Apex (Dixie) mine.

#### AUSTINITE

Basic calcium zinc arsenate,  $\text{CaZn}(\text{AsO}_4)(\text{OH})$ . Orthorhombic. In minute bladed or acicular crystals. Also as radially fibrous crusts and nodules. H. 4-4.5. G. 4.1. Colorless to white, yellowish. Cleavage good. Brittle. Luster subadamantine to silky.

*Beaver County* Southern San Francisco Mountains:

White Mountain, one mile east. Pine Grove district: Daisy, Producer, Staats (Monarch) mines.

*Emery County* San Rafael district: Delta Mine, Wild Horse Canyon.

*Garfield County* Circle Cliffs: Stud Horse mine.

*Tooele County* Gold Hill district: Gold Hill (U.S.) mine.

#### AUTUNITE

Hydrous calcium uranium phosphate,  $\text{Ca}(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 10-12\text{H}_2\text{O}$ . Tetragonal. In thin tabular, wedge-shaped crystals. Also in foliated and micaceous crusts. H. 2-2.5. G. 3.1. Cleavage good. Luster subadamantine, pearly. Color lemon to sulfur yellow. Streak yellowish. Transparent to translucent.

*Beaver County* Newton district: Indian Creek, Sniffer and Mystery claims; Pine Grove district: Daisy, Producer, Staats (Monarch) mines; Southern San Francisco Mountains: White Mountain, one mile east.

*Emery County* San Rafael district: Calf Mesa, Dalton group, Delta mine, Dripping Springs, Lone Tree group, South Temple Wash, Wild Horse Canyon. Wild Horse claims,

*Garfield County* Circle Cliffs: Acme, Black Widow, Blue Goose, Horse Head, Rocky Mountain, Steam Boat, Stud Horse mines.

*Grand County* Pack Creek; Seven Mile Canyon; Thompsons district: Thom claim, Parco no. 23 mine.

*Iron County* Kanarraville.

*Juab County* Honeycomb Hills; Indian Creek.

*Kane County* Bulloch claims; Paria, 9 miles south.

*Piute County* Marysvale district: Buddy, Bullion Monarch, Copper Butte, East Slope no. 2, Freedom lease, Freedom nos. 1 and 2, Prospector nos. 1 and 3 mines.

*San Juan County* Monument Valley district: Oljeta, Skyline mines.

*Sanpete County* R.A.J. prospect.

*Uintah County* Jensen: Bonnie Bell claims; Snow claims.

*Washington County* Hurricane Cliffs; Santa Clara Silver Reef district: Buckeye, Duffin and Toquerville, East Reef mines; Virgin anticline.

#### AXINITE

Hydrous aluminum borosilicate with varying amounts of calcium, manganese, and ferrous iron,  $(\text{Ca},\text{Mn},\text{Fe},\text{Mg})_3\text{Al}_2\text{BSi}_4\text{O}_{15}(\text{OH})$ . Triclinic. Frequently in crystals and crystalline aggregates; also massive, lamellar to granular. H. 6.5-7. G. 3.3. Luster vitreous. Color clove-brown, violet, gray, yellow, green. Transparent to translucent.

*Tooele County* Gold Hill district.

## AZURITE

Basic copper carboante,  $\text{Cu}_3(\text{OH})_2(\text{CO}_3)_2$ . Monoclinic. Crystals varied and highly modified. Also massive, earthy, and radiating spherical groups. H. 3.5-4. G. 3.8. Cleavage good. Fracture conchoidal. Brittle. Luster vitreous. Color azure blue to Berlin blue.

*Beaver County* Beaver Lake district: Copper Mountain, Beaver-Harrison, OK, Skylark mines; Lincoln district: Creole mine; Pruess district: Blackbird, Cactus mines; Rocky district: Bawana, Copper Ranch mine; Maria mines; San Francisco district: Horn Silver mine; Star district: Cedar-Talisman, Hoosier Boy, Commonwealth, Kemple, Progressive, St. Mary's, Copper King, Dotson, Harrington-Hickory, Rebel, White Rock, Red Warrior, Wild Bill mines.

*Box Elder County* Ashbrook district: Vipont mine; Lucin district: Copper Mountain, Jeff-Doran mines; Newfoundland district: Copper Ridge; Willard district: Mormon Girl, Ogden Boilmakers, Overland claims. *Cache County* Paradise district.

*Dagget County* Red Creek: Yellow Canary uranium deposit.

*Davis County* Antelope Island; Farmington district: Morning Star group, Parrish Canyon; Wandering Jew mine.

*Emery County* Castle Dale; Castle Valley; San Rafael district: Delta mine, Dexter group, Copper Globe deposit.

*Garfield County* Circle Cliffs: Acme, Black Widow, Steam Boat, Blue Goose mines; Henry Mountains: Bromide, Oro mines, Cuprum claim.

*Grand County* Hoosier mines; La Sal district: Bornite, McCoy mines; Miners Basin district: Moab no. 1, High Ore mines; Richardson district; Salt Valley.

*Iron County* Iron Springs district- Granite Mountain, Iron Mountain.

*Juab County* Deep Creek Mountains: Gold Bond, Johnson Canyon, Singleton Canyon, Water Canyon mines; Detroit district: Charm, Copperhead, E. P. H., Ibex mines; Tintic district: Boss Tweed, Bullion Beck, Carissa, Centennial Eureka, Gemini, Iron Blossom, Sioux mines; Spring Creek district: Queen of Sheba mine; West Tintic district: Scotia, Tintic Western mines.

*Kane County* Paria Mining Company mine.

*Millard County* Church Hills: Stevens prospect; Detroit district: Almond, Blue Bell, Major Drum mines; Leamington district: Fool Creek Canyon.

*Morgan County* Morgan district: Chicago-Utah, Iron King, Morgan Consolidated, Morgan Crescent, Red Eagle mines; Round Valley: Copper Mountain mine.

*Piute County* Gold Mountain district: Sevier mine; Ohio district: Bully Boy and Webster, Cascade, Cop-

per Belt, Dalton, Iris, Shamrock, Wedge mines.

*Rich County* Swan Creek district: Victoria prospect. *Salt Lake County* Big Cottonwood district: Antelope, Eclipse, Prince of Wales mines, Bingham district: Butterfield, Columbia, Commercial, Dalton and Lark, Galena, Highland Boy, Midland, Old Jordan, Old Telegraph, Tiewaukee, U. S. and Lark, Yampa, York mines. Little Cottonwood district: Emma mine.

*San Juan County* Big Indian district: Big Indian Copper mine; Elk Ridge: Oakie, Woodenshoe No. 3 mines; La Sal Mountains; La Sal Quadrangle: Jackpot mine; Lisbon Valley: Climax nos. 1-2, Lisbon Copper mines; Monticello district: Copper Queen, Tuffy Copper mines; Monument Valley district: Oljeta, Skyline, Whirlwind mines; Paradox Valley district: Grey Dawn mine; White Canyon district: Bell, Four Aces, Fry No. 4, Happy Jack, Hideout, Jomac, Posey mines.

*Sevier County* Salina Creek district: Ball, Lead Hill mines; Sevier Canyon.

*Summit County* Park City district: Daly, Daly-Judge, Daly West, Jupiter, New York, Silver King, Silver King Consolidated, Woodside mines.

*Tooele County* Deep Creek Mountains: Complex, Dewey, Devils Pit, Eagles Nest, Gold Star, Laura, Monocco, Oro del Rey, Overland, Prosperity, Silver Queen mines; Dugway district: Belcher, Black Maria, Confidence, Kellys Hole, Metal States, Raymond-Bald Eagle mines; East Erickson district: Jessel Bezzel mine; Gold Hill district: Calavera, Copper Bloom, Copper Hill, Copperopolis, Copper Queen-Midland Mining Company, Gold Hill (U. S.), Ida Lull, Minnehaha, Monoco, New Baltimore, Ozark, Pole Star Copper Company, Rea, Silver King, Unadine, Victory no. 1, Yellow Hammer mines; Granite Mountain district: Blue Bell, Cannon Tank Canyon, Desert, Dutch Mountain, El Dorado, Mountain Queen mines; Mercur district: Mineral Hill mine; Ophir district: Dry Canyon area - Brooklyn, Kearsarge, Mono, Queen of the Hills mines; Ophir Hill area - Chicago, Cliff, Hidden Treasure, Sacramento mines; Silver Island district: Carrie Mack property; Willow Springs district.

*Uintah County* Browns Park area: Brush Creek district: Little Alta mine; Bullionville; Carbonate district: Dyer, Jessie Ewing mines, Red, Willow Creeks; Little Split Mountain; Uteland Knoll district (Ouray).

*Utah County* American Fork district: Miller mine; East Tintic district: Apex Standard, Eureka Bullion, Eureka Lily, Eureka Standard, Tintic Standard, Trixie mines; Thorpe Hills.

*Washington County* Mineral Mountain: Emma mine; Silver Reef district: Leeds, Newton, Requa mines; Tutsagubet district: Apex (Dixie) mine.

*Wayne County* Capitol Wash; Capitol Wash to Sheets

Gulch; Miners Mountain district: Old Faithful, Wonder Copper no. 1 mines; Torrey: T. R. Lode no. 1 mine. *Weber County* Cold Water Canyon; Weber district: New Azurite claim.

#### BALYDONITE

Basic hydrous copper lead arsenate,  $(\text{Pb}, \text{Cu})_3\text{As}_2\text{O}_8 \cdot (\text{Pb}, \text{Cu}) (\text{OH})_2 \cdot \text{H}_2\text{O}$ . Probably monoclinic. In mammillary concretions, fibrous, drusy. H. 4.5. G. 4.4. Color green, yellow green. Luster resinous.

*Summit County* Park City district: Daly-Judge mine.

*Utah County* East Tintic district.

#### BARITE

Barium sulfate,  $\text{BaSO}_4$ . Orthorhombic. Crystals commonly tabular, also prismatic. Globular forms, fibrous, lamellar, crested, earthy. H. 3-3.5. G. 4.5. Cleavage good. Fracture uneven. Brittle. Luster vitreous. Color white, or various tinges. Transparent to translucent.

*Beaver County* Antelope district; Beaver Lake district; Granite district: Big Pass, Contact mines; McGarry district; Pruess district: Blackbird, Cactus, Gold Reef mines; San Francisco district: Horn Silver mine.

*Box Elder County* Lucin district: Copper Mountain, Tri-State Minerals mines; Rosebud district.

*Emery County* Barium Incorporated mine.

*Grand County* Courthouse Wash; Little Grand district: Colorado Fuel and Iron Company mine; Needles; Tenmile Wash; Ryan Creek Scheelite prospect.

*Iron County* Escalante district: Escalante mine, Iron Springs district: Granite Mountain, Iron Mountain.

*Juab County* Deseret district: Rockwell shaft; Fish Springs district: Garrick mine; Mount Nebo district: Eva, Freddie mines; Tintic district: Boss Tweed, Carissa, Centennial Eureka, Eureka Hill, Gold Chain, Grand Central, Iron Blossom, Mammoth, Ophohonga, Swansea mines; West Tintic district: 88, 1903, Pyramid, Scotia, War Eagle mines.

*Kane County* Kitchen Corral Canyon.

*Morgan County* Argenta district: Carbonate Hill, Carbonate Gem mines.

*Piute County* Gold Mountain district; Marysvale district: Bullion Monarch mine; Mount Baldy district: Lucky Boy mine; Ohio district: Bully Boy and Webster mines. *Rich County* Swan Creek district: Victoria prospect. *Salt Lake County* Big Cottonwood district; Bingham district: Eagle Bird Lode, Lucky Boy, Queen mines; Little Cottonwood district: Albion, Flagstaff mines. *San Juan County* White Canyon district: Happy Jack mine.

*Summit County* Park City district.

*Tooele County* Bluebell district: Morgan mine; Deep Creek Mountains: Probert mine; Dugway district: Buckhorn, Confidence, Four Metals, Francis, Great Eastern, Juno, Kellys Hole, Lauris, Nautilus, Pride of the West mines; Gold Hill district: Christmas Mining Company, Garrison Monster, Reaper mines; Ibapah Mountains; Mercur district; Ophir district: Dry canyon area; Lion Hill area - Buffalo, Chloride Point, Douglas, Lion, Zella mines; Ophir Hill area; Silver Island district: Carrie Mack Property; Wild Cat Mountain: Silver Queen mine.

*Utah County* American Fork district: Bog, Dutchman, Pacific, Yankee mines; East Tintic district: Burgin, Eureka Lily, Eureka Standard, Iron King, Zuma mines; Tintic Standard mines; Payson district: Syndicate mine; Santaquin district: Union Chief mine; Silver Lake district: Milkmaid, Ontario mines.

*Wasatch County* Strawberry area, along thrust fault. *Weber County* Cold Water Canyon.

#### BARNESITE

Hydrous sodium vanadate,  $\text{Na}_2\text{V}_6\text{O}_{16} \cdot 3\text{H}_2\text{O}$ . Monoclinic. Consists of microscopic bladed to fibrous crystals, in loose aggregates or in radiating cluster. Color dark red. Luster adamantine. Grains soft and friable. G. 3.2. Occurs in small cavities, fractures, and fillings in sandstone.

*Grand County* Thompsons district: Cactus Rat mine.

#### BARYTOCALCITE

Calcium barium carbonate,  $\text{CaBa}(\text{CO}_3)_2$ . Monoclinic. Usually short to long prismatic crystals. Cleavage perfect. Fracture uneven. Brittle. H. 4. G. 3.6. Luster vitreous. Colorless to white, gray, green, yellow. Occurs in dolomitic shale.

*Uintah County* Sun Oil Company South Ouray well.

#### BASALUMINITE

Hydrous aluminum sulphate,  $\text{Al}_4(\text{SO}_4)(\text{OH})_{10} \cdot 5\text{H}_2\text{O}$ . Hexagonal. Massive, microcrystalline. Compact to powdery, G. 2.12. Fracture conchoidal when compact. Color white, often shaded yellow, orange, or brown, Luster dull.

*Emery County* Temple Mountain: Fueemrol No. 2 mine.

#### BASSANITE

Hydrous calcium sulfate,  $2\text{CaSO}_4 \cdot \text{H}_2\text{O}$ . Monoclinic. Pseudomorphs after gypsum, composed of microscopic needles in parallel arrangement. Color white. G. 2.7.

Occurs with anhydrite in Green River Formation.  
*Duchesne County* Green River Formation.

**BASSETITE**

Hydrated iron uranium phosphate,  $\text{Fe}(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$ . Monoclinic. Occurs as plates of flattened crystals. Cleavage perfect. H. 2.5 G. 3.4. Luster vitreous. Color olive green, also yellow, brown. Transparent. Not fluorescent.

*Emery County* Green River district: Denise no. 1 mine; San Rafael district: Fuehrol no. 2 mine.

**BAYLEYITE**

Hydrated magnesium uranium carbonate,  $\text{Mg}_2(\text{UO}_2)(\text{CO}_3)_3 \cdot 18\text{H}_2\text{O}$ . Monoclinic. Occurs as minute, short prismatic crystals, also in acicular and divergent groups. H. 2-2.5. G. 2. Color sulfur yellow. Luster vitreous.

*Emery County* San Rafael district: Delta mine.

*San Juan County* Big Indian district: Mi Vida mine; Elk Ridge; Coral claim; White Canyon district: Hideout mine.

**BEAVERITE**

Basic sulfate of lead, copper, ferric iron, and aluminum,  $\text{Pb}(\text{Cu,Fe,Al})_3(\text{SO}_4)_2(\text{OH})_6$ . Hexagonal. Friable and earthy masses. G. 4.4. Color canary yellow.

*Beaver County* San Francisco district: Horn Silver mine.

*Millard County* Church Hills: Stevens prospect.

*Salt Lake County* Little Cottonwood district: Centennial Alta mine.

*Tooele County* Ophir district: Ophir Hill area - Hidden Treasure mine.

*Utah County* East Tintic district.

**BECQUERELITE**

Hydrated calcium uraninate,  $\text{CaU}_6\text{O}_{19} \cdot 11\text{H}_2\text{O}$ . Orthorhombic. Crystals tabular and elongated, striated; also massive. H. 2.5. G. 5.2. Cleavage good. Luster adamantine. Color amber to brownish yellow. Streak yellow. Transparent.

*Emery County* San Rafael district: Delta mine, Green Vein Mesa, Consolidated, Lucky Strike, Lucky Strike no. 2 mines.

*Grand County* Seven Mile Canyon.

*San Juan County* Big Indian district: Big Buck mine; Red Canyon district: Frey no. 4, Posey mines; White Canyon district: Happy Jack, Hideout, Posey mines.

**BEIDELLITE**

Hydrous aluminum silicate,  $(\text{Na, Ca}/2)_{0.33}\text{Al}_2(\text{Al, Si})_4\text{O}_{10}(\text{OH})_2 \cdot n\text{H}_2\text{O}$ . Monoclinic. A member of the smectite group. Occurs in thin crystal plates. H. 1.5. G. 2.6. Cleavage one direction. Luster vitreous to waxy. Color white, red, gray.

*Tooele County* Gold Hill district: Copper Bloom mine.

*Utah County* Clay Canyon; East Tintic district.

*Sanpete County* near Fairview.

**BENTONITE (See MONTMORILLONITE)****BERTRANDITE**

Hydrous beryllium silicate,  $\text{B}_4\text{Si}_2\text{O}_7(\text{OH})_2$ . Orthorhombic. Occurs in small tabular or prismatic crystals, heart shaped twins. Cleavage good. H. 6-7. G. 2.6. Colorless to pale yellow. Luster vitreous. Occurs in association with fluorite in tuffaceous beds replacing dolomite nodules. Grains about one micron in diameter.

*Juab County* Honeycomb Hills; Thomas Range: Spor Mountain - Claybank, Blue Chalk, Hogsback, Northend, Rainbow, Roadside claims.

*Tooele County* Gold Hill district: Rodenhouse Wash.

**BERYL**

Beryllium aluminum silicate,  $\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$ . Hexagonal. Crystals usually long prismatic, often vertically striated. Also coarse columnar or granular to compact. H. 7.5-8. G. 2.7. Cleavage poor. Fracture conchoidal to uneven. Brittle. Luster vitreous. Color emerald green, pale green to blue, yellow, white. Transparent to translucent. Aquamarine variety found in Ibapah Mountains; bixbite, raspberry red color, found on Topaz Mountain; morganite, pink to rose red, variety found on west side of Spor Mountain.

*Beaver County* Granite district: Miller, Scheelite group mines.

*Daggett County* Red Creek Complex.

*Juab County* Deep Creek Mountains: Apex, Jumbo, Mary, Queen of Sheba, Trout Creek mines. Goshute Indian Reservation: Ibapah Mountains: Fifteenmile Canyon; Thomas Range: Spor, Topaz Mountains; Trout Creek district: Apex mine; Spring creek district: Queen of Sheba mine; Dugway Range.

*Tooele County* Dugway district: East Erickson district: Hard - to - Beat, Sheeprock Canyons; Granite Mountain district; Blue Bell mine. Ibapah Mountains.

**BETA-URANOPHANE**

(See BETA-URANOTILE)

**BETA-URANOTILE**

Basic hydrated silicate of calcium and uranium,  $\text{Ca}(\text{UO}_2)_2(\text{SiO}_3)_2(\text{OH})_2 \cdot 5\text{H}_2\text{O}$ . Monoclinic. Occurs as velvety coatings, fanlike aggregates or needlelike crystals. Cleavage perfect. Fracture conchoidal. Brittle. H. 2.5-3. G. 3.9. Color usually yellowish green, citron yellow. Luster vitreous, silky. Fluoresces faint green.

*Emery County* San Rafael district: Delta mine.

*Garfield County* Henry Mountains.

*Juab County* Thomas Range: Good Will, Yellow Chief mines.

*Piute County* Marysvale district: Freedom no. 2 mine.

*San Juan County* Paradox Valley district: Grey Dawn mine.

**BEUDANTITE**

Basic sulfate-arsenate of lead and ferric iron,  $\text{PbFe}_3(\text{AsO}_4)(\text{SO}_4)(\text{OH})_6$ . Hexagonal. H. 3.5-4.5. G. 4.2. Color black, dark green, brown. Streak grayish yellow, greenish. Luster vitreous to resinous. Transparent to translucent.

*Tooele County* Gold Hill district: Gold Hill (U.S.), Gold Hill (Western Utah) mines; Rush Valley district: Honerine mine.

**BICKERITE (See AUSTINITE)****BIEBERITE**

Hydrous cobalt sulfate,  $\text{CoSo}_4 \cdot 7\text{H}_2\text{O}$ . Monoclinic. Occurs as crusts and efflorescences. Cleavage good. Luster vitreous. H. 2. G. 1.9. Color rose-red, flesh red.

*Emery County* San Rafael district: Lucky Strike no. 2 mine.

*San Juan County* Elk Ridge, White Canyon district: Happy Jack mine.

**BILINITE**

Hydrous iron sulfate,  $\text{Fe}_3(\text{SO}_4)_4 \cdot 22\text{H}_2\text{O}$ . Monoclinic. Radial fibrous aggregates. H. 2. G. 1.88. Color white to yellowish.

*Utah County* East Tintic district.

**BILLINGSLEYITE**

Silver sulfosalt,  $\text{Ag}_7(\text{AsSb})\text{S}_6$ . Orthorhombic. Occurs as fine grained aggregates. H. 2.5. G. 5.9. Color lead gray. Metallic luster. Slightly sectile.

*Utah County* East Tintic district: North Lily mine.

**BINDHEIMITE**

A pyroantimonate of lead,  $\text{Pb}_2\text{Sb}_2\text{O}_6 \cdot (\text{O},\text{OH})$ . Isometric. Occurs as cryptocrystalline masses, dense to earthy, or as incrustations. H. 4-4.5. G. 4.6-5.6. Fracture earthy to conchoidal. Luster resinous, dull or earthy. Color yellow, brown, reddish brown, gray white, greenish. Streak white to yellow. Opaque to translucent.

*Beaver County* San Francisco district: Horn Silver mine.  
*Box Elder County* Willard district: Ogden Boilmakers claim.

*Juab County* Tintic district: Scotia mine; West Tintic district: War Eagle claims.

*Utah County* East Tintic district.

**BINNITE (See TENNANTITE)****BIOTITE**

Potassium magnesium iron aluminum silicate, essentially  $\text{K}(\text{Mg},\text{Fe})_3(\text{Al}-\text{Si}_3\text{O}_{10})(\text{OH})_2$ . Monoclinic. Crystals tabular or short prismatic. Commonly in irregular foliated masses, also in scales and micaceous aggregates. H. 2.5-3. G. 2.7-3.1. Basal cleavage perfect. Folia flexible and elastic. Luster vitreous, pearly. Color green to black, deep brown. Biotite is a widely-occurring rock-forming mineral.

*Beaver County* San Francisco district.

*Davis County* Antelope Island.

*Grand County* La Sal Mountains (North Mountain).

*Iron County* Paragonah: Iron Peak.

*Juab County* Spring Creek district: Queen of Sheba mine.

*Millard County* House Range: Amasa Valley, Notch Peak intrusive; Twin Peaks.

*Morgan County* Arthur Fork.

*Piute County* Marysvale district.

*Salt Lake County* Little Cottonwood district: Alta mine; Little Cottonwood stock.

*Tooele County* East Erickson district: Ekker Canyon prospect, Silver King mine, South Pine Canyon; Gold Hill district: Gold Bond, Reaper mines; Stansbury Mountains: North Willow Canyon.

*Utah County* Little Cottonwood stock.

*Weber County* Sierra Madre district: Napoleon-Maghera group.

**BIRNESSITE**

A hydrous manganese oxide, perhaps  $(\text{Na},\text{Ca})\text{Mn}_7\text{O}_{14} \cdot 3\text{H}_2\text{O}$ . Hexagonal. Earthy, some grains show

facets; rosettes. H.1.5. G. 2.9. Crystals are nearly opaque. Color dark brown. Occurs as tiny rosettes in cavities in quartz.

*Utah County* East Tintic district: Burgin mine.

*Washington County* Enterprise.

#### BISCHOFITE

Hydrous magnesium chloride,  $MgCl_2 \cdot 6H_2O$ . Monoclinic. Crystalline granular, foliated; sometimes fibrous. Fracture conchoidal to uneven. H. 1-2. G. 1.6. Colorless to white. Luster vitreous to dull.

*Tooele County* Salduro; Wendover.

#### BISMITE

Bismuth trioxide,  $Bi_2O_3$ . Monoclinic. Massive, compact granular to earthy. H. 4.5. G. 8.6-9.2. Fracture uneven to earthy. Luster subadamantine to dull, earthy. Color grayish green, yellow.

*Juab County* Tintic district: Boss Tweed, Eagle, Blue Bell mines.

*Salt Lake County* Little Cottonwood district: South Hecla mine.

*Tooele County* Gold Hill district: Wilson Consolidated mine.

*Utah County* East Tintic district: Eureka Lily mine.

#### BISMOCLITE

Bismuth oxychloride,  $BiOCl$ . Tetragonal. Occurs only massive, compact, earthy, columnar to platy fibrous. H. 2-2.5. G. 7.7. Cleavage good. Very plastic. Color creamy-white, gray, yellow. Luster greasy to silky, dull to earthy.

*Juab County* Tintic district: Eagle, Blue Bell mines.

#### BISMUTH

Native bismuth, Bi. Hexagonal. Crystals rare. Foliated or granular. H. 2.5. G. 9.8. Cleavage good. Sectile. Brittle. Luster metallic. Color and streak silver-white, reddish tint. Opaque.

*Juab County* Tintic district: Boss Tweed, Emerald mines.

*Salt Lake County* Bingham district; Little Cottonwood district: South Hecla mine.

*Tooele County* Gold Hill district: Copper Bloom, Doctor, Lucy L., Wilson Consolidated mines; Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.

#### BISMUTHIAN BINDHEIMITE

Bismuth antimonate of lead,  $Pb_2(Sb,Bi)_2O_6(O,OH)$ . Isometric. Occurs as cryptocrystalline masses, earthy to dense, or as incrustations. H. 4-4.5. G. 4.6-5.6. Luster resinous, dull, or earthy. Color clear to pale yellow to deep yellow-brown.

*Juab County* Tintic district: Mammoth mine.

#### BISMUTHINITE

Bismuth trisulfide,  $Bi_2S_3$ . Orthorhombic. Usually massive, foliated or fibrous. H. 2. G. 6.8. Cleavage good. Somewhat sectile. Luster metallic. Color and streak lead-gray to tin - white, with a yellow tarnish. Opaque.

*Beaver County* Bismuth mine; Star district: Commonwealth, Kemple, Progressive, St. Mary's mines.

*Box Elder County* Newfoundland district.

*Juab County* Tintic district: Mammoth mine; West Tintic district.

*Piute County* Ohio district: Tunnel Extension No. 2 mine.

*Salt Lake County* Little Cottonwood district: South Hecla mine.

*Tooele County* Blue Bell district: Bogan mine; Gold Hill district: Copper Bloom, Lucy L., Wilson Consolidated mines; Overland Canyon.

*Utah County* East Tintic district: Eureka Lily, North Lily, Tintic Standard mines.

#### BISMUTITE

Bismuth subcarbonate,  $(BiO)_2(CO_3)$ . Tetragonal. Fibrous growths, earthy, or pulverulent. H. 2.5-3.5. G. 6.7-7.4. Cleavage good. Luster vitreous. Color white, green, yellow, gray. Streak greenish gray. Transparent in small grains.

*Beaver County* Star district: Commonwealth, Kemple, Progressive, St. Mary's mines.

*Box Elder County* Lucin district: Empire mine.

*Juab County* Detroit district: Charm, Copperhead, E. P. H., Ibex mines; Tintic district: Boss Tweed, Carissa, Eagle and Blue Bell, Victoria mines.

*Millard County* Detroit district: Almond, Blue Bell, Major Drum mines.

*Salt Lake County* Bingham district.

*Tooele County* Gold Hill district: Copper Bloom, Lucy L., Wilson Consolidated mines.

#### BIXBITE (See BERYL)

**BIXBYITE**

Iron manganese oxide,  $(\text{Mn,Fe})_2\text{O}_3$ . Isometric. Black cubic crystals. H. 606.5. G. 4.9. Cleavage poor. Fracture irregular. Luster metallic to submetallic. Color black. Streak black. Opaque.

*Juab County* Dugway Range; Thomas Range: Topaz Mountain.

**BLOEDITE**

Hydrated sulfate of sodium and magnesium,  $\text{Na}_2\text{Mg}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ . Monoclinic. Crystals short prismatic. Massive granular or compact. Fracture conchoidal. Brittle. H. 2.5-3. G. 2.3. Colorless. Luster vitreous. Transparent. Taste faint, saline, and bitter.

*Box Elder County* Great Salt Lake shores.

*Davis County* Great Salt Lake shores.

*Salt Lake County* Great Salt Lake shores.

*Tooele County* Great Salt Lake shores.

**BOEHMITE**

Hydrous aluminum oxide, H. 3.  $\text{Al}(\text{OH})_3$ . Orthorhombic. In microscopic lenticular crystals. G. 3.01. Color white, gray, tan, or reddish.

*Utah County* East Tintic district.

**BOG ORE (See GOETHITE)****BOLTWOODITE**

Hydrous potassium uranium silicate,  $\text{K}_2(\text{UO}_2)_2(\text{SiO}_3)_2 \cdot 5\text{H}_2\text{O}$ . Orthorhombic; may be monoclinic. Occurs as radiating acicular to fibrous aggregates. H. 3.5. G. 3.6. Cleavage good. Luster pearly to silky. Color yellow. Fluoresces dull green. Encrusts primary uraninite. *Emery County* San Rafael district: Delta, Pay Day mines.

*Grand County* Seven Mile Canyon.

*San Juan County* Blue Jay mine; Julia claims; Pete no. 6 claim; Red Canyon district: Jerry group; White Canyon district: Happy Jack mine.

**BOOTHITE**

Hydrous copper sulfate,  $\text{CuSO}_4 \cdot 7\text{H}_2\text{O}$ . Monoclinic. Usually massive with a crystalline structure, fibrous. Cleavage poor. H. 2-2.5. G. 2.1. Luster vitreous, in fibrous masses silky or pearly. Color pale blue. Secondary mineral.

*San Juan County* White Canyon district: W. N. mine.

**BORICKITE**

Hydrous basic calcium iron phosphate, probably  $\text{CaFe}_5(\text{PO}_4)_2(\text{OH})_{11} \cdot 3\text{H}_2\text{O}$ . Amorphous, Reniform massive, compact. In part opaline. H. 3.5. G. 2.7. Color and streak reddish-brown. Luster weak waxy. Opaque.

*Juab County* Tintic district: Ajax, Mammoth mines.

**BORNITE**

Copper iron sulfide,  $\text{Cu}_5\text{FeS}_4$ . Isometric. Usually massive, granular or compact. H. 3. G. 5. Cleavage poor. Fracture conchoidal, uneven. Luster metallic. Color copper-red to bronze, with iridescent tarnish. Streak grayish black. Opaque.

*Beaver County* Beaver Lake district; Granite district: Contact group; Lincoln district: Creole mine; Rocky district: Bawana, Maria, Old Hickory mines.

*Box Elder County* Crater Island district: Copper Blossom mine; Newfoundland district: Copper Ridge; Promontory district: Lakeview mining properties.

*Daggett County* Red Creek: Yellow Canary uranium deposits.

*Davis County* Farmington district: Parrish Canyon.

*Emery County* San Rafael district: Maybe mine.

*Garfield County* Henry Mountains.

*Grand County* Hoosier mine; La Sal district: Bornite, McCoy mines; Seven Mile Canyon: Shinarump nos. 1-3 claims.

*Juab County* Deseret Mountain district.

*Salt Lake County* Big Cottonwood district: Big Cottonwood, Columbus-Rexall, Mountain Lake mines; Bingham district: Bingham Copper pit, Carr Fork, Copper Center tunnel, Galena, Old Jordan, Highland Boy, Yampa mines; Little Cottonwood district: Alta Stock contact zone, South Hecla mine.

*San Juan County* Elk Ridge, Payday mine; La Sal Mountains; Monticello district: Copper Queen mine; White Canyon district: Blue Lizard, Happy Jack, Hideout, White Canyon No. 1, W. N. mines.

*Summit County* Park City district: Daly, Ontario mines.

*Tooele County* Gold Hill district: Alvarado, Cane Springs, Copperopolis, Doctor, Frankie, Ida Lull, Midas mines.

*Uintah County* Browns Park area; Carbonate district: Dyer mine.

*Utah County* East Tintic district; Eureka Lily, Eureka Standard, Trixie mines; Silver Lake district: Milkmaid mine.

*Wasatch County* Blue Ledge district: Mayflower mine.

*Washington County* Silver Reef district.

*Weber County* Sierra Madre district: Eldorado property.



**BOULANGERITE**

Lead antimony sulfide,  $Pb_5Sb_4S_{11}$ . Monoclinic. In prismatic or tabular crystals, Plumose, fibrous, granular, or compact. H. 2.5-3. G. 5.7-6.3. Cleavage good. Brittle. Luster metallic. Color bluish lead-gray; often yellow spots due to oxidation. Streak brownish gray to brown. Opaque.

*Summit County* Park City district: Park City Consolidated mine.

*Tooele County* Bingham district: May Flower mine; Gold Hill district: Rube mine.

**BOURNONITE**

Lead copper sulfantimonite,  $PbCuSbS_3$ . Orthorhombic. Usually short prismatic to tabular crystals. Also massive, granular to compact. H. 2.5-3. G. 5.7-5.9. Cleavage poor. Fracture uneven. Luster metallic, brilliant. Color and streak steel gray. Opaque.

*Salt Lake County* Bingham district; Little Cottonwood district: Albion mine.

*Summit County* Park City district: Daly Judge, Daly West, Silver King, Woodside mines.

**BRAITSCHITE**

Hydrous calcium rare-earth borate,  $7(Ca,Na_2)O \cdot RE_2O_3 \cdot 11B_2O_3 \cdot 7H_2O$ . Hexagonal. Very small platy crystals. Occurs in nodules in anhydrite beds. G 2. 8. Colorless to white.

*Grand County* Cane Creek: Texas Gulf Potash mine.

**BRAUNITE**

Manganese silicate,  $Mn^{2+}Mn_6^{3+}, SiO_{12}$ . Pyramidal forms, also granular massive. Cleavage good. Fracture uneven. Brittle. H. 6-6.5. G. 4.8. Luster submetallic. Color dark brownish black to steel gray. Streak same. Weakly magnetic. Opaque.

*Juab County* San Pitch Mountains: Black Jack (Kendall-Duvall) claims.

**BRAVOITE**

Nickel iron sulfide,  $(Ni,Fe)S_2$ . Isometric. Usually in crusts or nodular masses, with radial fibrous structure. Brittle. H. 5½-6. G. 4.6. Luster metallic. Color steel gray.

*Emery County* San Rafael district: Delta mine.

**BRICKERITE (See AUSTINITE)****BROCHANTITE**

Basic copper sulfate,  $Cu_4(SO_4)(OH)_6$ . Monoclinic. Occurs in groups of prismatic acicular crystals, drusy crusts. Also massive, reniform. H. 3. 5-4. G. 3.9. Cleavage good. Fracture uneven. Luster vitreous. Color emerald green, blackish green. Streak pale green. Transparent to translucent.

*Beaver County* San Francisco district: Horn Silver mine. *Daggett County* Red Creek: Yellow Canary uranium deposit.

*Emery County* San Rafael district: Delta mine.

*Juab County* Deseret district. Tintic district: Boss Tweed, Carissa, Eureka Hill, Mammoth mines.

*San Juan County* Red Canyon district: Posey mine: White Canyon district: Happy Jack mine, Hideout, Posey mines.

*Summit County* Park City district: Silver King, Woodside mines.

*Tooele County* Ophir district: Dry Canyon area.

*Utah County* East Tintic district: Burgin mine.

*Wayne County* Chimney Rock to Tantilus Flat.

**BROCKITE**

Hydrous rare earth phosphate carbonate,  $(Ca,Th,Ce)(PO_4)(CO_3) \cdot H_2O$ . Hexagonal. G. 3.9. Conchoidal fracture. Stubby hexagonal crystals. Color deep red brown. Luster greasy to vitreous.

*Sevier County* Monroe Canyon in a vein.

**BRONZITE (See ENSTATITE)****BROOKITE**

Titanium dioxide,  $TiO_2$ . Orthorhombic. Usually tabular and elongated crystals. Cleavage poor. Fracture subconchoidal to uneven. Brittle. H. 5.5-6. G. 4.1. Color brown, yellowish brown, reddish brown. Streak uncolored, or yellowish.

*Emery County* Emery: Phillips Huntington no. 1 well.

**BRUCITE**

Magnesium hydroxide,  $Mg(OH)_2$ . Hexagonal. Crystals usually broad tabular, also foliated massive, fibrous. H. 2.5. G. 2.4. Cleavage perfect. Folia flexible. Sectile. Luster pearly, waxy. Color white, pale green, gray, blue. Streak white. Transparent.

*Beaver County* Beaver Lake district.

*Salt Lake County* Big Cottonwood district: Big Cottonwood, Mountain Lake mines; Little Cottonwood district: Alta and Clayton Peak stocks along contact.

*Utah County* Silver Lake district: Deer, Silver Creeks.  
*Washington County* Mineral Mountain: Emma, Greger-son mines.

#### BURBANKITE

Rare earth carbonate,  $(\text{Na}, \text{Ca}, \text{Sr}, \text{Ba}, \text{Ce})_6(\text{CO}_3)_5$ . Hexagonal. Color grayish yellow. H. 3.5. G. 3.5. Cleavage good. Effervesces in cold HC.  
*Duchesne County* Green River Formation.  
*Uintah County* Sun Oil Company South Ouray well, Green River Formation.

#### BUSHMANITE (See PICKERINGITE)

#### BUTLERITE

Hydrous basic ferric sulfate,  $\text{Fe}(\text{SO}_4)(\text{OH}) \cdot 2\text{H}_2\text{O}$ . Monoclinic. Usually tabular. Cleavage good. H. 2.5. G. 2.5. Color deep orange. Streak yellow. Luster vitreous. Occurs with uranium ores.  
*Emery County* San Rafael district: Calf Mesa, Dexter group.

#### CALAMINE (See HEMIMORPHITE)

#### CALAUERITE

Gold ditelluride,  $\text{AuTe}_2$ . Monoclinic. Rarely in small lath-shaped crystals. Also massive granular. H. 2.5-3. G. 9. No cleavage. Fracture subconchoidal to uneven. Luster metallic. Color brass-yellow to silver-white. Streak yellowish to greenish gray. Opaque. Very brittle.  
*Salt Lake County* Bingham district: Highland Boy, Yampa mines.  
*Summit County* Park City district: Park City Consolidated mine.  
*Tooele County* Gold Hill district: Lucy L. mine.  
*Utah County* East Tintic district: Eureka Lily, Eureka Standard mines.

#### CALCIOVOLBORTHITE

Basic copper calcium vanadate,  $\text{CuCa}(\text{VO}_4)(\text{OH})$ . Orthorhombic. Occurs in pseudohexagonal scales, rosettes, and fine crystalline granular masses. H. 3.5. G. 3.5. Cleavage good one direction. Luster vitreous to pearly. Color yellow green. Subtranslucent.  
*Grand County* Moab Valley; Richardson district.  
*San Juan County* Monument Valley district: Whirlwind mine.

#### CALCITE

Calcium carbonate,  $\text{CaCO}_3$ . Hexagonal. Rhombohedral and scalenohedral crystals common. Also fibrous, granular, earthy, chalky, stalactitic. H. 3. G. 2.7. Cleavage perfect rhombohedron. Luster vitreous. Color usually white, colorless, may be various shades when impure. Shows double refraction.

*Beaver County* Antelope district; Beaver Lake district: Rat Ridge, Skylark mines; Blue Mountains: Susie Q claims; Granite district: Big Pass, Rattler groups; Indian Peak district: Blue Bell, Cougar Spar, Dugout, JB, Noonday, Lost Sheep, Utah mines; Lincoln district: creole mine; McCarry district; Newton district: Sheep Rock mine; Pine Grove district: Monarch mine; San Francisco district: Horn Silver mine; Star district: Commonwealth, Kemple, Progressive, St. Mary's mines.

*Box Elder County* Box Elder district; Crater Island district: Copper Blossom mine.

*Carbon County* near Price.

*Garfield County* Mammoth Creek.

*Grand County* Agare Switch; Cisco; Courthouse Wash; Miners Basin district: Dewey, High Ore, McCormick mines; Little Grand district: Colorado Fuel and Iron Company mines, Needles, Tenmile Wash.

*Juab County* Mt. Nebo district: Eva, Highland mines; Thomas Range: Autunite no. 8, Claybank, Blue Chalk, Hogsback, Northend, Rainbow, Roadside, Eagle Rock, Harrisite, Oversight, Thursday mines; Topaz Mountain: Tintic district: Carissa, Emerald, Iron Blossom mines; San Pitch Mountains: Orme property; West Tintic district: Tintic Western, War Eagle claims.

*Kane County* Kitchen Corral Canyon; Orderville.

*Piute County* Marysvale district.

*Rich County* Bear River Range: Lakeview claims.  
*Salt Lake County* Bingham district; Camp Williams: Evans lime quarry.

*San Juan County* Monticello district: Duckett mine.  
*Sevier County* Henry district: Trinity prospect.

*Summit County* Park City district.

*Tooele County* Cedar Mountains: Dugway district: Boston, Confidence mines, Kellys Hole; Gold Hill district, Alvarado, Bonnemort, Rea, Rube mines; Johnson Pass; Mercur district: Geyser Marion, Golden Gate, Mercur mines; Ophir district: Dry Canyon area; Lion Hill area - Lion, Douglas, Zella mines; Ophir Hill area - Ophir Coalition mine; Stansbury Mountains. Grantsville.

*Uintah County* Sun Oil Company South Ouray well.  
*Utah County*. East Tintic district; Lehi district: Pelican Point area - Canyon, Foothill and Hilltop, Pelican and Utah Valley veins, Philippine, Potter claims; Pfeiffer Canyon area; Provo district: Monarch mine; Santaquin district: Black Balsam, Blue Eagle, Union Chief mines;

## Wells Canyon.

*Wasatch County* Bonanza Flat.*Washington County* Bull Valley district; Silver Reef district.*Weber County* Sierra Madre district: Eldorado property.

## CALEDONITE

Basic carbonate - sulfate of lead and copper,  $\text{Cu}_2\text{Pb}_5(\text{SO}_4)_3(\text{CO}_3)(\text{OH})_6$ . Orthorhombic. In small prismatic crystals as coatings, rarely massive. H. 2. 5-3. G. 5.8. Cleavage good. Rather brittle. Luster resinous to vitreous. Color deep green to bluish green. Streak greenish. Translucent.

*Salt Lake County* Little Cottonwood district: Oxford, Geneva mines.

## CARBONATE APATITE

Hydrous calcium carbonate phosphate,  $\text{Ca}_5(\text{PO}_4, \text{CO}_3)_3(\text{OH}, \text{F})$ . Hexagonal. Cleavage indistinct. Fracture conchoidal. Brittle, H. 5. G. 3.1. Luster vitreous. Color sea - green, pale blue, brown, colorless. Occurs in Phosphoria Formation.

*Daggett County* Uintah Mountains.*Duchesne County* Uintah Mountains.*Uintah County* Brush Creek; Frandson Canyon; Little Brush Creek; Rock Creek.*Wasatch County* Uinta Mountains.

## CARBON DIOXIDE

Carbon dioxide,  $\text{CO}_2$ . Colorless, odorless gas. Slightly soluble in water. Density 1.53 in dry ice. Utilized in the manufacture of dry ice. Associated with natural gas.

*Carbon County* Farnham Dome; Gordon Creek.*Grand County* Harley Dome.

## CARMINITE

Basic lead iron arsenate,  $\text{PbFe}_2(\text{AsO}_4)_2(\text{OH})_2$ . Orthorhombic. Crystals lath - like, flattened, and elongated. In tufted or satiny aggregates of fine needles, also massive. H. 3. 5. G. 4.1. Luster vitreous, pearly. Color carmine-red, reddish-brown. Streak reddish-yellow. Cleavage good. Translucent.

*Tooele County* Gold Hill district: Gold Hill (U. S.) mine.

## CARNALLITE

Hydrous potassium magnesium chloride,  $\text{KMgCl}_3 \cdot 6\text{H}_2\text{O}$ . Orthorhombic. Usually massive, granular. H.

2.5. G.1.6. No distinct cleavage. Luster greasy. Colorless to white, often reddish. Transparent to translucent. Taste bitter.

*Grand County* Cane Creek: Texas Gulf Potash mine; Crescent Junction; Paradox basin; Salt Valley; Seven Mile Anticline.*San Juan County* Moab Valley; Paradox Valley district. *Tooele County* Salduro; Wendover.

## CARNELIAN

(See CRYPTOCRYSTALLINE QUARTZ)

## CARNOTITE

Hydrous potassium uranium vanadate,  $\text{K}_2(\text{UO}_2)_2(\text{VO}_4)_2 \cdot 3\text{H}_2\text{O}$ . Orthorhombic or monoclinic? Rarely found in crystals. Usually occurs as powder or loosely coherent aggregates, also disseminated. G. 5. Cleavage perfect basal. Luster dull or earthy. Color bright yellow to greenish-yellow.

*Beaver County* Southern San Francisco Mountains: White Mountain, one mile east.*Carbon County* Coal Creek.*Daggett County* Red Creek: Yellow Canary uranium deposit.*Emery County* Cedar Mountain district; Green River district: Yellow Queen mine; San Rafael district: Blue Bird, Calyx, Camp Bird Nos 7, 12, and 13, Delta, Flat Top Mesa, Migliaccio, North Mesa Nos. 1, 2 and 5, Temple Rock, South Temple Wash, Vagabond, West Little Horse Mesa, Wild Horse Canyon mines.*Garfield County* Circle Cliffs: Black Widow, Dream prospect, Horse Head, Lone B mines; Henry Mountains: Crescent Creek: Little Rockies district: Del Monte group, Ekker mine; North Wash district: S.Y. Guthrie group, V.C.A. deposits; Trachyte district: Blitz nos. 1-7, June Bell nos. 1-4, Minnie Pearl nos. 1-2 claims, Straight, Trachyte Creeks, Trachyte nos. 1-2, V.C.A. claims.*Grand County* Beaver Mesa: Corvusite nos. 1-3 mines; La Sal district: Jack claim; Miners Basin district: West Slope mine; Mill Creek; Moab Valley; Pack Creek; Polar Mesa district: Elva M. and Adjoining, Elva M. and Imp, Polar nos. 2-3, Rim Rock and Rim Rock no. 2 claims; Richardson district; Seger Station; Seven Mile Canyon: Shinarump nos. 1-3 claims: Thompsons area; Thompsons district: Cactus Rat, Flat Top no. 1, Red Vanadium groups; Yellow Cat district: Uvanco mine. *Iron County* Cedar Canyon.*Juab County* Thomas Range: Bell Hill, Blowout, Dell no. 5, Eagle Rock, Floride, Fluorine Queen, Fluorine Queen no. 4, Harrisite, Hilltop, Lost Sheep, Lucky Louie mines; Topaz Mountain.*Kane County* Bulloch group; south of Paria.

*San Juan County* Abe Day's vanadium claim; Big Indian district: Cal Uranium, Mi Vida, Radon, Rattlesnake mines; Browns Hole area; Bull Canyon; Cane Springs Pass: Bridger Jack Flat; Chess Ridge; Cottonwood Canyon district: Basin, Big Hole, Birthday Shale, Blue Bird, East Bank, Found no. 2, Hangover nos. 1-2, Ridge nos. 1 - 2, Ridge nos. 1 - 2 mines; Dry Valley; East Canyon; Elk Ridge: Coral claim; Indian Creek; La Sal Mountains; La Sal Quadrangle: Angle, Brushy Basin Nos. 1 and 3, Confusion, Elray, Evening Star, Firefly-Pigmy, Hesperus, Jackpot, Little Dawn, Little Peter, Lucky No. 1, Marjorie Ann, Maud, Morning Star, New Yellow Spot, Sumner, Too High, Uranium Girl, Valley View, Vista Grande, Wedge, Yellow Bird, Yip Yip mines; Lisbon Valley: Climax nos. 1 - 2 claims; Montezuma Canyon: Bradford No. 5, Cottonwood, Dixie No. 1, Last Chance No. 1, Lucky Boy, Rim Rock, Rock, Slum, Strawberry, Titus No. 3, Verdure, West Cliff House No. 8 mines; Monticello district; Navajo Reservation; Paradox Valley district: Grey Dawn, Vanadium Queen mines; Red Canyon district; Spanish Valley Anticline; White Canyon district: Four Aces, Happy Jack, Hideout, White Canyon no. 1, White Fawn, Yellow Circle mines.

*Uintah County* Ashley Creek.

*Washington County* Santa Clara district; Silver Reef district: Buckeye, Butte Reef, Doyle Shaft, East Reef mines.

*Wayne County* Capitol Reef Monument; Coleman Canyon to Oak Creek; Fruita: Oylar mine; Hanksville; Henry Mountains: Mt. Ellen; Muddy River; Noton Bench; Poisen Springs; Rabbit Valley: Old Dixon prospect; Upheaval Dome; Waterpocket Fold.

#### CARPHOSIDERITE

Hydrrous basic sulfate of ferric iron,  $(\text{H}_2\text{O})\text{Fe}_3(\text{SO}_4)_2(\text{OH})_2\text{H}_2\text{O}$ . Hexagonal. Earthy or scaly crusts and aggregates, reniform. H. 4 - 4.5. G. 2.4 - 2.9. Cleavage doubtful. Luster resinous to dull. color golden yellow, dark straw-yellow. A gossan constituent.

*Juab County* Tintic district: Carissa, Eureka Hill mines.

*Tooele County* Ophir district: Lion Hill area.

#### CASSITERITE

Tin dioxide,  $\text{SnO}_2$ . Tetragonal. Frequently in elbow-shaped twins; massive granular or reniform shapes. H. 6-7. G. 6.9. Luster adamantine to submetallic. Color usually brown or black. Streak white. Translucent. Occurs as a detrital mineral in Utah.

*Emery County* Emery; Phillips Huntington no. 1 well.

*Piute County* Ohio district: Tunnel Extension No. 2

mine.

#### CELADONITE

Iron magnesium potassium silicate,  $\text{K}(\text{Mg},\text{Fe})(\text{Fe},\text{Al})\text{Si}_4\text{O}_{10}(\text{OH})_2$ . Monoclinic. H. 2. G. 2.9-3.05. Earthy or in minute scales. Lamellar or fibrous. Perfect cleavage. Very soft. Color green. Occurs as fillings in amygdulose of lava flows.

*Piute County* Marysvale district: Silica Hills.

*Utah County* East Tintic district.

#### CELESTITE

Strontium sulfate,  $\text{SrSO}_4$ . Orthorhombic. Crystals tabular or prismatic. Also fibrous, radiated, globular or granular. H. 3.5. G. 3.9. Cleavage good. Luster vitreous to pearly. Colorless to pale blue. Transparent to translucent.

*Emery County* 50 miles S. of town of Green River.

*Grand County* Little Grand district: Salt Wash group.

*San Juan County* Big Indian district: Radon mine.

*Sevier County* Salina Creek district: Lead Hill mine.

*Washington County* Santa Clara district: Black Beauty no. 1 claim.

#### CERARGYRITE

Silver chloride,  $\text{AgCl}$ . Isometric. Crystals usually cubic but rare. Usually massive resembling wax or horn, often in crusts. H. 2-3. G. 5.5. No cleavage. Fracture uneven. Highly sectile and ductile. Luster resinous to horn-like. Colorless to pearly-gray when fresh, readily darkens on exposure to light. Transparent to translucent.

*Beaver County* Newton district: Sheep Rock mine;

*San Francisco district*: Horn Silver mine; Star district.

*Box Elder County* Ashbrook district: Vipont mine.

*Iron County* Escalante district: Escalante mine; Gold Springs district: Homestake mine; Stateline district: Creole, Gold Dome, Johnny, Ofer, Phelps, Utah Spur mines.

*Juab County* Detroit district: Charm, Copperhead, E. P.

H., Ibex mines; Fish Springs district: Carnation, Emma,

Galena, Utah mines; Tintic district: Bullion Beck, Cen-

tennial Eureka, Chief Consolidated, Eagle and Blue Bell,

Gemini, Godiva, Grand Central, Iron, Mammoth mines.

*Piute County* Gold Mountain district: Annie Laurie,

Sevier mines; Mt. Baldy district: Pluto mine.

*Salt Lake County* Bingham district: Dixon, Winnamuck mines.

*Summit County* Park City district: Daly, Ontario, Scottish Chief mines.

*Tooele County* Dugway district: Buckhorn, Four

Metals mines; Erickson district: OK, Silver Reef mines; Lakeside district; Mercur district: Geyser-Marion mine; Ophir district: Dry Canyon area - Mono mine; Foothill area - Lakes of Killarney mine; Lion Hill area - Buffalo, Chloride Point, East Side, Douglas, Empire, Iron, Lion, Monarch, Northern Light, Three Meadows, Woodruff, Zella mines; Ophir Hill area - Hidden Treasure, Jim Fish, Sacramento mines; Rush Valley district: Mescatine, Salvation-Hercules mines.

*Uintah County* Brush Creek district: Little Alta mine.

*Utah County* Santaquin district: Union Chief mine.

*Washington County* Silver Reef district: California, Leeds, Requa, Savage, Tecumseh Hill mines.

### CERUSSITE

Lead carbonate,  $PbCO_3$ . Orthorhombic. Crystals often tabular and elongated. Often granular massive and compact, earthy. H. 3 - 3.5. G. 6. 5. Cleavage good. Very brittle. Luster adamantine. Colorless to white, gray to black. Streak colorless to white. Transparent to translucent.

*Beaver County* Bradshaw district: Cave mine; Granite district: Beaver View, Big Pass mines; Indian Peak district: Lincoln district: Creole mine; Pine Grove district; Pruess district: Gold Reef mine; San Francisco district: Horn Silver mine; Star district: Cedar-Talisman, Emerson, Gold Crown, Hoosier Boy, Commonwealth, Kemple, Maud S., Progressive, St. Mary's, Dotson, Estelle, Mowitza, Vicksburg, Harrington-Hickory, Rebel, Sundown, White Rock, Hub, Mammoth, Moscow, Red Warrior, Wild Bill mines, Woodhouse mines.

*Box Elder County* Ashbrook district: Vipont mine; Box Elder district; Lucin district: Cunepah Tunnel, Copper Mountain, Judson, Tecoma Hill mines; Newfoundland district; Promontory district: Big Pine, Lakeview, Sunshine Mining Properties; Rosebud district. *Cache County* Hyrum area - Tip Top claim; La Plata area - Yellow Jacket claim; Paradise district; Smithfield area.

*Emery County* San Rafael district: Copper Globe deposit.

*Iron County* Escalante district: Escalante mine.

*Juab County* Deseret district: Miller mine; Fish Springs district: Utah mines; Juab district; Mona district: Mt. Nebo district: Big Nebo, Eva, Freddie, Santaquin Chief, Santaquin King, Syndicate Tunnel mines; Tintic district: Beck Tunnel, Bullion Beck, Chief, Chief Consolidated, Colorado, Eagle and Blue Bell, Eureka Hill, Gemini, Godiva, Humbug, Iron Blossom, Mammoth, Sunbeam, Swansea mines; West Tintic district: 88, 1903, Scotia, War Eagle mines.

*Millard County* Church Hills: Stevens prospect. Leam-

ington district: Arbroath, Leamington Mining Company, Yellowstone mines.

*Morgan County* Argenta district: Carbonate Hill, Carbonate Gem mines.

*Piute County* Mt. Baldy district: Deer Trail, Pluto mines; Ohio district: Bully Boy and Webster, Cascade, Copper Belt, Dalton, Iris, Shamrock mines.

*Rich County* Swan Creek district: Victoria prospect.

*Salt Lake County* Big Cottonwood district: Alta Tunnel and Transportation Company, Carbonate, Cardiff Kennebec, Eclipse, Reed and Benson, Silver Mountain mines, Prince of Wales, Woodlawn mines; Bingham district: Boston Consolidated, Burning Moscow, Broad Gauge, Brooklyn, Butterfield, Caledonia, Dalton and Lark, Galena, Jersey Blue, Last Chance, Midland, Montezuma, Nast, Old Jordan, Old Telegraph, Petro, Red Wing, U. S. and Lark, Yosemite mines; Hot Springs district; Little Cottonwood district: Albion, Alta Consolidated, Cabin, Dwyer, Emma, Flagstaff, Little Emma, Michigan-Utah, West Toledo mines.

*San Juan County* Big Indian district: Mi Vida mine.

*Sevier County* Salina Creek district: Lead Hill mine.

*Summit County* Park City district: Comstock, Creole, Daly, Jupiter, Little Bell, Nail Driver, New York, Ontario, Scottish Chief, Silver King, Woodside mines.

*Tooele County* Blue Bell district: Black Hawk, Morgan mines; Columbia district: Benmore, Sharp mines; Deep Creek Mountains; Dutch Mountain; Dugway district: Bertha, Boston, Bryan, Buckhorn, Confidence, Four Metals, Francis, Kellys Hole, Lauris, Raymond - Bald Eagle, Yellow Jacket mines; Erickson district: Black Jack, Black Rock, Blain, Deer Trail, Good Hope, Happy Jack, Indian Boy, Indian Chief, May Farmer mines; Free Coinage district; Gold Hill district: Bonanza, Boston, Cash Boy, Garrison Monster, Gold Hill (U. S.), Mascot, Monoco, Monte Del Rey, New Baltimore, Red Jacket, Rube, Silver and Gold Mining Company, Silver King, Spotted Fawn, U. S. mines; Grantsville district: Greeley district; Lakeside district; Mercur district: Mineral Hill mine; North Tintic district: New Bullion, Scranton mines; Ophir district: Dry Canyon area - Brooklyn, Mono, Queen of the Hills mines; Lion Hill area - Buffalo, Chloride Point, Douglas, Lion, Zella, East Side, Empire, Iron, Monarch, Northern Light, Three Metals, Woodruff mines; Ophir Hill area - Admiral Dewey, Chicago, Cliff, Hidden treasure, Jim Fisk, Sacramento mines; Osceola district; Rush Valley district: Argent, Ben Harrison, Calument, Galena, Honerine, Mescatine, Muerbrook, Salvation - Hercules, Southport mines; Silver Island district: Carrie Mack property; Tooele district; Willow Springs district.

*Uintah County* Silver King mine.

*Utah County* Alpine district: Alpine - Galena property;

American Fork district: Dutchman, Miller, Pittsburgh mines; East Tintic district: Apex Standard, Burgin, Eureka Bullion, Eureka Lily, Eureka Standard, North Lily, Tintic Standard, Trixie mines; North Tintic district: Blowhole Hill, Lehi-Tintic, Tintic Empire, Tintic Paymaster, Selma mines; Payson district: Syndicate mine; Provo district: Monarch mine; Santaquin district: Blue Eagle, Union Chief mines; Silver Lake district: Milkmaid, Ontario mines.

*Wasatch County* Blue Ledge district: Glencoe, McHenry, Valeo mines; Elkhorn district: Crawford, Nelson and Queen mines; Snake Creek district: Revelator, West Quincy mines.

*Washington County* Tutsagubet district: Apex, Paymaster mines.

*Weber County* Sierra Madre district: Eldorado property.

### CERVANTITE

Antimony oxide,  $Sb_2O_4$ . Orthorhombic. Found in minute acicular crystals. Usually found as a massive fibrous crust or powder. H. 4.5. G. 6.6. Luster greasy, pearly. Color yellow, white to reddish white. Streak light yellow. Transparent.

*Salt Lake County* Little Cottonwood district: Emma, Little Emma mines.

### CHABAZITE

Hydrous calcium aluminum silicate,  $CaAl_2Si_4O_{12} \cdot 6H_2O$ . Hexagonal. Usually in crystals. Cleavage poor. H. 4-5. G. 2. 1. Luster vitreous. Color white, yellow, pink, red. Transparent to translucent. Brittle.

*Piute County* Marysvale district: Silica Hills.

*Salt Lake County* Little Cottonwood district.

*Summit County* Park City district.

*Wasatch County* Clayton Peak.

### CHALCANTHITE

Hydrous copper sulfate,  $CuSO_4 \cdot 5H_2O$ . Triclinic. Crystals short prismatic, flattened. Also massive, stalactitic, reniform. H. 2. 5. G. 2. 2. Cleavage poor. Fracture conchoidal. Luster vitreous. Color berlin blue to sky blue. Streak colorless. Taste metallic and nauseous. Subtransparent to translucent.

*Beaver County* San Francisco district: Horn Silver mine. *Emery County* San Rafael district: Calf Mesa, Dexter group.

*Salt Lake County* Bingham district: Bingham Copper pit, Broad Gauge, Galena, Old Jordan, Highland Boy, Yampa mines.

*San Juan County* Elk Ridge; Red Canyon district:

Markey no. 3 mine; White Canyon district: Fry No. 4 mine, Happy Jack, Jomac, W. N. mines.

*Sevier County* Henry district: Trinity prospect.

*Summit County* Park City district.

*Tooele County* Deep Creek Mountains: Cyclone, Leap Year mines; Dugway district: Bertha, Four Metals, Juno, Metal States mines; Gold Hill district: Alvarado, Cyclone mines; Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.

*Utah County* East Tintic district.

*Wayne County* Chimney Rock to Tantalus Flat; Fruitita: Oyler mine.

### CHALCEDONY

(See CRYPTOCRYSTALLINE QUARTZ)

### CHALCOCITE

Cuprous sulfide,  $Cu_2S$ . Orthorhombic. Short prismatic and tabular crystals. Usually compact massive. H. 2. 5. G. 5. 5. Cleavage indistinct. Fracture conchoidal. Brittle. Imperfectly sectile. Luster metallic. Color and streak bluish lead-gray. Often tarnished blue or green. Opaque. One of the chief sources of copper.

*Beaver County* Beaver Lake district: Beaver-Harrison, OK mines; San Francisco district: Horn Silver mine. *Box Elder County* Ashbrook district: Vipont mine. *Daggett County* Red Creek: Yellow Canary uranium deposit.

*Davis County* Farmington district: Parrish Canyon. *Emery County* San Rafael district: Blue Bird, Dexter Group mines.

*Grand County* Seven Mile Canyon.

*Juab County* Tintic district: Centennial Eureka, Grand Central mines.

*Millard County* Church Hills: Stevens prospect.

*Piute County* Ohio district: Tunnel Extension No. 2 mine.

*Salt Lake County* Big Cottonwood district: Mountain Lake, Steamboat Tunnel mines; Bingham district: Boston Consolidated, Burning Moscow, Columbia, Commercial, Conger, Dixon, Fortune, Galena, Highland Boy, Last Chance, Minnie, Nast, Old Jordan, Old Telegraph, Phoenix, Winnamuch, Yampa mines.

*San Juan County* Big Indian district: Big Indian Copper, Mi Vida mines; Elk Ridge; La Sal Mountains; Monticello district: Copper Queen, Tuffy Copper mines; Monument Valley district: Whirlwind mine; Paradox Valley district: Grey Dawn mine; Red Canyon district; White Canyon district: Happy Jack, Hideout, Jomac, Posey, W. N. mines.

*Sevier County* Salina district: Ball, Lead Hill mines.

*Summit County* Park City district: Daly, Mayflower,

Ontario mines.

*Tooele County* Deep Creek Mountains: Devils Pit, Eagles Nest, Oro del Rey mines, Dugway district: Bertha mine; Gold Hill district: Alvarado, Bonnemort, Cane Springs, Centennial and Enterprise, Copper Bloom, Copperopolis, Gold Hill (U. S.), Silver King, Victory no. 1 mines; Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.

*Uintah County* Browns Park area; Carbonate district: Dyer mine: little Split Mountain; Uteland Knoll district: Ouray.

*Utah County* East Tintic district: Eureka Lily, Eureka Standard, Trixie mines.

*Washington County* Silver Reef district: Barbee and Walker, Cobb, Duffin and Toquerville, Emily Jane, Last Chance, Thompson, Tecumseh Hill mines.

### CHALCOPHANITE

Hydrous oxide of zinc and manganese,  $Zn,Mn_3O_7 \cdot 3H_2O$ . Triclinic. Massive, granular, or platy. Minute crystals tabular. Cleavage good. Thin plates flexible. H. 2. 5. G. 4. Luster metallic. Color bluish to iron black. Streak chocolate brown. Transparent on thin edges.

*Utah County* East Tintic district: Burgin mine.

### CHALCOPHYLLITE

Hydrous basic sulfate-arsenate of copper and aluminum,  $Cu_{18}Al_2(AsO_4)_3(SO_4)_3(OH)_{27} \cdot 33H_2O$ . Hexagonal. Tabular six-sided crystals. Also foliated masses, and rosette aggregates. H. 2. G. 2. 6. Cleavage basal. Luster vitreous, pearly. Color emerald green or grass-green. Streak paler than the color. Transparent to translucent.

*Juab County* Tintic district: Ajax, Mammoth mines.

### CHALCOPYRITE

Copper iron sulfide,  $CuFeS_2$ . Tetragonal. Crystals commonly tetragonal in habit. Also often massive, compact, reniform. H. 3. 5-4. G. 4. 1. Fracture uneven. Brittle. Luster metallic. Color brass-yellow, often tarnished. Streak greenish black. Opaque. Chief copper ore.

*Beaver County* Beaver Lake district: Beaver-Harrison, OK, Skylark mines; Bradshaw district: Cave, Hecla, Nip and Tuck mines; Granite district: Contact group; Lincoln district: Creole, Lincoln mines; Pruess district: Blackbird, Cactus mines, Cactus Gulch; Rocky district: Bawana, Maria, Old Hickory mines; San Francisco district: Beaver Carbonate, Cupric, Horn Silver, Imperial, Michigan, Washington mines; Star district: Commonwealth, Harrington Hickory, Hub, Kemple, Lady Bryan, Maud S., Moscow, Progressive, Rebel, Red Warrior, St.

Mary's, Vicksburg, White Rock, Wild Bill mines.

*Box Elder County* Ashbrook district: Vipont mine; Crater Island district: Copper Blossom mine; Lucin district: Tecoma Hill mines; Newfoundland district: Copper Ridge; Park Valley district: Century, Susannah mines; Promontory district: Lakeview properties; Rosebud district: Red Buttes; Willard district: Overland claim.

*Daggett County* Red Creek: Yellow Canary uranium deposit.

*Davis County* Antelope Island; Farmington district: Morning Star group; Parrish Canyon.

*Emery County* San Rafael district: Dexter group, Lucky Strike mine.

*Garfield County* Circle Cliffs: Rocky Mountain, Stud Horse mines; Henry Mountains: Bromide, Oro mines.

*Grand County* La Sal district: McCoy mine; Miners Basin district: Dewey, High Ore, Moab no. 1, Skylark mines; Seven Mile Canyon, Shinarump nos. 1-3 claims.

*Juab County* Deseret district: Rockwell shaft; Detroit district: Charm, Copperhead, E. P. H., Ibex mines; Fish Springs district: Carnation, Emma, Galena, Utah mines; Thomas Range: Bell Hill mine; Tintic district: Centennial Eureka, Grand Central mines; West Tintic district: Lockheed Iron, 1903, Scotia, Tintic Western, War Eagle mines.

*Millard County* Detroit district: Almond, Blue Bell, Major Drum mines; Saw Back district.

*Morgan County* Morgan district: Morgan Crescent mine.

*Piute County* Mt. Baldy district: Clyde mine; Ohio district: Bully Boy and Webster, Cascade, Copper Belt, Iris, Shamrock mines, Tunnel Extension No. 2, Shamrock mines.

*Salt Lake County* Big Cottonwood district: Columbus Rexall, Big Cottonwood, Howell-Baby McKee, Reed and Benson, Woodlawn mines, KentuckyUtah, Lulu, Mountain Lake mines; Bingham district: Bingham Copper Pit, Boston Consolidated, Brooklyn, Burning Moscow, Butterfield, Colorado, Commercial, Conger, Copper Center Tunnel, Dalton and Lark, Dixon, Fortune, Frisco, Galena, Highland Boy, Last Chance, Nast, Old Jordan, Old Telegraph, Queen, Silver Shield, U. S. and Lark, Winnamuck, York, Yosemite mines; Little Cottonwood district: Albion, Alta Consolidated, Columbus-Rexal, Dwyer, Native Copper, Oxford and Geneva, South Hecla, Superior mines.

*San Juan County* Big Indian district: Big Indian Copper mine; Elk Ridge: King Edward, Notch nos. 5 and 6, Oakie, Payday, Sandy no. 3 mines; Monticello district: Blue Bird, Danish Girl, Dream, Gold Queen, Copper Queen mines; Paradox Valley district: Grey Dawn mine; Red Canyon district: Jerry group; San Juan River; White Canyon district: Blue Lizard, Fry no. 4, Happy Jack, Hideout, Jomac, White Canyon no. 1, W. N.

mines.

*Sevier County* Henry district: Trinity prospect. Salina Creek district: Ball mine.

*Summit County* Park City district: Daly, J.A.C. Tunnel, Kearns-Keith, Mayflower mine, Ontario, Scottish Chief, Silver King, Wabash, Woodside mines.

*Tooele County* Deep Creek Mountains: Cyclone, Devils Pit, Eagles Nest, Laura, Leap Year, Midas, Monte de Rey, Monocco, Oro del Rey mines; Dugway district: Bertha, Kellys Hole, New Park, Surplus mines; East Erickson district: Copper Jack, Flying Dutchman, Hard-to-Beat, Sheeprock Canyons, Silver King, Silver Shield mines; Erickson district: Highland Lassie no. 1, Last Hope no. 3, Silver Reef mines; Gold Hill district: Alvarado, Bonnemort, Cane Springs, Calaveras, Centennial and Enterprise, Copper Bloom, Copperopolis, Copper Queen-Midland Mining Company, Cyclone, Doctor, Frankie, Gold Hill (U. S.), Lucy L., Ida Lull, Reaper, Rube, U. S., Victory no. 1, Yellow Hammer mines; Granite Mountain district: Blue Bell, Cannon Tank Canyon, Desert, El Dorado, Mountain Queen mines; Grantsville district; Mercur district: Mineral Hill mine; Ophir district: Dry Canyon area - Kearsarge, Mono, Surprise mines; Lion Hill area - Buffalo mine; Ophir Hill area - Cliff, Ophir Hill Consolidated, Ophir Coalition, Sacramento mines; Rush Valley district: Ben Harrison, Calument, Galena King, Honerine, Muerbrook, Salvation-Hercules, Tip Top mines; Wild Cat Mountains: Silver Queen mine; Yellow Springs district.

*Utah County* American Fork district: Dutchman, Mary Ellena and Live Yankee, Yankee mines; East Tintic district: Eureka Lily, Tintic Standard mines; Santaquin district: Black Balsam, Copper Bullion, Sally Ann, Santaquin Central mines; Silver Lake district: Milkmaid, Ontario mines.

*Wasatch County* Blue Ledge district: Mayflower mine.

*Washington County* Silver Reef district.

*Wayne County* Fruita: Oyler mine; Miners Mountain district.

*Weber County* Fremont Island district; Sierra Madre district: Eldorado, King Solomon, Napoleon-Maghera mines.

#### CHALCOTRICHITE (See CUPRITE)

#### CHENEVIXITE

Basic hydrous arsenate of copper and ferric iron, probably  $\text{Cu}_2\text{Fe}_2(\text{AsO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}$ . Orthorhombic. Compact earthy to opaline H. 3. 5-4. 5. G. 3. 9. Fracture earthy. Brittle. Color dark green to greenish yellow. Streak greenish yellow.

*Juab County* Tintic district: American Eagle, Mammoth mines.

*Tooele County* Gold Hill district: Gold Hill (U. S.) mine. *Utah County* East Tintic district.

#### CHERT

(See CRYPTOCRYSTALLINE QUARTZ)

#### CHEVKINITE

Titano-silicate of the cerium earths,  $\text{Ce}_4\text{Fe}_2\text{Ti}(\text{Si}_2\text{O}_7)_2\text{O}_8$ . Monoclinic. Crystals prismatic. Color black. Luster splendid. Irregular fracture. Metamict crystals. G. 4. 5. Found in volcanic ash in Utah.

*Grand County* onion Creek.

#### CHLORARGYRITE (See CERARGYRITE)

#### CHLORITE

Hydrous magnesium aluminum silicate,  $\text{Mg}_3(\text{Si}_4\text{O}_{10})(\text{OH})_2 \cdot \text{Mg}_3(\text{OH})_6$  essentially. Monoclinic. In pseudo-hexagonal tabular crystals. Usually foliated massive or aggregates of minute scales. Cleavage perfect. Folia flexible but not elastic. H. 2-2.5. G. 2. 6-2.9. Luster vitreous to pearly. Color green of various shades.

*Beaver County* San Francisco district: Star district: Harrington - Hickory, Rebel, White Rock mines.

*Box Elder County* Rosebud district.

*Davis County* Antelope Island.

*Iron County* Paragonah: Iron Peak.

*Juab County* West Tintic district: Tintic Western mine.

*Piute County* Marysvale district.

*Salt Lake County* Bingham district: Bingham Copper Pit.

*San Juan County* Moses Rock dike.

*Summit County* Park City district.

*Tooele County* Dugway district: Bertha, Boston, Four Metals mines; East Erickson district: Ekker Canyon prospect; Gold Hill district: Gold Hill (U. S.), Rube mines; Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines; Oquirrh Mountains: Manning Canyon Shale; Stansbury Mountains: Manning Canyon Shale.

*Utah County* Beverly Hills: Manning Canyon Shale; Lake Mountain: Manning Canyon Shale; Lehi district: Manning Canyon Shale; Thorpe Hills: Manning Canyon Shale; Wasatch Mountains: Manning Canyon Shale. *Washington County* Mineral Mountain: Emma mine.

#### CHLOROPAL (See NONTRONITE)

#### CHLOR-UT AHLITE (See VARISCITE)

#### CHROME MICA-CLAY



A green chrome mica-clay. Contains approximately 0.4 to 0.6 percent  $\text{Cr}_2\text{O}_3$ , and consists of mixed  $2\text{M}_1$  and  $1\text{M}$  mica polymorphs. Occurs in thin veinlets, layers, and streaks in sandstone. Micaceous habit. Color green, or gray-green.

*Emery County* San Rafael district: Flat Top Mesa, Temple Mountain, North Temple Mountain, Eagle Nest prospect, South Temple Mountain.

## CHROMITE

Iron chromate,  $\text{FeCr}_2\text{O}_4$ . Isometric. Crystals not common; massive; fine granular to compact. Cleavage none. Fracture uneven. Brittle. H. 5.5. G. 4.6. Luster metallic. Color black. Streak brown. Sometimes feebly magnetic. In Utah found only in placers.

*Grand County* Colorado River area, Green River.  
*San Juan County* Colorado River placers.

*Uintah County* Green River district: Cub Creek.

## CHRYSOCOLLA

Hydrous copper silicate,  $\text{Cu}_2\text{H}_2\text{Si}_2\text{O}_5(\text{OH})_4$ . Orthorhombic. Often Opal-like; massive compact, earthy. H. 2-4. G. 2-2. 4. Fracture conchoidal. Luster vitreous, pearly. Color green, bluish green to sky blue, brown to black.

*Beaver County* Beaver Lake district: Beaver-Harrison, OK, Skylark mines; Granite district: Beaver View mine; Lincoln district: Creole, Lincoln mines; San Francisco district: Horn Silver mine; Star district: Wild Bill mine.  
*Box Elder County* Crater Island district: Copper Blossom mine; Lucin district: Copper Mountain, Parkdale mines; Newfoundland district: Copper Ridge.

*Davis County* Antelope Island.

*Garfield County* Circle Cliffs: Rocky Mountain mine.  
*Grand County* Miners Basin district: Dewey, High Ore, Skylark mines.

*Juab County* Deseret district: Rockwell shaft; Tintic district: Carissa, Dragon mines; West Tintic district: 88, 1903, Scotia, Tintic Western, War Eagle mines.  
*Millard County* Church Hills: Stevens prospect.

*Morgan County* Morgan district: Morgan Crescent mine.  
*Salt Lake County* Little Cottonwood district: Emma, Little Emma mines.

*San Juan County* La Sal Mountains; Monticello district: Copper Queen mine.

*Summit County* Park City district: Daly, Daly-Judge, Little Bell, Scottish Chief, Silver King, Woodside mines.  
*Tooele County* Deep Creek Mountains: Monocco mine. Dugway district: Belcher, Black Dragon, Black Maria, Bryan, Confidence, Kellys Hole, Metal States mines; East Erickson district: Copper Jack, Jessel Bezzel, Silver

Shield mines; Erickson district: Highland Lassie no. 1 mine; Gold Hill district: Calaveras, Frankie, Gold Hill (U. S.), Gold Bond, Minnehaha, Monoco, Napoleon, Silver King, Unadine, Victory no. 1 mines; Ophir district: Dry Canyon area.

*Washington County* Mineral Mountain: Emma, Gregeron mines.

## CHRY SOLITE (See OLIVINE)

## CIMOLITE

Hydrous silicate of aluminum,  $\text{Al}_4\text{Si}_9\text{O}_{24}\cdot 6\text{H}_2\text{O}$ . Amorphous. Claylike or chalky. Very soft, G. 2.18-2.30. Color white, gray white, reddish.

*Utah County* East Tintic district.

## CINNABAR

Mercuric sulfide,  $\text{HgS}$ . Hexagonal. Crystals usually rhombohedral or thick tabular. In crystalline incrustations, granular, massive, or as earthy coatings. H. 2-2.5 G. 8. Cleavage good, Slightly sectile. Luster adamantine to metallic to dull. Color vermilion-red when pure, brownish red when impure. Streak scarlet.

*Iron County* Cima mine; Iron Springs district: Granite Mountain, Iron Mountain.

*Piute County* Marysvale district; Quicksilver mine; Mt. Baldy district: Lucky Boy mine.

*Tooele County* Deep Creek Mountains: Congar Hill mine; Gold Hill district; Grantsville district: Timpie Valley, Ruby Crystal mine; Mercur district: Golden Gate, Hillside, Mercur, Sacramento, Sparrowhawk, Sunshine mines.

## CLAUDETITE

Arsenic trioxide,  $\text{As}_2\text{O}_3$ . Monoclinic. Prismatic crystals in thin plates and elongated. Flexible. H.  $2\frac{1}{2}$ . G. 4.5. Luster vitreous to pearly. Transparent. Colorless to white.

*Utah County* East Tintic district.

## CLAUSTHALITE

Lead selenide,  $\text{PbSe}$ . Isometric. Massive, commonly fine granular, sometimes foliated. Cleavage good. Fracture granular. H. 2.5 - 3. G. 7. 8. Luster metallic. Color lead-gray, somewhat bluish. Streak darker. Associated with uranium and vanadium ores.

*San Juan County* Big Indian district: Mi Vida mine. La Sal Quadrangle: Firefly-Pigmy mine.

## CLINOCHLORE

Hydrous magnesium iron aluminum silicate,  $(\text{Mg,Fe,Al})_6(\text{Si,Al})_4\text{O}_{10}(\text{OH})_8$ . Monoclinic. Crystals hexagonal in form, often tabular. Cleavage perfect. H. 2 - 2.5. G. 2.7. Luster somewhat pearly. Color deep grass-green to olive-green. Occurs in zone of hydrothermal alteration.

*Piute County* Marysvale district.

*Utah County* East Tintic district.

## CLINOCLASE

Basic arsenate of copper,  $\text{Cu}_3(\text{AsO}_4)(\text{OH})_3$ . Monoclinic. Crystals elongated and tabular, also as crusts or coatings. H. 2. 5-3. G. 4.4. Cleavage good. Fracture uneven. Brittle. Luster vitreous and pearly. Color dark greenish black to greenish blue. Streak bluish green.

*Juab County* Tintic district: Mammoth mine.

*Tooele County* Gold Hill district: Gold Hill (U. S.) mine.

## CLINOCLASITE (See CLINOCLASE)

## CLINOHUMITE

Hydrous magnesium silicate,  $\text{Mg}_9\text{Si}_4\text{O}_{16}(\text{F,OH})_2$ . Monoclinic. Cleavage poor. Fracture subconchoidal to uneven. Brittle. H. 6-6.5. G. 3.1. Luster vitreous to resinous. Color white, light yellow, brown.

*Beaver County* Beaver Lake district: West Spring.

## CLINOPTILOLITE

A zeolite,  $(\text{Na,K})_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 10\text{SiO}_2 \cdot 6\text{H}_2\text{O}$ . Monoclinic. Crystals platy, minute, usually in clusters. H. 3½-4. G. 2.1. Colorless to white. Transparent to translucent. Alteration of tuff.

*Beaver County* Tushar Mountains: Sulfurdale, Three Creek Reservoir areas.

*Juab County* Thomas Range: Topaz Mountain, Spor Mountain.

*Millard County* Tusher Mountains: Cove Fort area.

## CLINOZOISITE

Hydrous calcium aluminum silicate,  $\text{Ca}_2\text{Al}_3\text{Si}_3\text{O}_{12}\text{OH}$ . Monoclinic. Crystals are prismatic, columnar, also massive granular. H. 6-6.5. G. 3.3. Luster vitreous. Color grayish white, green, pink. Transparent to translucent.

*Beaver County* Bradshaw district; Lincoln district: Creole mine.

*Juab County* West Tintic district: Iron King, Tintic Western mines.

*Tooele County* Gold Hill district: Frankie mine; Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines; Rush Valley district: Honerine mine.

## COBALT BLOOM (See ERYTHRITE)

## COBALTITE

Cobalt sulfarsenide,  $\text{CoAsS}$ . Isometric. Commonly in cubes or pyritohedrons, sometimes granular massive to compact. Cleavage perfect. Fracture uneven. Brittle. H. 5.5. G. 6.3. Luster metallic. Color silver-white, inclined to red; also steel-gray. Streak grayish black.

*Tooele County* Gold Hill district: U. S. mine.

## COBALTOCALCITE

Cobalt carbonate,  $\text{CoCO}_3$ . Hexagonal. Crystals rare. Occurs as small spherical masses, with a crystalline surface and concentric and radiated structure; also as crusts. Cleavage poor. H. 4. G. 4.1. Color rose-red. Luster vitreous. Streak peak-blossom-red. Occurs as efflorescence with uranium minerals.

*Emery County* San Rafael district: Lucky Strike no. 2 mine.

## COBALTOMENITE

Hydrous cobalt selenite,  $\text{CoSeO}_3 \cdot 2\text{H}_2\text{O}$ . Monoclinic. Occurs as minute crystals, and as crystalline crusts. H. 2-2½. Brittle. Rose red in dark red color. Vitreous luster. Transparent.

*Emery County* San Rafael district: Calyx mine.

## COCONINOITE

Hydrous iron aluminum vanadate phosphate sulfate,  $\text{Fe}_2\text{Al}_2(\text{VO}_2)_2(\text{PO}_4)_4(\text{SO}_4)(\text{OH})_2 \cdot 2\text{OH}_2\text{O}$ . Monoclinic. Aggregates of microcrystalline to platy grains. H. soft. G. 2.7. Light creamy color.

*San Juan County* White Canyon district: Jomac mine.

## COFFINITE

Hydrous uranous silicate,  $\text{U}(\text{SiO}_4)_{1-x}(\text{OH})_{4x}$ . Tetragonal. Found as aggregates or disseminations of tiny particles. Color black. Luster dull, pulverulent to friable. Fracture earthy. H. 5-6. G. 5.1. Not fluorescent.

*Emery County* Green River district: Denise no. 1 mine; San Rafael district: Calyx, Dirty Devil, Magor, Temple Mountain, Vanura mines.

*Grand County* Beaver Mesa: Corvusite nos. 1-3 mines.  
*San Juan County* Big Indian district: Big Buck, Cal Uranium, Homestake, La Sal, Mi Vida, Radon, Rattlesnake mines; Elk Ridge: Avalanche No. 13, Horse-shoe No. 1, King Edward, Oakie, Western Payday mines; La Sal Quadrangle: Black Hat, Firefly-Pigmy mines. Paradox Valley district: Grey Dawn, Vanadium Queen mines.

#### COLLOPHANE

Hydrous calcium carbonate phosphate,  $\text{Ca}_{10}(\text{PO}_4)_6(\text{CO}_3)\cdot\text{H}_2\text{O}$ . Massive. Cryptocrystalline apatite, or organic origin. Opaline or horn-like; with dense, layered or colloform structure, H. 3-4. G. 2. 7. Luster weakly vitreous to dull. Color grayish white, yellow, or brown. Associated with fish scales in the Green River Formation found in the Phosphoria Formation.

*Daggett County* Uinta Mountains.

*Duchesne County* Green River Formation; Uinta Mountains.

*Uintah County* Brush Creek; Frandson Canyon; Little Brush Creek; Rock Creek.

*Utah County* East Tintic district.

#### CONICHALCITE

Basic calcium copper arsenate,  $\text{CaCu}(\text{AsO}_4)(\text{OH})$ . Orthorhombic. Crystals equant or short prismatic. Fibrous. Usually reniform and massive. Resembles malachite. H. 4. 5. G. 4. 3. Fracture uneven. Brittle. Luster vitreous to greasy. Color green, yellow green. Streak green.

*Juab County* Tintic district: American Eagle, Carissa, Centennial Eureka, Gold Chain mines; West Tintic district: Scotia mine.

*Millard County* Church Hills: Stevens prospect.

*Tooele County* Deep Creek Mountains: Fortuna, Probert mines; Gold Hill district: Frankie, Gold Hill (Western Utah), Pole Star Copper Company mines.

*Utah County* East Tintic district.

#### CONNELLITE

Hydrous basic chloride sulfate of copper,  $\text{Cu}_{19}(\text{SO}_4)\text{Cl}_4(\text{OH})_{32}\cdot 3\text{H}_2\text{O}$ . Hexagonal. Acicular crystals, in radiated groups and as felted aggregates. H. 3. G. 3. 3. Luster vitreous. Color azure blue. Streak pale greenish blue. Translucent.

*Juab County* Tintic district: Grand Central mine.

#### COPALITE

A hydrocarbon. Color pale yellow, gray, brown. G. 1.03. Associated with coal.

*Carbon County* Tidewell and Rideout district: Winter Quarters mine.

*Sevier County* Salina Canyon.

#### COPIAPITE

Hydrous basic iron magnesium sulfate,  $(\text{Fe}, \text{Mg}) \text{Fe}_4(\text{SO}_4)_6(\text{OH})_2\cdot 20\text{H}_2\text{O}$ . Triclinic. Small, brilliant plates, stacked one upon another in large numbers forming wormy or rod-like structures. Cleavage perfect. H. 2. 5 - 3. G. 2. 1. Color yellow to bronzy brown. Luster pearly. Transparent to translucent.

*Emery County* San Rafael district: Dexter group.

*Utah County* East Tintic district.

#### COPPER

Native copper, Cu. Isometric. Occurs in cubic, dodecahedral, or tetrahedral forms, often distorted; also massive. H. 2. 5. G. 9. Cleavage none. Fracture hackly. Highly ductile and malleable. Luster metallic. Color copper red. Streak metallic and shining. Opaque.

*Beaver County* Beaver Lake district: Skylark mine; San Francisco district: Imperial mine.

*Box Elder County* Ashbrook district: Vipont mine; Lucin district: Copper Mountain mine.

*Juab County* Tintic district: Carissa, Centennial Eureka mines.

*Morgan County* Morgan district: Morgan Crescent mine.

*Salt Lake County* Bingham district: Commercial, Highland Boy, Yampa mines; Little Cottonwood district: Native Copper mine.

*San Juan County* San Juan River; White Canyon district: White Canyon no. 1 mine.

*Tooele County* Dugway district: Buckhorn, Four Metals mines; Ophir district: Dry Canyon Area - Mono mine.

*Utah County* East Tintic district.

*Washington County* Tutsagubet district: Apex (Dixie) mine.

#### COPPER PITCH (See TENORITE)

#### COQUIMBITE

Hydrous iron aluminum sulfate,  $\text{Fe}_2\text{Al}(\text{SO}_4)_3\cdot 9\text{H}_2\text{O}$ . Hexagonal. Short hexagonal prisms, up to one-half inch long. H. 2. 5. G. 2. 1. Color pale violet to purple; small crystals colorless. Cleavage poor. Luster vitreous. Transparent. Taste astringent.

*Emery County* San Rafael district: Dexter group.

*Utah County* East Tintic district.

## CORDIERITE

Magnesium iron aluminum silicate,  $(\text{Mg,Fe})_2\text{Al}_4\text{Si}_5\text{O}_{18}$ . Orthorhombic. Crystals usually short prismatic pseudo-hexagonal twins. Also as imbedded grains and massive. Cleavage poor. H. 7 - 7.5. G. 2.6. Luster vitreous. Color different shades of blue. Transparent to translucent.

*Utah County* Silver Lake district: Deer, Silver Creeks.

## CORKITE

Basic sulfate-phosphate of lead and ferric iron,  $\text{PbFe}_3(\text{PO}_4)(\text{SO}_4)(\text{OH})_6$ . Hexagonal. H. 3.5. G. 4.3. Cleavage perfect. Color dark green, yellowish green to pale yellow. Luster vitreous to resinous. Occurs in gossans with limonite.

*Beaver County* Star district: Harrington-Hickory, Rebel, White Rock, Wild Bill mines.

## CORNWALLITE

Hydrous basic arsenate of copper,  $\text{Cu}_5(\text{AsO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}$ . Monoclinic. Occurs as small botryoidal crusts with a radial fibrous structure. Somewhat resembles malachite. Fracture conchoidal. Slightly brittle. H. 4.5. G. 4.1. Color green to emerald green.

*Juab County* Tintic district: Centennial Eureka mine.  
*Tooele County* Gold Hill district: Gold Hill (U. S.) mine.

## CORONADITE

Manganese lead oxide,  $\text{MnPbMn}_6\text{O}_{14}$ . Tetragonal. Massive, in botryoidal crusts with fibrous structure. H. 4½-5. G. 5.44. Luster dull. Color dark gray to black. Streak brownish black.

*Utah County* East Tintic district: Trixie mine.

## CORUNDUM

Aluminum oxide,  $\text{Al}_2\text{O}_3$ . Hexagonal. Crystals usually prismatic in habit. Often rounded into barrel shapes. Massive granular, rounded grains. H. 9. G. 4.1. Cleavage none. Fracture uneven. Brittle. Tough. Luster adamantine to pearly. Color various hues, usually some shade of brown, blue, or pink. Found in alluvium at south end of Sevier Lake; found in isolated boulders with hercynite in Sevier County.

*Millard County* South end of Sevier Lake.

*Sevier County* Pine Canyon, Black Hawk claims.

*San Juan County* Moses Rock dike.

## CORVUSITE

Hydrous oxide of vanadium,  $\text{V}_2\text{O}_4 \cdot 6\text{V}_2\text{O}_3 \cdot n\text{H}_2\text{O}$ . Massive. H. 2.5-3. G. 2.8. Fracture conchoidal. Color and streak blue - black to brown. Opaque.

*Emery County* San Juan district: North Mesa Nos. 1, 2, and 5 mines. San Rafael district: Calyx, Rex no. 2, Temple Mountain mines, Temple Rock, South Temple Wash.

*Grand County* La Sal district: Jack claim; Thompsons district: Parco no. 23, Juniper mines.

*San Juan County* Elk Ridge: Notch Nos. 5 and 6 mines; La Sal Quadrangle: Black Hat, Evening Star, Firefly-Pigmy, Hesperus, Little Peter, Valley View, Yellow Bird mines; Monument Valley district: Mitten no. 1 mine; Paradox Valley district: Grey Dawn, Vadadium Queen mines.

## COSALITE

Lead bismuth sulfide,  $\text{Pb}_2\text{Bi}_2\text{S}_5$ . Orthorhombic. Prismatic crystals, but usually massive, fibrous, or radiated. H. 2.5-3. G. 6.7. Fracture uneven. Luster metallic. Color lead-gray to steel-gray. Streak black. Opaque.

*Beaver County* Pruess district: Black Bird, Cactus mines; San Francisco district: Horn Silver mine.

## COTUNNITE

Lead chloride,  $\text{PbCl}_2$ . Orthorhombic. Crystals often flattened and elongated. Also massive, granular. H. 2.5. G. 5.8. Cleavage good. Fracture subconchoidal. Slightly sectile. Luster adamantine, silky, pearly. Colorless to white, also yellowish or greenish.

*Juab County* Tintic district.

## COVELLITE

Cupric sulfide,  $\text{CuS}$ . Hexagonal. Crystals rarely in hexagonal plates. Commonly massive, or spheroidal. H. 1.5-2. G. 4.6. Cleavage perfect. Flexible in thin plates. Luster submetallic to resinous, of massive material subresinous to dull. Color indigo-blue, sometimes with a purple tarnish. Streak lead-gray to black.

*Beaver County* Beaver Lake district: Beaver-Harrison, OK mines; San Francisco district: Horn Silver mine.  
*Box Elder County* Ashbrook district: Vipont mine.

*Emery County* San Rafael district: Delta, Dexter Group mines.

*Juab County* Fish Springs district: Carnation, Emma, Galena, Utah mines; Tintic district: Grand Central, Iron Blossom mines.

*Millard County* Church Hills: Stevens prospect.

*Piute County* Ohio district: Tunnel Extension No. 2 mine.

*Salt Lake County* Big Cottonwood district: Cardiff mine; Bingham district: Highland Boy, Northern Chief, Yampa mines.

*San Juan County* Big Indian district: Big Indian Copper mine; La Sal Mountains; Monticello district: Copper Queen mine; Paradox Valley district: Grey Dawn mine; Red Canyon district; White Canyon district: Happy Jack mine, White Canyon district: Blue Lizard, Hideout, White Canyon No. 1, W. N. mines.

*Summit County* Park City district: Park City Consolidated mine.

*Tooele County* Dugway district: Bertha, Pride of the West mines; Gold Hill district: Cane Springs, Copper Bloom, Ida Lull, Reaper mines; Ophir district: Dry Canyon area - Kearsarge mine.

### CRANDALLITE

Hydrous basic phosphate of calcium and aluminum.  $\text{CaAl}_3(\text{PO}_4)_2(\text{OH})_5 \cdot \text{H}_2\text{O}$ . Hexagonal. Rarely as minute trigonal prisms. Usually compact or fibrous masses. H. 5. G. 2. 8. Cleavage good. Luster vitreous. Color yellow to yellowish white, white, gray.

*Juab County* Tintic district: Brooklyn mine.

*Tooele County* Amatrice Hill.

*Utah County* Clay Canyon.

### CREDNERITE

Copper manganese oxide,  $\text{CuMnO}_2$ . Monoclinic. Occurs in six sided plates, in radiating or spherulitic masses. Also earthy. H. 4. G. 5.01. Luster bright metallic. Color iron black.

*Utah County* East Tintic district.

### CRISTOBALITE

Silicon dioxide,  $\text{SiO}_2$ . Tetragonal. Color white or milky white. No apparent cleavage. Brittle. H. 6. 5. G. 2. 3. Occurs in volcanic rocks.

*Piute County* Marysvale district.

### CROCIDOLITE (See RIEBECKITE)

### CRYOLITE

Sodium aluminum fluoride,  $\text{Na}_3\text{AlF}_6$ . Monoclinic. Usually massive, coarsely granular. H. 2. 5. G. 3. Cleavage none. Fracture uneven. Brittle. Luster vitreous to greasy. Colorless to white.

*Emery County* Southern part of County.

### CRYPTOCRYSTALLINE QUARTZ

Silicon dioxide,  $\text{SiO}_2$ . Cryptocrystalline. Often mammillary, massive. Fibrous and granular varieties. H. 6. 7. G. 2. 6. Luster dull, waxy, vitreous. Transparent to translucent, some opaque. Color white, gray, blue, brown, yellow, green, red, black. The main varieties found in Utah are: *Chalcedony*, the common variety has a waxy luster, color gray, blue, brown or white. *Agate*, or variegated chalcedony, is more colorful and is found in many gravels, veins, and replacements. Distinctive agate patterns are the mosslike patterns in *moss agate*; distinct angular bands are characteristic of *fortification agate*; feathery-shaped impurities are typical of *plume agate*. *Jasper*, a granular opaque variety of cryptocrystalline quartz is red, and less commonly yellow, blue or green. *Petrified wood* is a term loosely applied to wood replaced by silica; the term *silicified wood* is preferred. Most silicified wood in Utah occurs in the Triassic Petrified Forest and Shinarump Members of the Chinle Formation. *Dinosaur bone* is commonly silicified. Most bone occurs in the Jurassic Brushy Basin Member of the Morrison Formation. *Chert*, a granular variety, is common in Upper Paleozoic strata, where it occurs as bends, lenses, concretions, and irregular-shaped masses. The Mississippian Desert, Humbug, Gardner, Madison, and Pine Canyon strata contain abundant light-gray to brown and black chert. The Pennsylvanian Oquirrh Formation contains creamy, and gray to black chert. The Permian Park City Group has abundant purplish black, gray to black, and reddish brown chert.

*Beaver County* Blue Valley (black agate with blue bands); Beaver Lake district, San Francisco district, and Rock Corral area (chert, chalcedony).

*Emery County* Castle Dale, Castle Valley, Cedar Mountain, Green River, Last Chance Desert, San Rafael River, San Rafael district, and Woodside areas (agate, chalcedony, chert, jasper, silicified bone and wood).

*Garfield County* Moss Agate Hills near Panguitch (moss agate); Circle Cliffs, and Escalante areas (agate, silicified bone and wood).

*Grand County* Agate Switch, and Cisco areas (agate, chalcedony, jasper); Moab, and Thompsons areas (agate, chalcedony, jasper, silicified bone and wood); Little Grand district (chert); Miners Basin district (chalcedony) *Iron County* Cedar Breaks area (red and moss agate); Antelope Range, and Newcastle areas (chalcedony geodes); Iron Springs district (chalcedony).

*Juab County* Detroit district, Keg Mountains, San Pitch Mountains, and Thomas Range areas (agate); Jerico (moss agate, plume agate, jasper); Thirteen miles south of Levan (fortification agate); Detroit district, Dugway Range, Mt. Nebo district, Thomas Range, Tintic district,

Topaz Mountain, San Pitch Mountains, and West Tintic district areas (chalcedony, jasper).

*Kane County* Kanab (silicified wood); Kitchen Corral Canyon (chalcedony); Orderville (agate, silicified wood).

*Millard County* Detroit district (chalcedony, jasper).

*Rich County* Bear River Range (jasper).

*San Juan County* White Canyon district (chalcedony).

*Sevier County* Glenwood, Henry district areas (chalcedony).

*Tooele County* Amatrice Hill, Deep Creek Mountains, and Gold Hill district areas (agate, chalcedony); Dugway Mountains (agate geodes); Blue Bell district, Mercur district, and Ophir district areas (jasper).

*Utah County* Two miles west of Alpine (jasper); East Tintic district, North Tintic district, and Utah district areas (jasper); Wasatch Mountains (chert).

*Washington County* Beaver Dam Wash, and Castle Cliffs areas (agate, silicified wood), central (chalcedony in basalts); Silver Reef district (jasper, silicified wood).

*Wayne County* Fruita, Hanksville and Torrey areas (agate, jasper, silicified bone and wood).

#### CRYPTOMELANE

Potassium manganese oxide,  $K(Mn^{2+}, Mn^{4+})_8O_{16}$ . Tetragonal. H. 6-6½. G. 4.3. Occurs in slaggy, cavernous masses. Color dull black on the outside, blue gray on fresh surfaces. Psilomelane type mineral.

*Utah County* East Tintic district: Burgin mine. Lehi district: West Slope area - Wildcat mine.

#### CUBANITE

Copper iron sulfide,  $CuFe_2S_3$ . Orthorhombic. Elongated and thick tabular crystals. Massive, H. 3. 5. G. 4. 1. fracture conchoidal, Strongly magnetic. Color brass to bronze-yellow, Streak black. Opaque.

*Salt Lake County* Bingham district: Dixon, Winnamuck mines.

*Utah County* East Tintic district: North Lily mine.

#### CUPRITE

Cuprous oxide,  $Cu_2O$ . Isometric. Crystals octahedral, cubic, or dodecahedral. Also massive, granular, or earthy. H. 3 . 5 - 4. G. 6. 1. Fracture conchoidal to uneven. Brittle. Luster metallic - adamantine. Color red of various shades. Streak brownish red.

*Beaver County* Beaver Lake district: Skylark mine; Bradshaw district: Cave mine; San Francisco district: Imperial mine.

*Box Elder County* Ashbrook district: Vipont mine; Lucin district: Copper Mountain mine.

*Cache County* Logan area.

*Davis County* Farmington district: Morning Star group.

*Juab County* Detroit district: Charm, Copperhead, E. P. H., Ibex mines; Mt. Nebo district: Eva mine; Tintic district: Boss Tweed, Carissa, Centennial Eureka mines. *Kane County* Paria Mining Company mine.

*Millard County* Detroit district: Almond, Blue Bell, Major Drum mines.

*Morgan County* Morgan district: Morgan Crescent mine.

*Salt Lake County* Big Cottonwood district: Copper King mine; Bingham district: Galena, Old Jordan, Highland Boy, Yampa mines.

*San Juan County* Big Indian district: Big Indian Copper mine; Lisbon Valley: Climax nos. 1-2, Lisbon Copper mines.

*Summit County* Park City district: Daly-Jude mine.

*Tooele County* Dugway district: Black Dragon, Buckhorn, Four Metals mines, Kellys Hole; Gold Hill district: Pole Star Copper Company mine; Ophir district: Ophir Hill area - Hidden Treasure, Sacramento mines.

*Utah County* East Tintic district; Santaquin district: Sally Ann prospect.

*Washington County* Silver Reef district: Tutsagubet district: Apex (Dixie) mine.

#### CUPROADAMITE (See ADAMITE)

#### CUPROBISMUTITE

Copper bismuth sulfide,  $Cu_6Bi_8S_{15}$ . Monoclinic. Similar to but not dimorphous with emplectite. G. 6.35. Occurs as small bladed intergrowths.

*Piute County* Ohio district: Tunnel Extension No. 2 mine.

#### CUPRODESCLOIZITE

(See DESCLOIZITE)

#### CUPROGOSLARITE

Hydrous zinc copper sulfate,  $(Zn,Cu)SO_4 \cdot 7H_2O$ . Orthorhombic. Usually in efflorescent crusts, or stalagmitic with fibrous structures. Massive. Granular or fibrous. H. 2-2½. G. 1.98. Color bluish.

*Utah County* East Tintic district.

#### CUPROPLUMBITE (See BALYDONITE)

#### CUPROSCHEELITE

(See CUPROTUNGSTITE)

#### CUPROSKLODOWSKITE

Hydrous basic copper uranium silicate,  $\text{Cu}(\text{UO}_2)_2(\text{SiO}_3)_2(\text{OH})_2 \cdot 5\text{H}_2\text{O}$ . Orthorhombic. Minute prismatic or acicular crystals. Usually grouped in radial clusters, also as thin films and botryoidal crusts. Cleavage good. H. 3 - 4. G. 3. 5. Color yellowish green, grass green. Luster silky, pearly to dull.

*San Juan County* Elk Ridge: North Nos. 1 and 4 mines; White Canyon district: Frey no. 4, Posey mines.

#### CUPROTUNGSITE

Basic copper tungstate,  $\text{Cu}_2(\text{WO}_4)(\text{OH})_2$ . Microcrystalline masses and crusts. Friable to compact. Color pistachio-green, olive-green. Luster vitreous, waxy to earthy.

*Tooele County* Gold Hill district: Copper Bloom, Kena, Pole Star Copper Company mines.

#### CYANOTRICHITE

Hydrous basic copper aluminum sulfate,  $\text{Cu}_4\text{Al}_2(\text{SO}_4)(\text{OH})_{12} \cdot 2\text{H}_2\text{O}$ . Orthorhombic. Occurs as velvet-like druses or wool-like aggregates. G. 2. 9. Luster silky. Color sky-blue or azure blue. Streak pale blue.

*Juab County* Tintic district: Carissa, Mammoth mines.

#### CYRTOLITE (See ZIRCON)

#### DAHLLITE (See CARBONATE APATITE)

#### DAMOURITE

Variety of muscovite mica. Monoclinic. Cleavage perfect basal. H. 2 - 2. 5. G. 2. 7 - 3. Luster somewhat pearly or silky. Small scales.

*Iron County* Paragonah: Iron Peak.

#### DANBURITE

Borosilicate of calcium,  $\text{CaBe}_2\text{Si}_2\text{O}_8$ . Orthorhombic. Resembles topaz. H. 7. G. 2. 9. Cleavage poor. Fracture uneven to subconchoidal. Brittle. Luster vitreous to greasy. Color pale yellow to colorless, yellowish brown. Transparent to translucent.

*Tooele County* Gold Hill district: Gold Bond mine.

#### DAUBREEITE

An earthy oxychloride of bismuth,  $\text{BiO}(\text{OH},\text{Cl})$ . Tetragonal. Found only massive; compact, earthy, columnar to platy fibrous. Cleavage good. Very plastic. H. 2 - 2. 5. G. 7. 7. Luster greasy to silky. Color creamy-white, gray, yellowish brown.

*Juab County* Tintic district: Eagle, Blue Bell mines.

#### DAVISONITE

Hydrous basic phosphate of calcium and aluminum, perhaps  $\text{Ca}_3\text{Al}(\text{PO}_4)_2(\text{OH})_3 \cdot \text{H}_2\text{O}$ . Possibly hexagonal. Occurs as botryoidal or spherulitic crusts. Cleavage perfect basal. H. 4. 5. G. 2.85. Color white.

*Utah County* Clay Canyon.

#### DAWSONITE

Hydrous sodium aluminum carbonate,  $\text{NaAlCO}_3(\text{OH})_2$ . Orthorhombic. Found as bladed to acicular crystals with perfect cleavage. H. 3. G. 2.44. Transparent. Colorless to white. Authigenic mineral.

*Duchesne County* Green River Formation.

*Uintah County* Green River Formation.

#### DEHRNITE

Basic calcium sodium potassium phosphate,  $(\text{Ca},\text{Na},\text{K})_5(\text{PO}_4,\text{CO}_3)_3(\text{OH})$ . Hexagonal. Occurs as botryoidal crusts composed of fibrous to bladed crystals; also as minute hexagonal prisms. H. 5. G. 3. Cleavage perfect basal. Colorless to pale green, greenish white, grayish. Luster Weakly vitreous.

*Utah County* Clay Canyon.

#### DELESSITE

Chlorite variety,  $(\text{Mg},\text{Fe}_2,\text{Al})_6(\text{Si},\text{Al})_4\text{O}_{10}(\text{O},\text{OH})_8$ . Monoclinic. Varies from fine scaly to earthy masses. Color greenish. H. 1-2. G. 2. 8. Luster feebly pearly.

*Utah County* East Tintic district.

#### DELTAITE

Hydrous basic phosphate of calcium and aluminum,  $\text{Ca}(\text{Al}_2\text{Ca})(\text{PO}_4)_2(\text{OH})_4\text{H}_2\text{O}$ . Hexagonal. As minute crystals; also as cherty or chalky crusts of matted fibers. Cleavage good. H. 5. G. 2. 9. Color gray to lavender, pale blue; also canary yellow.

*Utah County* Clay Canyon.

#### DENNISONITE (See DAVISONITE)

#### DESCLOIZITE

Basic vanadate of lead, copper, zinc,  $(\text{Zn},\text{Cu})\text{Pb}(\text{VO}_4)(\text{OH})$ . Orthorhombic. Small, short prisms. Often drusy; also massive, fibrous radiated with a mammillary surface. H. 3 - 3. 5. G. 6. 2. Fracture conchoidal to uneven. Brittle. Luster greasy. Color cherry red, brownish red, brown, black. Streak brownish red or yellowish.

*Grand County* Pack Creek.

*Iron County* Escalante district: Escalante mine.

*Tooele County* Gold Hill district: New Baltimore mine.

#### DIADOCHITE

Hydrous basic iron sulfate-phosphate,  $\text{Fe}_2(\text{PO}_4)(\text{SO}_4)(\text{OH}) \cdot 5\text{H}_2\text{O}$ . Triclinic. Microcrystalline, earthy masses. Fracture earthy. H. 3 - 4. G. 2. 2. Color yellow to orange brown.

*Emery County* San Rafael district: Dexter group.

#### DIASPORE

Hydrogen aluminum oxide,  $\text{HAlO}_2$  or  $\text{AlO}(\text{OH})$ . Orthorhombic. Crystals thin platy and elongated; also foliated massive, H. 6. 7 - 7. G. 3. 4. Cleavage good. Fracture conchoidal. Luster brilliant, pearly. Color white, gray, colorless, various tints. Very brittle.

*Beaver County* Beaver Lake district.

*Box Elder County* Ashbrook district.

*Utah County* East Tintic district.

#### DICHOITE (See CORDIERITE)

#### DICKITE

Hydrous aluminum silicate,  $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$ . Monoclinic. Usually a clay - like mass, either compact, friable, or mealy. H. 2-2.5. G. 2.6. Cleavage perfect. Luster of plates, pearly; of mass, pearly to dull, Color white, grayish, yellowish. A hydrothermal alteration product.

*Piute County* Marysvale district.

*Utah County* East Tintic district: Burgin mine, North Lily mine.

*Wasatch County* Keetley area.

#### DIGENITE

Copper sulfide,  $\text{Cu}_{2-x}\text{S}$ . Isometric. Usually massive. Cleavage good. Brittle, Conchoidal fracture. H. 2. 5-3. G. 5.5. Color blue to black. Opaque.

*Salt Lake County* Bingham district: Bingham Copper Pit.

#### DIOPSIDE

Calcium magnesium silicate,  $\text{CaMgSi}_2\text{O}_6$ . Monoclinic. In prismatic crystals; also granular massive, columnar and lamellar. H. 5-6. G. 3. 2. Cleavage prismatic imperfect. Luster vitreous. Color white to light green. Characteristically found as a contact metamorphic

mineral in limestone.

*Beaver County* Beaver Lake district: Skylark mine; Rocky district: Bawana mine, Old Hickory mine; San Francisco district: Beaver Carbonate mine; Star district: Lady Bryan, Wild Bill mines.

*Iron County* Iron Springs district: Granite Mountain, Iron Mountain.

*Millard County* House Range: Amasa Valley, Horseshoe, Mt. Baldy, New Klondike, Notch Peak, Pine Peak, Pinke Peak, Rainbow, South, South Pit, Sidesprings mines.

*Salt Lake County* Little Cottonwood district: Alta and Clayton Peak stocks along contact.

*Sevier County* Henry district: Trinity prospect.

*Tooele County* Gold Hill district: Alvarado, Bonnemort, Cane Springs, Centennial and Enterprise, Copperopolis, Frankie, Gold Bond, Ida Lull mines; Ophir district: Ophir Hill area Cliff, Hidden Treasure, Ophir Hill Consolidated, Ophir Coalition mines; Rush Valley district: Honerine mine.

#### DOLOMITE

Calcium magnesium carbonate,  $\text{CaMg}(\text{CO}_3)_2$ . Hexagonal. Habit rhombohedral, the crystal faces commonly curved. Also massive, coarse to fine granular. H. 3. 5. G. 2. 8. Cleavage rhombohedral perfect. Brittle. Luster vitreous to pearly. Colorless, White, yellowish brown, pink, rose.

*Emery County* San Rafael district: Temple Mountain. *Juab County* Mt. Nebo district: Eva mine; Tintic district: Sioux mine.

*Millard County* Cricket Mountains.

*Summit County* Park City district: Park City Consolidated mine.

*Tooele County* Gold Hill district: Ophir district: Ophir Hill area.

*Uintah County* Sun Oil Company South Ouray well *Utah County* East Tintic district: Provo district: Monarch mine.

#### DOLORESITE

Hydrous vanadium oxide,  $3\text{V}_2\text{O}_4 \cdot 4\text{H}_2\text{O}$ . Monoclinic. Forms radiating groups in bands or veinlets, often shows botryoidal surfaces. Color black. Greenish black streak. Submetallic luster. G. 3. 3. Opaque. Cleavage good.

*San Juan County* Big Indian district: Big Buck, Cal Uranium, Homestake, La Sal, Mi Vida, Radon, Rattlesnake mines.

#### DONKEYITE



Copper arsenide,  $\text{Cu}_3\text{As}$ . Isometric. Reniform and botryoidal. Massive. H. 3-3½. G. 7.2-7.9. Luster metallic. Color tin white to steel gray. Tarnishes yellow to brown, then to iridescence.

*San Juan County* Elk Ridge.

#### DUFRENOYSITE

Lead arsenic sulfide,  $\text{Pb}_2\text{As}_2\text{S}_5$ . Monoclinic. Modified tabular and elongated crystals; also massive. H. 3. G. 5. 5. Cleavage good. Fracture conchoidal. Brittle. Luster metallic. Color lead-gray to steel gray. Streak reddish brown.

*Beaver County* San Francisco district: Horn Silver mine. *Salt Lake County* Big Cottonwood district: Bingham district: Dixon, Winnamuck mines; Little Cottonwood district: Oxford, Geneva mines.

#### DUMORTIERITE

Aluminum borosilicate,  $(\text{Al, Fe})_7(\text{BO}_3)(\text{SiO}_4)_3$ . Orthorhombic. Rarely in distinct crystals. Usually in fibrous to columnar aggregates. Cleavage poor. H. 7. G. 3. 3. Luster vitreous. Color blue, greenish blue, violet, pink. Transparent to translucent. Occurs as a detrital mineral in the Ferron Sandstone Member of the Mancos Shale. *Emery County* Emery: Phillips Huntington no. 1 well.

#### DYSCRASITE

Silver antimonide,  $\text{Ag}_3\text{Sb}$ . Orthorhombic. Crystals rare; massive. Cleavage good. Fracture uneven. Sectile. H. 3. 5 - 4. G. 9 . 6 - 10. Luster metallic. Color and streak silver white; sometimes tarnished yellow or blackish. *Salt Lake County* Big Cottonwood district: Maxfield mine.

#### EARDLEYITE

Status uncertain, composition indefinite, possibly a nickelian smithsonite. Color green to pale green. Associated with calcite, smithsonite, and quartz in small veins and replacements.

*Utah County* Wells Canyon.

#### EITELITE

Sodium magnesium carbonate,  $\text{Na}_2\text{Mg}(\text{CO}_3)_2$ . Hexagonal. Occurs as tiny crystals a few millimeters in diameter. Good basal cleavage. Authigenic mineral. Found in cores and cuttings from the Green River Formation.

*Duchesne County* Green River Formation; Sinclair

Mortenson well.

#### ELATERITE (See WURTZILITE)

#### ELPIDITE

Orthorhombic. Thin prismatic crystals; or fine fibrous fan-shaped aggregates. H. 5. G. 2.5-2.6. Hydrated sodium zirconium silicate,  $\text{Na}_2\text{ZrSi}_6\text{O}_{15}\cdot 3\text{H}_2\text{O}$ . An authigenic mineral, found in the Green River Formation. *Uintah County* Sun Oil Company South Ouray well.

#### EMBOLITE

Bromian cerargyrite,  $\text{Ag}(\text{Cl,Br})$ . Isometric. Crystals are cubic. Ordinarily massive; in crusts and waxy coatings. Fracture uneven. Tough. Sectile and ductile. Very plastic. H. 2. 5. G. 5. 6. Luster resinous to adamantine, horn-like. Colorless when pure and fresh; usually gray, yellowish, greenish brown.

*Washington County* Silver Reef district: Cobb mine.

#### EMPLECTITE

Copper bismuth sulfide,  $\text{CuBiS}_2$ . Orthorhombic. Prismatic, striated crystals, occasionally twinned. Fracture conchoidal to uneven. Brittle. H. 2. G. 6.38. Luster metallic. Color gray to tin-white.

*Piute County* Ohio district: Tunnel Extension No. 2 mine.

#### ENARGITE

Copper arsenic sulfide,  $\text{Cu}_3\text{AsS}_4$ . Orthorhombic. Crystals elongated. Columnar, bladed, massive. Cleavage perfect. H. 3. G. 4. 4. Luster metallic. Color and streak grayish black to iron black. Opaque.

*Juab County* Tintic district: Ajax, Carissa, Centennial Eureka, Chief Consolidated, Eagle and Blue Bell, Eureka Hill, Gold Chain, Grand Central, Homestake and Shoebridge, Iron Blossom, Lower Mammoth, Mammoth, Opohonga, Sioux, Swansea, Victoria mines.

*Salt Lake County* Big Cottonwood district: Cardiff, Columbus-Rexall mines; Bingham district: Bingham Copper Pit, Commercial, Galena, Old Jordan, Highland Boy, Yampa mines; Little Cottonwood district: Centennial Alta, Columbus-Rexal, South Hecla mines.

*Summit County* Park City district: Mayflower mine. *Utah County* East Tintic district: Apex Standard, Iron King, Trixie, Zuma mines, Eureka Bullion, Eureka Lily, Eureka Standard, North Lily, Tintic Standard mines.

#### ENDELLITE

Hydrous aluminum silicate,  $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4 \cdot 4\text{H}_2\text{O}$ . Monoclinic. Usually in claylike masses, either compact or friable. Perfect cleavage. H. 2. G. 2. 6. Color usually white. Hydrothermal alteration product.

*Utah County* East Tintic district: Larson clay pits, North Lily mine; Fox Hills.

#### ENGLISHITE

Hydrous basic phosphate of potassium, calcium, and aluminum of uncertain formula, perhaps  $\text{K}_2\text{Ca}_4\text{Al}_8(\text{PO}_4)_8(\text{OH})_{10} \cdot 9\text{H}_2\text{O}$ . Probably monoclinic. Occurs as layers and aggregates of subparallel plates. Cleavage perfect, micaceous. Flexible. H. 3. G. 2. 6. Colorless and transparent. Luster vitreous, pearly.

*Utah County* Clay Canyon.

#### ENSTATITE

Magnesium silicate,  $\text{MgSiO}_3$ . Orthorhombic. Distinct crystals rare, prismatic habit. Usually massive, fibrous, or lamellar. Cleavage prismatic. Fracture uneven. Brittle. H. 5. 5. G. 3. 2. Luster pearly to vitreous. Color grayish, yellowish, greenish white, olive-green and brown.

*Juab County* West Tintic district.

*Tooele County* Gold Hill district.

#### EPHESITE

Hydrous sodium lithium aluminum silicate, belonging to the margarite group,  $\text{Na}(\text{LiAl}_2)(\text{Al}_2\text{Si}_2)\text{O}_{10}(\text{OH})_2$ . Monoclinic. Crystals indistinct. H.  $3\frac{1}{2}$ - $4\frac{1}{2}$ . G. 2.98. Laminae brittle. Pink color. Translucent. Vitreous to pearly luster.

*Salt Lake County* Big Cottonwood district: Big Cottonwood, Mountain Lake mines.

#### EPIDESMINE

Hydrous calcium sodium aluminum silicate.  $(\text{Ca}, \text{Na}, \text{K})_3\text{Al}_5(\text{Al}, \text{Si})\text{Si}_{14}\text{O}_{40} \cdot 15\text{H}_2\text{O}$ . Orthorhombic. Occurs in minute crystals. G. 2. 2. Cleavage good. Colorless to yellow. Found in lava flows.

*Tooele County* Rush Valley district: Soldier Creek.

#### EPIDOTE

Hydrous calcium aluminum iron silicate,  $\text{Ca}_2\text{Al}_2\text{FeOSiO}_4\text{Si}_2\text{O}_7(\text{OH})$ . Monoclinic. Crystals usually prismatic. Also fibrous, granular, and forming rock masses. Cleavage good. Brittle. Luster vitreous. H. 6 - 7. G. 3. 4. Color usually pistachio-green or yellowish green.

*Beaver County* Bradshaw district: 2 R's group; Granite

district: Big Pass, Burnt Hollow, Contact, Garnet, Molly, Oak, Oak Basin, Rattler, Scheelite, Ward groups; Lincoln district; Star district: Lady Bryan mine.

*Box Elder County* Grouse Creek Range; Rosebud district.

*Davis County* Antelope Island.

*Garfield County* Henry Mountains: Bromide, Oro mines.

*Juab County* West Tintic district: Iron King, Lockheed Iron, Tintic Western mines.

*Salt Lake County* Big Cottonwood district: Mountain Lake mine; Little Cottonwood district: Patsey Marley mine.

*Sevier County* Henry district: Trinity prospect.

*Summit County* Park City district.

*Tooele County* Gold Hill district: Doctor, Fraction Frankie, Gold Bond, Lucy L., Reaper mines; Ophir district: Ophir Hill area - Cliff, Hidden Treasure, Ophir Hill Consolidated, Ophir Coalition mines; Rush Valley district: Honerine mine.

*Utah County* Silver Lake district: Milkmaid mine, Silver Creek.

*Weber County* Sierra Madre district.

#### EPSOMITE

Hydrous magnesium sulfate,  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ . Orthorhombic. Usually as long fibers in bunches of fibrous crusts. H. 2 - 2. 5. G. 1. 6. Cleavage good. Fracture conchoidal. Luster vitreous, silky, earthy. Colorless in pure crystals, white in massive aggregates. Very soluble.

*Beaver County* Gordon district: Sulphurdale; San Francisco district: Frisco Contact mine.

*Emery County* Castle Dale; Castle Valley.

*Garfield County* Coyote Creek district: Hampton mine.

*Sanpete County* Manti.

*Utah County* East Tintic district.

#### ERINITE

Basic copper arsenate,  $\text{Cu}_5(\text{OH})_4(\text{AsO}_4)_2$ . Orthorhombic probably. In mammillary crystalline groups. Cleavage good. H. 4. 5. G. 4. Fracture conchoidal. Luster dull, resinous. Color dark green to emerald green. *Juab County* Tintic district: American Eagle, Centennial Eureka, Mammoth mines.

#### ERUBESCITE (See BORNITE)

#### ERYTHRITE

Hydrous cobalt arsenate,  $\text{Co}_3(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$ . Monoclinic. Prismatic crystals; often as radial or stellate groups.

Incrustations, earthy. H. 1. 5 - 2. 5. G. 3. 1. Cleavage good. Luster adamantine to vitreous, pearly. Color crimson-red, peach red, pink, white or gray, pale green. Streak paler than color.

*San Juan County* Elk Ridge: Avalanche No. 13, King Edward mines; White Canyon district: Happy Jack mine.

#### ESSONITE (See GARNET)

#### ETTRINGITE

Hydrous calcium aluminum sulfate.  $\text{Ca}_6\text{Al}_2(\text{SO}_4)_3 \cdot (\text{OH})_{12} \cdot 26\text{H}_2\text{O}$ . Hexagonal. Small prismatic crystals. H. 2-2½. G. 1.77. Colorless. Transparent, becoming white on dehydration.

*Beaver County* Rocky district: Old Hickory mine.

#### EUCARITE

Copper silver selenide,  $\text{CuAgSe}$ , Orthorhombic. Massive and granular. H. 2½. G. 7.6-7.8. Luster metallic. Color silver white and lead gray. Brittle.

*San Juan County* Paradox Valley district: Grey Dawn mine.

#### FAMATINITE

Copper sulfantimonate,  $\text{Cu}_3\text{SbS}_4$ . Tetragonal. H. 3. 5. G. 4. 5. Fracture uneven. Brittle. Color gray with copper-red tinge. Opaque. Usually massive, granular to dense.

*Juab County* Tintic district: Mammoth mine.  
*Utah County* East Tintic district.

#### FARATSIHITE

Hydrous aluminum iron silicate,  $(\text{Al,Fe})_2\text{Si}_2\text{O}_5(\text{OH})_4$ . Monoclinic. Intermediate between kaolinite and chloropal. In microscopic hexagonal plates. Soft. G. 2. Color pale yellow.

*Utah County* East Tintic district.

#### FERBERITE

Ferrous tungstate,  $\text{FeWO}_4$ . Monoclinic. Crystals elongated and flattened. Also in groups of bladed crystals, or massive. H. 4 - 4. 5. G. 7. 5. Cleavage good. Fracture uneven. Brittle. Luster submetallic. Color black. Streak brownish black to black. Weakly magnetic.

*Tooele County* Gold Hill district: Pole Star Copper Company mine.

#### FERNANDINITE

Hydrous calcium vanadyl vanadate,  $\text{CaO} \cdot \text{V}_2\text{O}_4 \cdot 5\text{V}_2\text{O}_5 \cdot 14\text{H}_2\text{O}$ . Massive, cryptocrystalline to fibrous; rarely in rectangular plates. Color dull green.

*Emery County* San Rafael district: Temple Mountain.

#### FERRIMOLYBDITE

Hydrous ferric molybdate, probably  $\text{Fe}_2(\text{MoO}_4)_3 \cdot 8\text{H}_2\text{O}$ . Probably orthorhombic. Massive, and as fibrous crusts or tufted and radial fibrous aggregates. Also as earthy powder or coating. Very soft. G. 3. Luster silky to earthy. Color canary yellow to greenish yellow. Streak pale yellow.

*Iron County* State Line district.

*Salt Lake County* Little Cottonwood district.

*Tooele County* Gold Hill district.

#### FERRISYMPLESITE

Hydrous iron arsenate,  $\text{Fe}_3(\text{AsO}_4)_2(\text{OH})_3 \cdot 5\text{H}_2\text{O}$ . Small irregular masses. Luster resinous. Color amber-brown. H. 2. 5. G. 3.

*Tooele County* Gold Hill district: Gold Hill (U. S.) mine.

#### FERROGOSLARITE

Hydrous zinc iron sulfate,  $(\text{Zn,Fe})\text{SO}_4 \cdot 7\text{H}_2\text{O}$ . Orthorhombic. Usually in crusts or stalagmitic, with fibrous structure. Massive, fibrous, or granular. H. 2½. G. 1.98. Color green to brown.

*Utah County* East Tintic district.

#### FERROLUDWIGITE (See LUDWIGITE)

#### FERROPALLIDITE

(See SZOMOLNOKITE)

#### FERROSELITE

Iron selenide,  $\text{FeSe}_2$ . Orthorhombic. Prismatic crystals. Very brittle. H. 6-6½. G. 7.21. Color steel gray to tin white with rose tint. Tarnishes brown. Metallic luster. Streak black.

*Emery County* San Rafael district: Calyx, Temple Mountain mines.

#### FERVANITE

Hydrous ferric vanadate,  $\text{Fe}_4\text{V}_4\text{O}_{16} \cdot 5\text{H}_2\text{O}$ . Probably

monoclinic. Occurs in parallel fibrous aggregates. Color golden brown. Luster brilliant. Cleavage not apparent. G. 3. 3.

*Grand County* Polar Mesa district.

#### FIBROFERRITE

Hydrous basic ferric sulfate,  $\text{Fe}(\text{SO}_4)(\text{OH}) \cdot 5\text{H}_2\text{O}$ . Orthorhombic. Occurs as fine fibrous crusts and masses, botryoidal, radial fibrous. H. 2. 5. G. 2. Cleavage basal. Luster silky to pearly. Color pale yellow, yellowish green to pale green.

*Emery County* Green River: 30 miles southwest; San Rafael district: Dexter group.

#### FLUELLITE

Hydrous aluminum phosphate,  $\text{Al}_2\text{PO}_4\text{F}_2\text{OH} \cdot 7\text{H}_2\text{O}$ . Orthorhombic. Cleavage indistinct. H. 3. G. 2. 7. Luster vitreous. Colorless to white. Transparent.

*Piute County* Marysvale district: Freedom no. 2, Prospector no. 1 mines.

#### FLUORAPATITE

Calcium fluorine phosphate,  $\text{Ca}_5(\text{PO}_4)_3\text{F}$ . Hexagonal. Cleavage indistinct. Fracture conchoidal. Brittle. H. 5. G. 3. 1. Luster vitreous. Color sea - green, pale blue, colorless, brownish. Occurs as an authigenic mineral in the Green River and Phosphoria Formations.

*Daggett County* Uinta Mountains.

*Duchesne County* Green River Formation; Uinta Mountains.

*Uintah County* Brush Creek; Frandson Canyon; Little Brush Creek; Rock Creek.

*Wasatch County* Uinta Mountains.

#### FLUORITE

Calcium fluoride,  $\text{CaF}_2$ . Isometric. Habit usually cubic, Also massive; granular; compact. H. 4. G. 3. 2. Cleavage octahedral. Brittle. Luster vitreous. Color various, light green, yellow, bluish green, purple, colorless. *Beaver County* Bradshaw district: 2 R's group; Granite district: Bismuth, Big Pass, Contact, Garnet mines; Indian Peak district: Blue Bell, Cougar Spar, Dugout, J. B., Noonday, Lost Sheep, Utah mines; Lincoln district: Creole mine; Newton district: Indian Creek, Sheep Rock, Sniffer and Mystery mines; Pine Grove district: Daisy, Iron Queen, Pine Grove Associates, Prospector, Staats (Monarch) mines; San Francisco district: Cupric mine; Star district: Brown Thrush, Cabin, Fluorine Ledge, Hub, Lady Bryan, Lucky Boy nos. 1-2, Manassa,

Monte Cristo, Moscow, Quartzite, North Virginia Extension, Virginia nos. 1-5, Wild Bill mines; Washington district: Blue Bell, Cougar Spar, Doughout (Dugout), J. B., Lost Sheep, Noonday, Utah mines.

*Grand County* Blue Spar property; Miners Basin district: Dewey, High Ore mines; Ryan Creek Scheelite prospect.

*Iron County* Escalante district: Escalante mine; Gold Springs district: Homestake mine.

*Juab County* Deep Creek Mountains: Apex, Mary, Trout Creek mines: Deseret district, Dugway Range; Fish Springs district: Carnation, Emma, Galena, Utah mines; Honeycomb Hills; Indian Creek; Thomas Range: Autunite no. 8, Buena no. 1, Good Will, Yellow Chief mines; Spor Mountain: Bell Hill, Blowout, Claybank, Blue Chalk, Hogsback, Northend, Rainbow, Roadside, Dell no. 1, Dell no. 5, Evening Star, Floride, Floride no. 5, Fluorine Queen, Fluorine Queen no. 4, Green Crystal, Harrisite, Hilltop, Lost Sheep, Lost Soul, Lucky Louie, Monella, Oversight, Rainbow no. 2, Thursday mines; Topaz Mountain; Trout Creek: West Tintic district: 88, 1903 mines.

*Millard County* Gordon district: Rain Bow mine; South Pavant Range: Cove Fort, Dog Valley.

*Piute County* Gold Mountain district: Annie Laurie, Keystone, Sevier mines; Marysvale district: Buddy, Bullion Monarch, Fluorite, Freedom no. 1-2, LaVita, Prospector no. 1 mines; Mt. Baldy district: Deer Trail mine; Ohio district: Bully Boy, Great Western, Shamrock and Webster mines.

*San Juan County* Big Indian district: Mi Vida mine.

*Sevier County* Henry district: La Veta prospect.

*Summit County* Park City district: Silver King, Woodside mines.

*Tooele County* Columbia district: Benmore, Sharp mines; Dutch Mountain; Dugway district: Black Maria, Bryan, Buckhorn, Confidence, Eureka, Four Metals, Golconda, Pride of the West, Kellys Hole, Lauris, Rainbow, Rattler mines; East Erickson district: Copper Jack, Flying Dutchman, Hard-to-Beat Canyon, Sheeprock, Silver King, Silver Shield mines; Erickson district: Black Jack, Black Rock, Blain, Deer Trail, Indian Boy, May Farmer, Good Hope mines; Gold Hill district: Gold Bond mine; Granite Mountain district: Blue Bell, Cannon Tank Canyon, Desert, El Dorado, Mountain Queen mines; Ophir district: Lion Hill area - Buffalo mine; Ophir Hill area - Ophir Coalition mine; Rush Valley district: Honerine mine; Wild Cat Mountains: Silver Queen mine.

*Utah County* Santaquin district: Black Balsam vein.

*Weber County* Cold Water Canyon; Sierra Madre district: Eldorado property; Weber district: Norman mine.

#### FORSTERITE (See OLIVINE)

Magnesium variety of olivine,  $Mg_2SiO_4$ . Orthorhombic. In small equidimensional or tabular crystals. Usually in imbedded grains or in granular masses. H. 6 - 7. G. 3. 2. Fracture conchoidal. Luster vitreous. Color olive to grayish green and brown, also white and yellow.

*Salt Lake County* Big Cottonwood district: Big Cottonwood, Mountain Lake, Steamboat Tunnel mines; Little Cottonwood district: Alta mine, Alta and Clayton Peak stocks contact zone.

#### FOSHAGITE

Hydrous calcium silicate,  $Ca_4Si_3O_9(OH)_2$ . Monoclinic. A zeolite. Occurs in compact fibrous masses. G. 2. 4. Color white. Luster silky.

*Salt Lake County* Bingham district: Bingham Copper Pit.

#### FOURMARIERITE

Hydrous lead uraninate  $PbU_4O_{13} \cdot 4H_2O$ . Orthorhombic. Crystals tabular and elongated. H. 3 - 4. G. 6. Cleavage basal. Luster adamantine. Color red to golden red and brown. Transparent.

*Emery County* San Rafael district: Delta, Lucky Strike, Lucky Strike no. 2 mines.

#### FRANCOLITE (See FLUORAPATITE)

#### FREIBERGITE

Argentian tetrahedrite. Tetrahedral. Groups of crystals, massive, or compact. Cleavage none. Fracture subconchoidal to uneven. H. 3 - 4. 5. G. 4. 6 - 5. 1. Luster metallic. Color flint-gray to cherry red.

*Salt Lake County* Bingham district: Silver Shield mine.

*Utah County* East Tintic district.

#### GALENA

Lead sulfide,  $PbS$ . Isometric. Commonly in cubes. Also massive, cleavable, coarse or fine granular. H. 2. 5. G. 7. 6. Cleavage cubic. Luster metallic. Color and streak lead-gray. Opaque.

*Beaver County* Antelope district; Beaver Lake district: Galena mine; Bradshaw district: Cave, Hecla, Nip and Tuck mines; Granite district: Beaver View, Big Pass, Burnt Hollow mines; Indian Peak district; Lincoln district: Creole, Lincoln mines; McGarry district; Newton district; Indian Creek; Pine Grove district: Pine Grove Associates mine; Pruess district: Gold Reef, Indian Queen mines; San Francisco district: Beaver Carbonate, Cupric, Horn Silver, Imperial, King David, Michigan,

Peacock Copper, Washington mines; Star district: Dotson, Hoosier Boy, Hub, Moscow, Red Warrior, Vicksburg, White Rock, Wild Bill mines.

*Box Elder County* Ashbrook district: Vipont mine; Box Elder district; Lucin district: Cenepah Tunnel, Copper Mountain, Tecoma Hill mines; Newfoundland district; Park Valley district: Century, Susannah mines; Rosebud district: A & W, Magnitude, Mogul mines; Willard district: Consolidated group, Louise Consolidated mine, Ogden Boilmakers, Silver Queen mines.

*Cache County* Hyrum area: Lucky Star, Tip Top claims; La Plata area: La Plata, Sunrise claims; Logan area; Paradise district: Richmond district.

*Davis County* Wandering Jew mine.

*Emery County* Emery district; San Rafael district: Calyx, Delta, Dirty Devil, Lucky Strike, Temple Mountain mines, Dexter group, Lucky Strike no. 2 mines.

*Grand County* Richardson district; Ryan Creek Scheelite prospect.

*Iron County* Escalante district: Escalante mine; Iron Springs district: Granite Mountain, Iron Mountain.

*Juab County* Deep Creek Mountains: Johnson Canyon prospects; Deseret district: Miller mine; Detroit district: Utah mine; Juab district; Mona district; Mt. Nebo district: Ajaxto no. 2, Big Nebo, Blackett Tunnel, Eva, Freddie, Highland, Santaquin Chief, Santaquin King, Snydicat mines; North Tintic district: Tintic Prince mine; Tintic district: Black Dragon, Beck Tunnel, Bullion Beck, Centennial Eureka, Chief Consolidated, Colorado, Dragon, Eagle and Blue Bell, Eureka Hill, Gemini, Godiva, Grand Central, Humbug, Iron Blossom, Lower Mammoth, Mammoth, May Day, Sioux, Swansea, Victoria mines; Spring Creek district: Queen of Sheba mine; West Tintic district: 88, 1903, Pyramid, Scotia, War Eagle mines.

*Millard County* Leamington district: Arbroath, Leamington Mining Company, Wood Canyon, Yellowstone mines; Saw Back district.

*Morgan County* Argenta district: Carbonate Hill, Carbonate Gem mines.

*Piute County* Gold Mountain district: Annie Laurie mine; Mt. Baldy district: Crystal, Deer Trail, Pluto mines; Ohio district: Bully Boy and Webster, Cascade, Copper Belt, Great Western, Iris, Shamrock mines.

*Rich County* Swan Creek district: Victoria prospect. *Salt Lake County* Big Cottonwood district: Alta Tunnel and Transportation Company, American Metals, Big Cottonwood, Carbonate, Cardiff, Columbus-Rexall, Howell-Baby McKee, Kennebec, Lulu, Maxfield, Prince of Wales, Reed and Benson, Silver Mountain, Tar Baby, Woodlawn mines; Bingham district: Boston Consolidated, Brooklyn, Burning Moscow, Butterfield, Caletonia, Colorado, Conger, Dalton and Lark, Dixon, Eagle

Bird, Fortune, Frisco, Galena, Highland Boy, Jersey Blue, Midland, Montezuma, Nepture, Old Jordan, Old Telegraph, Petro, Phoenix, Queen, Queen Lode, Red Wing, Silver Shield, Tiewaukee, U. S. and Lark, Winnamuck, Yampa, York, Yosemite mines; Hot Springs district; Little Cottonwood district: Albion, Cabin, Columbus Consolidated and Wasatch Drainage Tunnel, Columbus-Rexal, Dwyer, Emma, Flagstaff, Little Emma, Michigan - Utah, Peruvian Consolidated, South Hecla, Superior mines.

*San Juan County* Big Indian district: Mi Vida mine; Elk Ridge: Notch Nos. 5 and 6, Payday mines; La Sal Quadrangle: Firefly-Pigmy mine; Monticello district: Blue Bird, Copper Queen, Danish Girl, Gold Queen mines; Paradox Valley district: Grey Dawn mine; White Canyon district: Happy Jack mine.

*Sanpete County* Dry Canyon

*Sevier County* Henry district: Trinity prospect; Salina Creek district: Ball, Lead Hill mines.

*Summit County* Marble district; Park City district: American Flag, California, Comstock, Creole, Daly, Daly West, Jupiter, Kearns - Keith, Little Bell, Mayflower Nail Driver, New York, Ontario, Scottish Chief, Silver King, Silver King Consolidated, Woodside mines.

*Tooele County* Bingham district: May Flower mine; Blue Bell district: Bennion Canyon, Black Hawk, Bogan, Hidden Splendor, Morgan mines; Columbia district: Sharp, Benmore, Sultana mines; Deep Creek Mountains: Cyclone, Devils Pit, Eagles Nest, Gold Star, Leap Year, Midland, Monoco, Monte del Rey, North Pass, Oro del Rey, Overland, Silver Queen, Willow Springs mines, Dutch Mountain; Dugway district: Bertha, Bryan, Buckhorn, Bullion Canyon, Four Metals, Francis, Kellys Hole, Lauris, Raymond - Bald Eagle mines; East Erickson district: Dutch Peak, Indianapolis, Tintic-Delaware mines; Erickson district: Black Joe, Black Rock, Blain, Deer Trail, Indian Boy, May Farmer, Good Hope, Indian Chief, Last Hope no. 3, Utonia mines; Free Coinage district; Gold Hill district: Alvarado, Bonanza, Cash Boy, Christmas Mining Company Climax, Copper Queen-Midland Mining Company, Cyclone, Garrison Monster, Gold Belt, Gold Hill (U. S.), Gold Hill Standard, Monoco, New Baltimore, Reaper, Red Jacket, Rube, Silver and Gold Mining Company, Spotted Fawn, Success, Unadine mines; Granite Mountain district: Blue Bell, Cannon Tank Canyon, Desert, El Dorado, Mountain Queen mines; Grantsville district; Johnson Pass; Lakeside district; Mercur district: Mineral Hill mine; North Tintic district: New Bullion, Scranton mines; Ophir district: Dry Canyon area - Kearsarge, Mono, Queen of the Hills, Surprise mines; Lion Hill area - Buffalo mine; Ophir Hill area - Admiral Dewey, Cliff, Hidden Treasure, Ophir Hill Consolidated, Ophir Coalition, Sacramento mines;

Osceola district; Rush Valley district: Argent, Ben Harrison, Calumet, Galena King, Honerine, Mescatine, Muerbrook, Salvation - Hercules, Tip Top mines; Silver Island district: Carrie Mack property; Tooele district; Willow Springs district.

*Uintah County* Bassett mine.

*Utah County* Alpine district: Alpine-Galena, Lucky Chance mines; American Fork district: Bay State, Bog, Dutchman, Mary Ellen, Live Yankee, Miller, Pacific, Pittsburgh, Silver Dipper, Water Fall, Yankee mines; East Tintic district: Apex Standard, Burgin, Eureka Bullion, Eureka Lily, Eureka Standard, Iron King, North Lily, Tintic Standard, Trixie mines; North Tintic district: Blowhole Hill, Lehi Tintic, Tintic Empire, Tintic Paymaster mines; Payson district: Nelson, Snyder mines; Provo district: Monarch mine; Santaquin district: Union Chief mine; Silver Lake district: Milkmaid, Ontario mines.

*Wasatch County* Blue Ledge district: Glencoe, Mayflower, McHenry, Valeo mines; Elkhorn district: Crawford, Nelson and Queen mines; Snake Creek district: Revelator, West Quincy mines.

*Wayne County* Miners Mountain district.

*Weber County* Fremont Island district; Sierra Madre district: Eldorado property; Weber district: New Azurite, Standard Mining Company mines.

## GARNET GROUP

The group includes a number of important subspecies which conform to the general formula  $A_3B_2(SiO_4)_3$ . (A = calcium, magnesium, ferrous iron, or divalent manganese; B = aluminum, ferric iron, titanium, or chromium). Isometric. Common forms are dodecahedrons and trapezohedrons. Also in ground grains, massive granular, coarse or fine. H. 6. 5-7.5. G. 3.5-4.3. Luster vitreous to resinous. Color varying with composition; mostly red, brown, yellow, white, green, black. Transparent to translucent. Grossularite is the most common garnet in Utah and occurs in contact metamorphic zones in crystalline limestones.

*Beaver County* Beaver Lake district: Bat Ridge, Skylark mine; Bradshaw district: 2 R's group; Granite district: Big Pass, Contact, Molly, Oak, Oak Basin, Rattler, Scheelite, Ward groups; Lincoln district: Creole mine; Pine Grove district: Pine Grove Associates mine; Pruess district: Cactus Gulch, Copper Gulch; Rocky district: Bawana, Copper Ranch, Old Hickory mines; San Francisco district: Cupric mine; Star district: Commonwealth, Copper King, Kemple, Progressive, St. Mary's, Wild Bill mines; Washington district; Orizaba Consolidated mine, Lucero claim.

*Box Elder County* Dove Creek; Rosebud district.

*Davis County* Antelope Island.

*Iron County* Gold Springs district: Homestake mine.

*Juab County* Dugway Range; Thomas Range: Topaz Mountain; Tintic district: Carissa mine; Spring Creek district: Queen of Sheba mine; West Tintic district: Iron King, Tintic Western mines.

*Millard County* House Range: Amasa Valley, Horseshoe, Mt. Baldy, New Klondike, Pine Peak, Pinke Peak, Rainbow, South, South Pit, Sidesprings mines, Notch Peak, Painter Springs; Saw Back district.

*Piute County* Gold Mountain district.

*Salt Lake County* Big Cottonwood district: Mountain Lake mine; Bingham district; Little Cottonwood district: Alta, South Hecla mines, Alta and Clayton Peak stocks contact zone.

*San Juan County* Chinle Wash; Comb Ridge; Moses Rock; Mule Ear; Navjo Reservation.

*Sevier County* Henry district: Trinity prospect.

*Summit County* Bonanza Flat; Park City district: Jupiter mine.

*Tooele County* Deep Creek Mountains: Midas mine; Dugway district; Gold Hill district: Alvarado, Calaveras, Cane Springs, Copperopolis, Doctor, Fraction Lode, Frankie, Lucy L., Ida Lull mines; Granite Mountain district: Blue Bell mine; Ophir district: Ophir Hill area - Chicago, Hidden Treasure, Ophir Hill Consolidated, Ophir Coalition mines; Rush Valley district: Settlement Canyon, Soldier Creek.

*Utah County* Silver Lake district: Deer Creek, Milkmaid mine, Silver Creek.

*Wasatch County* Bonanza Flat; Snake Creek district.

*Weber County* Ogden Canyon; Sierra Madre district; Strongs Canyon.

#### GARRELSITE

Hydrous barium sodium boron silicate,  $Ba_3NaB_6Si_2O_{13}(OH)_7$ . Monoclinic. Crystals have steep dipyrmidal shape, faces striated. Colorless, but darkened by inclusions. Occurs as sparse crystals in the Green River Formation.

*Uintah County* Sun Oil Company South Ouray well.

#### GEARKSUTITE

Hydrous calcium aluminum fluoride,  $CaAl(OH)F_4 \cdot H_2O$ . Probably monoclinic. Massive or nodular, earthy. Consists of very minute needles. H. 2. G. 2.7. Colorless to white. Luster dull.

*Piute County* Marysvale district: Freedom no. 2 mine.

*Utah County* East Tintic district.

#### GEOCRONITE

Lead antimony arsenic sulfide,  $Pb_5SbAsS_8$ . Monoclinic. Crystals rare. Massive, granular. H. 2.5. G. 6.3. Cleavage good. Fracture uneven. Luster metallic. Color and streak lead - gray to grayish blue. Opaque.

*Juab County* Tintic district: Colorado mine.

*Summit County* Park City district: Silver King mine.

#### GEL-BERTRANDITE

(See BERTRANDITE)

#### GERSDORFFITE

Nickel arsenic sulfide,  $NiAsS$ . Isometric. Octahedral, pyritohedral crystals; sometimes striated as in pyrite; lamellar and granular massive. Cleavage perfect. Fracture uneven. H. 5.5. G. 5.9. Luster metallic. Color silver-white to steel gray, often tarnished gray or grayish black. Streak grayish black. Opaque.

*San Juan County* White Canyon district: Happy Jack mine.

#### GIBBSITE

Aluminum hydroxide,  $Al(OH)_3$ . Monoclinic. Spheroidal concretions, incrustations, or earthy masses. H. 3. G. 2.3. Luster pearly. In hydrothermal alteration zones of ore deposits.

*Millard County* Church Hills: Stevens prospect.

*Tooele County* Oquirrh Mountains: Manning Canyon Shale; Stansbury Mountains: Manning Canyon Shale.

*Utah County* Beverly Hills: Manning Canyon Shale; East Tintic district; Lake Mountain: Manning Canyon Shale; Lehi district: Manning Canyon Shale; Thorpe Hills: Manning Canyon Shale; Wasatch Mountains: Manning Canyon Shale.

#### GILSONITE

An asphalt. Occurs in veined masses. Conchoidal fracture. Brittle. H. 2.5. G. 1.06. Color black. Luster brilliant, lustrous. Streak brown. Burns with brilliant flame.

*Duchesne County* Castle Peak district; Myton.

*Uintah County* Asphalt Wash; Black Dragon mine; Bonanza mine; Fort Duchesne; Rainbow mine.

#### GLAUBERITE

Sodium calcium sulfate,  $Na_2Ca(SO_4)_2$ . Monoclinic. Cleavage perfect. Fracture conchoidal. Brittle. H. 2.5-3. G. 2.8. Color usually gray or yellowish. Transparent and translucent. Taste slightly saline.

*Box Elder County* Shores of Great Salt Lake.

*Davis County* Shores of Great Salt Lake.  
*Salt Lake County* Shores of Great Salt Lake.  
*Tooele County* Shores of Great Salt Lake.

#### GLAUCONITE

Essentially a hydrous silicate of iron and potassium.  $(K,Na)(Al,Fe,Mg)_2(Al,Si)_4O_{10}(OH)_2$ . Monoclinic. H. 2. G. 2.4-2.9. Considerable variation in composition. Probably occurs in both colloidal and crystalline forms. Usually amorphous. Resembles chlorite. Color dull green. Found in ocean sediments near the continental shores. Found in the Cambrian Ladore Formation, and Jurassic Curtis Formation.

*Daggett County* Uinta Mountains.  
*Utah County* Eastern Uinta Mountains; Split Mountain; North of Vernal.

#### GOETHITE

Hydrogen iron oxide,  $HFeO_2$ . Orthorhombic. Rarely in distinct crystals, often flattened. In acicular crystals. Also massive, reniform, stalactitic in radiating fibrous aggregates. Cleavage good. H. 5-5.5. G. 4.4. Luster adamantine to dull. Brittle. Color yellowish brown to dark brown. Streak yellowish brown. Occurs with limonite forming gossans in Utah.

*Beaver County* San Francisco district: Pruess district: Blackbird, Cactus mines.

*Box Elder County* Lucin district: Copper Mountain, Tecoma Hill mines.

*Grand County* Miners Basin district: High Ore mine.

*Iron County* State Line district.

*Juab County* Detroit district: Iron Blossom mine.

*Piute County* Marysvale district: La Vita prospect, Silica Hills.

*Salt Lake County* Big Cottonwood district: Eclipse, Reed and Benson mines.

*San Juan County* White Canyon district: Happy Jack mine.

*Utah County* East Tintic district: Burgin mine.

#### GOLD

Native gold, Au. Isometric. Crystals rare. Commonly reticulated, dendritic, filiform, spongy. Also massive or as flattened grains or scales. H. 2.5-3. G. 19.3. Fracture hackly. Very malleable and ductile. Color and streak gold-yellow when pure. Luster metallic. Opaque.  
*Beaver County* Bradshaw district: Cave, Hecla, Jolly, Nip and Tuck mines; Fortuna district: Rocky Hollow; San Francisco district: Golden Reef, Michigan group mines; Granite district: Beaver View, Big Pass, Contact, Garnet group mines; Newton district: Indian Creek,

Rob Roy mine; Pruess district: Gold Reef mine.

*Box Elder County* Ashbrook district: Vipont mine; Dove Creek; Lucin district: Copper Mountain, Tecoma Hill mines; Park Valley district: Century, Susannah mines; Promontory district: Lakeview mine; Rosebud district: Mogul mine, Red Buttes; Willard district: Overland claim.

*Cache County* Hyrum area: Moon claim.

*Daggett County* Red Creek: Yellow Canary uranium deposit.

*Davis County* Farmington district: Morning Star mine, Parrish Canyon.

*Emery County* Emery district; southern part of County.  
*Garfield County* Colorado River district: Dirty Devil River south to Lake Canyon; Henry Mountains: Bromide, Crescent Creek, south flank of Mount Ellen, Cuprum, Oro mines.

*Grand County* Bald Mesa; Colorado River area: Dolores River south to Amasa Back; Miners Basin district: Dillon, M. I. F. mines, Placer Creek, Tornado deposit; Salt Valley; Wilson Mesa.

*Iron County* Gold Springs district: Aetna, Homestake, Independence, Jennie, Jumbo, Little Buck, Snowflake mines; Sand Springs; State Line district: Creole, Gold Dome, Johnny, Ofer, Phelps, Utah Spur mines.

*Juab County* Deep Creek Mountains: Gold Bond, Jumbo, Queen of Sheba mines; Detroit district: Charm, Copperhead, E. P. H., Ibex, Martha mines: Tintic district: Black Jack, Bullion Beck, Centennial, Empire, Eureka, Eureka Hill, Mammoth, May Day, Victoria mines; Trout Creek district; West Tintic district: Scotia, War Eagle mines.

*Kane County* Colorado River district; Paria River, Shinarump clay 15 miles north of state boundary.

*Millard County* House Range: Amasa Valley, Granite Canyon, Notch Peak; Leamington district: Yellowstone mine.

*Morgan County* Morgan district: Chicago-Utah, Iron King, Morgan Consolidated,, Morgan Crescent, Red Eagle mines; Strawberry mine.

*Piute County* Deer Creek; Gold Mountain district: Annie Laurie, Mill Creek on Signal Peak, Sevier mines. Mt. Baldy district: Deer Trail, Pluto mines; Ohio district: Bully Boy and Webster, Cascade, Dalton, Pine Gulch Creek, Tunnel Extension No. 2, Wedge mines.

*Salt Lake County* Big Cottonwood district: New State mine; Bingham district: Bingham Copper Pit, Broad Gauge, Boston Consolidated, Burning Moscow, Butterfield, Caledonia, Commercial, Dalton and Lark, Dixon, Galena, Last Chance, Montezuma, Nast, Old Jordan, Old Telegraph, Parnell, Red Wing, U. S. and Lark, Winnamuck, Yosemite mines; Bingham district: Bear Gulch, Bingham Canyon, Carr Fork; Little Cottonwood district:



Dwyer claims; Lower Placer district.

*San Juan County* Abajo Mountains: south flank; Bluff; Colorado River: San Juan River junction south to Lees Ferry; Golden Queen mine; La Sal Mountains; Monticello district: Blue Bird, Copper Queen, Danish Girl, Duckett, Gold Queen, Log Cabin mines; Point Lookout Placer; San Juan River: Moneuzuma Canyon west to Colorado River.

*Summit County* Park City district: Daly-Judge, Mayflower, New York, Silver King, Woodside mines.

*Tooele County* Columbia district: Sultana mine; Deep Creek Mountains: Devils Pit, Eagles Nest, Midland, Oro del Rey, Red Hill mines; Dugway district: Four Metals mine; East Erickson district: Indianapolis mine; Free Coinage district; Gold Hill district: Alvarado, Cane Springs, Copper Bloom, Lucy Midas, Reaper, Rube, Yellow Hammer mines; Granite Mountain district: Desert, El Dorado, Mountain Queen mines; Mercur district: Consolidate Mercur, Daisy, La Cigale, Golden Gate, Sacramento mines; Ophir district: Dry Canyon area - Surprise mine; Lion Hill area Buffalo, East Side, Empire, Iron, Monarch, Northern Light, Woodruff mines; Rush Valley district: Honerine mine; Wild Cat Mountains: Silver Queen mine.

*Uintah County* Green River: Flaming Gorge Reservoir downstream to Horseshoe Bend. Green River district: Cub Creek; Little Split Mountain.

*Utah County* American Fork district: Yankee mine; East Tintic district: Apex Standard, Burgin, Eureka Bullion, Eureka Lily, Eureka Standard, Iron King, North Lily, Tintic Standard, Trixie mines; Payson district: Nelson mine; Silver Lake district: Deer Creek, Milkmaid, Ontario mines.

*Wasatch County* Blue Ledge district: Glencoe, McHenry, Mayflower, Valeo mines; Elkhorn district: Crawford, Nelson and Queen properties; Snake Creek district; West Quincy mine.

*Washington County* Bull Valley district.

*Weber County* Cold Water Canyon: Fremont Island district; Sierra Madre district: King Solomon vein.

#### GOLDICHITE

Hydrous potassium ferric sulfate,  $\text{KFe}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ . Monoclinic. Occurs as radiating clusters, or finegrained crusts. Larger crystals striated. H. 2.5. G. 2.4. Color pale yellowish green. Cleavage good.

*Emery County* San Rafael district: Dexter group.

#### GORDONITE

Hydrous basic magnesium aluminum phosphate,  $\text{MgAl}_2(\text{PO}_4)_2(\text{OH})_2 \cdot 8\text{H}_2\text{O}$ . Triclinic. Usually in

bundles which radiate outward in sheaf-like aggregates. H. 3.5. G. 2.2. Cleavage good. Fracture conchoidal. Brittle. Luster vitreous to pearly. Colorless to smoky white.

*Utah County* Clay Canyon.

#### GOSLARITE

Hydrous zinc sulfate,  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ . Orthorhombic. Usually found as crusts, acicular to hair-like crystals; massive, granular or fibrous. H. 2-2.5. G. 1.9. Cleavage good. Brittle. Luster vitreous. Colorless, Tints of brown, green, blue. Taste metallic, astringent.

*Beaver County* San Francisco district: Horn Silver mine.

*Salt Lake County* Bingham district: Dixon, Galena, Old Jordan, Winnamuck mines.

*Summit County* Park City district.

*Utah County* East Tintic district.

#### GOYAZITE

Hydrous strontium aluminum phosphate,  $\text{SrAl}_3(\text{PO}_4)_2(\text{OH})_5 \cdot \text{H}_2\text{O}$ . Hexagonal. Small rhombohedral crystals. H. 4½-5. G. 3.26. Colorless, pink, or honey yellow color. Luster greasy to resinous. Transparent.

*Utah County* Clay Canyon.

#### GRANTSITE

Hydrous sodium calcium vanadate,  $\text{Na}_4\text{CaV}_2\text{V}_{10}\text{O}_{32} \cdot 8\text{H}_2\text{O}$ . Monoclinic. Occurs as aggregates of microscopic fibers or blades; botryoidal. H. soft. G. 2.9. Color dark olive green to greenish black. Luster silky. *Grand County* Thompsons district: Parco no. 23 mine.

#### GRAPHITE

Native carbon, C. Hexagonal. Commonly in foliated masses. Also scaly, radiated, granular, earthy, to compact. H. 1-2. G. 2.1. Cleavage basal perfect. Flexible. Sectile. Greasy feel. Luster metallic. Color iron black to steel gray. Streak black.

*Tooele County* Gold Hill district: Alvarado mine.

*Utah County* Silver Lake district: Deer, Silver Creeks.

#### GREENOCKITE

Cadmium sulfide, CdS. Hexagonal. Usually as an earthy coating. H. 3-3.5. G. 4.9. Cleavage good. Fracture conchoidal. Brittle. Luster adamantine to resinous. Color yellow, orange. Streak yellow-orange to brick-red.

*Beaver County* Star district: Moscow mine.

*San Juan County* Big Indian district: Mi Vida mine;

White Canyon district: Happy Jack mine.  
*Utah County* East Tintic district: North Lily mine.

#### GROSSULARITE (See GARNET)

#### GUANO

Essentially a tricalcium phosphate. Found in areas frequented by birds, comprised chiefly of their excrement.

*Box Elder County* Bird Island: Gunnison Island.  
*Millard County* Tabernacle Mountain.

#### GUMMITE

No single formula attributed to these materials, essentially oxides of uranium, usually with Pb, Th, rare earths, and large amounts of water. Massive, dense. Also as crusts. H. 2.5-5. G. 3.9-6.4. Fracture conchoidal, uneven. Brittle. Luster greasy to vitreous, often resembles gum. Color yellow, orange, brown, black.

*Emery County* San Rafael district: Delta mine.  
*San Juan County* Paradox Valley district: Grey Dawn mine.

#### GUNNINGITE

Hydrous zinc iron sulfate,  $(\text{Zn,Fe})\text{SO}_4 \cdot \text{H}_2\text{O}$ . Monoclinic. Very fine grained; as an efflorescence. Easily soluble in water. H.  $2\frac{1}{2}$ . G. 3.2. Color white. Luster vitreous.

*Utah County* East Tintic district.

#### GYPSITE

Earthy mixture of gypsum with clay and sand. Found on playas.

*Millard County* West of Fillmore, dunes twenty feet high.

*Tooele County* Large dunes near Knolls.

#### GYPSUM

Hydrous calcium sulfate,  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ . Monoclinic. Single crystals commonly simple in habit. Also granular massive, foliated, and rock forming. H. 2. G. 2.3. Cleavage perfect one direction, two imperfect. Flexible, not elastic. Luster vitreous to pearly. Colorless, white, gray, yellowish or brownish. Gypsum occurs as extensive beds of sedimentary origin, associated with anhydrite. In southeastern Utah found in the Paradox Member of the Hermosa Formation; in east-central Utah it occurs in the Carmel, Entrada, and Summerville Formations; in

central Utah in the Arapien Shale; in southwestern Utah in the Kaibab, Moenkopi, Carmel, and Curtis Formations; in northeastern Utah in the Thaynes and Carmel Formations. Huge selenite crystals have been found in caves in Wayne County, and other parts of the State.

*Beaver County* Pruess district: Blackbird, Cactus mines;  
*San Francisco district*: Horn Silver mine.

*Box Elder County* Promontory district: Lakeview Mining properties.

*Duchesne County* Lake Fork; Rock Creek.

*Emery County* Cedar Mountain district; Fullers Bottom; Horn Silver Gulch; San Rafael district: Delta mine, Flat Top Mesa; San Rafael River: Tidwell Ranch.

*Garfield County* Circle Cliffs: Acme, Black Widow, Blue Goose, Rocky Mountain, Steam Boat mines; Coyote Creek district: Hampton mine, Water Pocket Canyon.  
*Grand County* Agate Switch; Cane Creek: Texas Gulf Potash mine; Fisher Valley; Gypsum Hills; Moab Valley; Onion Creek; Polar Mesa district; Paradox Basin; Salt Valley; Seven Mile anticline; Thompsons area.

*Iron County* Cedar Canyon; Kanarraville.

*Juab County* Mona district: San Pitch Mountains; Chicken Creek, Levan, Nephi, Salt Creek; Tintic district: Mammoth mine.

*Kane County* Cannonville; Glendale; Johnson Creek; Kanab Creek; Kimball Valley; Orderville; Paria.

*Millard County* Fillmore; Gordon district: Cove Creek, Black, Excelsoir, Maripose, New York, Philadelphia, Prince Albert, Sulphur King, Queen Victoria mines; Kanosh.

*Piute County* Gold Mountain district; Marysvale district: Quick silver mine; Sevier Canyon.

*Salt Lake County* Shores of Great Salt Lake.

*San Juan County* Gypsum Creek; Moab Valley; Monticello district; Paradox Basin; San Juan River; White Canyon district: Happy Jack mine.

*Sanpete County* Gunnison; Mayfield; Twelve Mile Canyon.

*Sevier County* Glenwood; Henry district: Trinity prospect; Rock Candy Mountain; Sigurd.

*Summit County* Park City district: Wabash property.

*Tooele County* Dugway district: Bertha, Four Metals, Kellys Hole, Metal States, Surplus mines; Gold Hill district: Gold Hill (U. S.) mine; shores of Great Salt Lake; Knolls; Mercur district: Mercur mine; Ophir district: Ophir Hill area - Admiral Dewey prospect; Rush Valley district: Mescatine mine.

*Uintah County* Steinaker Draw; Uteland Knoll district: Ouray; Whiterocks Canyon.

*Utah County* Utah district: Alpha, Emerald, Lucky Boy, Queen of the West, Spalding, Trotter mines.

*Washington County* Santa Clara district: Black Beauty

no. 1 claim; Silver Reef district; St. George; Toquerville; Virgin River.

*Wayne County* Caineville; Fremont River: South Wash; Fruita: Oyler mine; Last Chance Gulch; Muddy River.

### GYROLITE

Hydrous basic calcium silicate,  $\text{Ca}_2\text{Si}_3\text{O}_7(\text{OH})_2 \cdot \text{H}_2\text{O}$ . Hexagonal. A zeolite. Occurs in white concretions, lamellar, radiating structures. Basal cleavage. H. 3-4. G. 2.4.

*Salt Lake County* Bingham district: Bingham Copper Pit.

### HALITE

Sodium chloride,  $\text{NaCl}$ . Isometric. Usually cubic crystals, faces often cavernous and stepped. Also massive, coarsely granular to compact. H. 2. G. 2.1. Cleavage cubic. Brittle. Luster vitreous. Colorless, white, yellow, red.

*Box Elder County* Great Salt Lake.

*Davis County* Great Salt Lake.

*Grand County* Cane Creek: Texas Gulf Potash mine. Cane Creek; Paradox Basin; Salt Valley; Seven Mile anticline.

*Juab County* San Pitch Mountains: Chicken Creek, Levan, Nephi, Salt Creek.

*Piute County* Marysvale district.

*Salt Lake County* Great Salt Lake.

*San Juan County* Moab Valley.

*Sanpete County* Gunnison; Twelve Mile Canyon.

*Sevier County* Glenwood; Redmond; Sigurd.

*Tooele County* Great Salt Lake; Great Salt Lake Flats; Salduro; Wendover.

*Washington County* Virgin River.

### HALLOYSITE

Hydrous aluminum silicate,  $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4 \cdot 2\text{H}_2\text{O}$ . Monoclinic. H. 1-2. G. 2.1. Fracture conchoidal. Luster pearly, waxy, dull. Color white, grayish, greenish, yellowish, bluish, reddish.

*Box Elder County* Lucin district: Copper Mountain, Tecoma Hill mines.

*Juab County* Tintic district: Dragon mine, Packard Peak.

*Millard County* Church Hills: Stevens prospect.

*Piute County* Marysvale district.

*Summit County* Park City district: Park-Bingham Tunnel.

*Tooele County* Blue Bell district: The Iron mine.

*Utah County* East Tintic district: Larsen clay pits; Fox Hills.

*Wasatch County* Keetley area.

*Washington County* Mineral Mountain: Beauty Knoll claims.

### HALOTRICHITE

Hydrous sulfate of divalent iron,  $\text{FeAl}_2(\text{SO}_4)_4 \cdot 22\text{H}_2\text{O}$ . Monoclinic. Occurs in silky fibrous forms, tufted. Also acicular. H. 1.5. G. 1.9. Cleavage poor. Fracture conchoidal. Brittle. Luster vitreous. Colorless to white, yellowish or greenish. Taste astringent.

*Emery County* San Rafael district: Dexter group.

*Uintah County* Uteland Knoll district: Ouray.

*Utah County* East Tintic district: Tintic Standard mine.

### HECTORITE

Hydrous magnesium lithium silicate,  $\text{Na}_{0.33}(\text{Mg},\text{Li})_3\text{Si}_4\text{O}_{10}(\text{F},\text{OH})_2$ . Monoclinic. A member of the smectite group. Massive, very fine grain; claylike. H. 1-2. G. 2-3. Color white. Luster dull.

*Duchesne County* Green River Formation.

*Juab County* Thomas Range: Spor Mountain.

*Uintah County* Green River Formation.

### HEDENBERGITE

Calcium iron silicate,  $\text{CaFeSi}_2\text{O}_6$ . Monoclinic. A pyroxene. In prismatic crystals. Cleavage prismatic imperfect. H. 5-6. G. 3.5. Color black.

*Beaver County* Star district: Lady Bryan, Moscow mines.

*Grand County* La Sal Mountains: North Mountain; Miners Basin district: Dewey, M. I. F. mines.

*Tooele County* Ophir district: Ophir Hill area – Hidden Treasure mine.

### HELIUM

Helium, He. Inert, colorless, odorless gas. Helium is next to hydrogen in lightness. Density 0.178. Associated with natural gas.

*Emery County* Woodside Dome.

*Grand County* Harley Dome.

### HELVITE

Complex beryllium silicate,  $\text{Mn}_7\text{FeBe}_6\text{Si}_6\text{O}_{24}\text{S}_2$ . Isometric. Crystals are tetrahedrons. Occurs also in spherical masses. Cleavage poor. Fracture uneven to conchoidal. Brittle. H. 6. G. 3.2. Luster vitreous to earthy. Color red-brown. Garnet-like masses.

*Beaver County* Granite district: Miller mine.

## HEMATITE

Iron oxide,  $\text{Fe}_2\text{O}_3$ . Hexagonal. Crystals often thick to thin tabular. Also micaceous to platy, columnar to granular, botryoidal, friable, earthy or compact. H. 5-6. G. 5.2. Cleavage none. Fracture subconchoidal to uneven. Brittle. Luster metallic to submetallic to dull. Color steel gray, red. Streak reddish brown.

*Beaver County* Beaver Lake district: Black Rock mine, Iron Mountain Pass, Skylark mines; Blue Mountains; English Springs; Granite district: Burnt Hollow, Contact, King of the Hills groups; Lincoln district: Creole, Lincoln mines; Pine Grove district: Emma, Iron Duke (Iron Gloery or Ruby Iron), Iron Queen (Mooney, Wilson, Last Chance), King Iron prospects; San Francisco district: Imperial mine; Star district: Wild Bill mine; Wah Wah Mountains: Violet Claims.

*Box Elder County* Ashbrook district: Vipont mine; Lucin district: Copper Mountain, Tecoma Hill mines; Willard district: Gold Standard, Wasatch Iron and Gold mines.

*Cache County* Hyrum area: Moon claim; Paradise district: Mineral Point.

*Daggett County* Red Creek: Yellow Canary uranium deposit; Red Creek Complex.

*Davis County* Antelope Island: Farmington district: Parrish Canyon.

*Duchesne County* Duchesne Iron prospect; Moon Lake Iron deposit; Red Ledge: Hilltop Iron claims.

*Emery County* San Rafael district: Delta mine.

*Garfield County* Henry Mountains: Bromide, Oro mines.

*Grand County* Miners Basin district: Dewey, High Ore mines.

*Iron County* Escalante district: Escalante mine; Iron Springs district: Granite Mountain, Iron Mountain, Three Peaks (See under MINERAL LOCALITIES, Iron County); Pinto Iron district; Stateline district: Creole, Gold Dome, Johnny, Ofer, Phelps, Utah Spur mines.

*Juab County* Deseret district; Detroit district: Charm, Copperhead, E. P. H., Ibex mines; Thomas Range: Bell Hill mine, Floride mine; Topaz Mountain; Tintic district: Emerald, Iron mines; West Tintic district: Lockheed Iron, Scotia, War Eagle, Iron King, Tintic Western mines.

*Millard County* Cricket Mountains: ferruginous member of Prospect Mountain Quartzite; Gordon district: Excelsior, Mariposa, New York, Prince Albert, Queen Victoria mines, Cove Creek; Twin Peaks (martite variety).

*Morgan County* Hardscrabble district: Norway group.

*Piute County* Marysvale district: East Slope no. 2, La Vita prospects; Mt. Baldy district: Deer Trail mine.

*Salt Lake County* Bingham district: Broad Gauge, Highland Boy, Yampa mines.

*San Juan County* White Canyon district: Happy Jack, Jomac mines.

*Sevier County* Henry district: Iron Peaks, Krotke Iron, Trinity mines.

*Summit County* Park City district: Mayflower mine. Jupiter mine.

*Tooele County* Columbia district: Iron King mine; Deep Creek Mountains: Devils Pit, Eagles Nest, Iron Blowout, Oro del Rey mines; Blue Bell district: Bogan, The Iron mines; Columbia district: Iron Hope prospect; Dugway district: Bertha, Black Dragon, Bryan, Confidence, Four Metals, Kellys Hole, Lauris, Eagle mines; East Erickson district: Indianapolis, Silver King, Tintic-Delaware mines; Gold Hill district: Calaveras, Gold Bond, Reaper mines; Granite Mountain district: Desert, El Dorado, Mountain Queen mines; Rush Valley district: Soldier Creek mine.

*Uintah County* Ashley Creek: Woodside Iron prospect; Browns Park area; Carbonate district: Dyer, Pope Iron mines.

*Utah County* East Tintic district: Apex Standard, Eureka Lily, Iron King, North Lily, Tintic Standard mines; North Tintic district: Selma mine; Provo district: Monarch mine; Santaquin district: Copper Bullion, Santaquin Central Tunnel, Union Chief mines; Silver Lake district: Deer, Silver Creeks; Utah district: Alpha, Emerald, Lucky Boy, Queen of the West, Spalding, Trotter mines.

*Wasatch County* Rhodes Plateau district: Ferry Iron deposit.

*Washington County* Bull Valley district: Cove Mountain, Buddy, Big Mountain, Emma, Enterprise, Iron Rod, Pilot, Soft Iron claims.

*Weber County* Sierra Madre district; Weber district.

## HEMIMORPHITE

Hydrous silicate of zinc,  $\text{Zn}_4(\text{Si}_2\text{O}_7)(\text{OH})_2 \cdot \text{H}_2\text{O}$ . Orthorhombic. Crystals tabular or prismatic. Also stalactitic, mammillary, fibrous, massive, granular. H. 4.5-5. G. 3.4. Cleavage good. Brittle. Luster vitreous. Color white, bluish, greenish, yellowish. Transparent to translucent.

*Beaver County* San Francisco district: Horn Silver mine; Star district: Emerson, Sundown mines, Cedar-Talisman, Hoosier Boy mines.

*Box Elder County* Lucin district; Tecoma Hill mine; Promontory district: Lakeview Mining properties.

*Iron County* Escalante district: Escalante mine.

*Juab County* Mt. Nebo district: Eva, Freddie mines; Tintic district: Boss Tweed, Bullion Beck, Colorado, Gemini, May Day, Victoria mines; West Tintic district: Lockheed Iron mine.

*Salt Lake County* Big Cottonwood district: Reed and Benson mines; Little Cottonwood district: Emma, Little Emma mines.

*Summit County* Park City district: Quincy mine.

*Tooele County* Dugway district: Bertha, Bryan claims, Bullion Canyon; Gold Hill district: Garrison Monster mine; North Tintic district: Raymond-Bald Eagle, New Bullion, Scranton mines; Ophir district: Ophir Hill area Hidden Treasure, Sacramento mines.

*Utah County* East Tintic district: Eureka Lily, North Lily, Trixie mines.

#### HERCYNITE

Essentially an oxide of iron and aluminum,  $\text{FeAl}_2\text{O}_4$ . Isometric. Occurs as massive, coarse granular to compact, irregular or rounded embedded grains. H. 7.5-8. G. 4.4. Dark grayish green to dark green. Found in isolated boulders with corundum.

*Sevier County* Pine Canyon: Black Hawk claims.

#### HESSITE

Silver telluride,  $\text{Ag}_2\text{Te}$ . Monoclinic. Highly modified and often greatly distorted. Also massive, compact, fine-grained, H. 2-3. G. 8.2. Cleavage cubic indistinct. Somewhat sectile. Luster metallic. Color lead-gray to steel-gray. Opaque.

*Tooele County* Ophir district: Dry Canyon area - Kear-sarge mine.

*Utah County* East Tintic district: Apex Standard, Eureka Lily, Eureka Standard mine, Iron King, North Lily, Tintic Standard mines.

#### HETAEROLITE

Oxide of zinc and manganese,  $\text{ZnMn}_2\text{O}_4$ . Tetragonal. Crystals pyramidal; also massive. Cleavage indistinct. Fracture uneven. Brittle. H. 6. G. 5.2. Luster submetallic. Color black. Streak dark brown.

*Utah County* East Tintic district: Burgin mine.

#### HEULANDITE

Hydrous calcium sodium aluminum silicate,  $(\text{Ca},\text{Na}_2)\text{Al}_2\text{Si}_7\text{O}_{18}\cdot 6\text{H}_2\text{O}$ . Monoclinic. Crystals sometimes flattened. Also globular forms, granular. H. 3.5-4. G. 2.2. Cleavage good. Brittle. Luster pearly, vitreous. Color white to red, gray, brown. A zeolite.

*Juab County* Tintic district: Gemini mine.

*Salt Lake County* Little Cottonwood district.

*Utah County* East Tintic district.

#### HEWETTITE

Hydrous calcium vanadate,  $\text{CaV}_6\text{O}_{16}\cdot 9\text{H}_2\text{O}$ . Monoclinic. Found as nodular aggregates, fibrous coatings, microscopic needles. H. soft. G. 2.6. Luster silky. Color deep red.

*Emery County* San Rafael district: Flat Top Mesa, Temple Mountain, Rex no. 2 mine, South Rock, South Temple Wash.

*Grand County* La Sal district: Jack claim; Polar Mesa district; Thompsons district: Cactus Rat mine.

*San Juan County* La Sal Quadrangle: Evening Star mine; Paradox Valley district: Grey Dawn, Vanadium Queen mines.

#### HIGGINSITE (See CONICALCITE)

#### HISINGERITE

Hydrous iron silicate,  $\text{Fe}_2\text{Si}_2\text{O}_5(\text{OH})_4\cdot 2\text{H}_2\text{O}$ . Amorphous. Compact. Fracture conchoidal. H. 3. G. 2.5-3. Luster greasy. Color black to brownish black.

*Utah County* East Tintic district.

#### HOLLANDITE

Manganese barium oxide,  $\text{MnBaMn}_6\text{O}_{14}$ . Monoclinic. Short prismatic crystals. Usually massive; fibrous; sometimes concretionary. H. 6. G. 4.95. Brittle. Luster metallic to dull. Color black, gray black, silvery gray.

*Utah County* East Tintic district: Burgin mine.

#### HORNBLÉNDE

A complex series, general formula,  $\text{Ca}_2\text{Na}(\text{Mg},\text{Fe})_4 - (\text{Al},\text{Fe},\text{Ti})(\text{Al},\text{Si})_8\text{O}_{22}(\text{O},\text{OH})_2$ . Monoclinic. A common amphibole. Cleavage prismatic. Luster vitreous. H. 5-6. G. 3. 2. Color various shades of dark green to black.

*Beaver County* Granite district: Bismuth mine; San Francisco district; Star district: Moscow mine.

*Daggett County* Red Creek Complex.

*Davis County* Antelope Island.

*Salt Lake County* Little Cottonwood stock.

*Tooele County* Gold Hill district: Reaper mine.

*Utah County* Little Cottonwood stock.

*Weber County* Ogden Canyon; Sierra Madre district: Napoleon-Maghera group.

#### HUEBNERITE

Manganese tungstate,  $\text{MnWO}_4$ . Monoclinic. Commonly long prismatic crystals. Striated or furrowed. Cleav-

age perfect. Fracture uneven. Brittle. H. 4-4.5. G. 7.1. Luster submetallic, somewhat resinous. Color yellowish brown to reddish brown. Streak yellow to reddish brown.

*Beaver County* Newton district: Louise claims; Pine Grove district: Pine Grove Associates mine.

*Tooele County* East Erickson district: South Pine Canyon; Gold Hill district.

#### HUMITE

Basic magnesium fluosilicate,  $Mg_7Si_3O_{12}(F,OH)_2$ . Orthorhombic. Cleavage poor. H. 6-6.5. G. 3.1. Brittle. Luster vitreous to resinous. Color white, yellow, brown, reddish.

*Tooele County* Gold Hill district: Calaveras, Frankie mines.

#### HUMMERITE

Hydrous potassium vanadate,  $KMgV_5O_{14} \cdot 8H_2O$ . Triclinic. G. 2.53. Crystals elongated. Color yellow, bright orange. Occurs as tiny veins in clay, and as efflorescence on sandstone.

*Emery County* San Rafael district: Temple Mountain.

#### HUNTITE

Magnesium calcium carbonate,  $Mg_3Ca(CO_3)_4$ . Orthorhombic. Crystals exceedingly small, one micron or less in size. H. soft. G. 2.7. Occurs compact, chalklike masses. Fracture even to subconchoidal. Brittle. Porous. Crumbles in water emitting crackling noises. Smooth feel, adheres to tongue. Color white. Luster dull.

*Beaver County* Rocky district: Little Rocky prospect.

*Juab County* Tintic district: 1800' level of Chief Consolidated mine.

#### HYALITE (See OPAL)

#### HYDROMAGNESITE

Hydrous magnesium carbonate hydroxide,  $Mg_5(CO_3)_4(OH)_2 \cdot 4H_2O$ . Monoclinic. Crystals tiny. Occurs as tufts, rosettes, or acicular or bladed crystals. Also massive, chalky, or mealy. Cleavage perfect. Brittle. H. 3.5. G. 2.2. Luster vitreous, silky or pearly. Colorless to white.

*Salt Lake County* Big Cottonwood district; Big Cottonwood, Mountain Lake mines.

#### HYDROMICA (See Illite).

#### HYDROZINCITE

Zinc carbonate hydroxide,  $Zn_5(OH)_6(CO_3)_2$ . Monoclinic. Crystals minute tiny blades. Usually massive, fibrous, earthy or compact. H. 2-2.5. G. 3.7. Cleavage good. Very brittle. Luster pearly, silky to earthy. Color white, gray, yellowish, brownish, pinkish, lilac.

*Juab County* Tintic district: Gemini, May Day mines. *Piute County* Ohio district: Bully Boy and Webster mines.

*Tooele County* Dugway district: Bryan, Four Metals, Morrell mines; North Tintic district: Scranton mine; Ophir District: Ophir Hill area - Hidden Treasure, Sacramento mines.

*Washington County* Tutsagubet district: Apex (Dixie) mine.

#### HYPERSTHENE

Ferrous magnesium silicate,  $(Fe, Mg)SiO_3$ . Orthorhombic. A pyroxene. Crystals rare, prismatic and tabular. Usually foliated massive. H. 5-6. G. 3.4. Cleavage prismatic. Luster pearly. Color dark brownish green, grayish black, greenish black.

*Beaver County* Star district: Lady Bryan mine.

*Salt Lake County* Alta stock.

*Tooele County* Oquirrh Mountains: Tickville Gulch.

#### ICELAND SPAR (See CALCITE)

#### IDDINGSITE

Hydrous magnesium iron silicate, probably  $H_8Mg_9Fe_2Si_3O_{14}$ . Orthorhombic. Lamellar crystals or foliated. H. 3. G. 2.7. Cleavage good. Luster bronze. Color chestnut brown to yellowish green. Alteration product. *Tooele County* Rush Valley district.

#### IDOCRASE

Hydrous calcium aluminum silicate,  $Ca_{10}(Mg,Fe)_2Al_4(SiO_4)_5(Si_2O_7)_2(OH)$ . Tetragonal. Crystals prismatic, often striated. H. 6.5. G. 3.4. Luster vitreous to resinous. Color green, brown, yellow, blue, red. Usually found in crystalline limestone resulting from contact metamorphism.

*Beaver County* Bradshaw district: 2 R's group; Granite district: Big-Pass, Bismuth, Oak, Oak Basin, Rattler, Ward groups; Lincoln district: Creole mine.

*Juab County* West Tintic district.

*Millard County* House Range: Amasa Valley, Horseshoe, Mt. Baldy, New Klondike, Pine Peak, Pinke Peak, Rainbow, South, South Pit, Sidesprings mines, Notch

Peak, Painter Springs.

*Salt Lake County* Little Cottonwood district: Alta mine, Clayton Peak Stock contact zone.

*Tooele County* Deep Creek Mountains: Midas mine; Gold Hill district: Alvarado, Cane Springs, Midas mines; Pine Canyon.

*Wasatch County* Clayton Peak.

## ILLITE

Hydrous potassium aluminum silicate,  $K_2(Si_6Al_2)Al_4O_{20}(OH)_4$ . Monoclinic. Massive, extremely fine grained. Often admixed with other clay minerals. H. 1-2. G. 2.6-2.9. Usually white, also pale colors.

*Duchesne County* Green River Formation.

*Emery County* San Rafael district: Delta, Temple Mountain mines.

*Salt Lake County* Bingham district: Bingham Copper Pit.

*San Juan County* White Canyon district: Happy Jack mine.

*Sevier County* Henry district: Trinity prospect; Rock Candy Mountain.

*Tooele County* Dugway district: Bertha claim; Oquirrh Mountains: Manning Canyon Shale; Stansbury Mountains: Manning Canyon Shale.

*Uintah County* Green River Formation.

*Utah County* Beverly Hills: Manning Canyon Shale; East Tintic district: Burgin mine; Lake Mountain: Manning Canyon Shale; Lehi district: Manning Canyon Shale; Thorpe Hills: Manning Canyon Shale; Wasatch Mountains: Manning Canyon Shale.

## ILMENTE

Iron titanium oxide,  $FeTiO_3$ . Hexagonal. Commonly thick tabular crystals. Also compact massive; detrital. H. 5-6. G. 4.7. Cleavage none. Parting due to twinning. Fracture conchoidal to subconchoidal. Luster metallic to submetallic. Color iron black. Streak black with greenish tinge. Occurs in igneous rocks, hydrothermal ore deposits, and with black sandstones of Late Cretaceous age in Utah.

*Beaver County* San Francisco district.

*Emery County* Emery.

*Garfield County* Escalante; Henry Mountains: Bromide, Oro mines, southwestern flanks of Henry Mountains. *Kane County* Southern part of Kaiparowits Plateau.

*Tooele County* Gold Hill district: Reaper mine.

## ILSEMANNITE

Molybdenum oxide,  $Mo_3O_8 \cdot nH_2O$ ? Found only as earthy masses, stains, or as a disseminated pigment.

Color black, blue black, blue.

*Grand County* La Sal district: Jack claim.

*Piute County* Marysvale district: Bullion Monarch, Freedom nos. 1-2, Prospector no. 1, Quick silver mines.

*San Juan County* Elk Ridge: King Edward, King James-Virgene, Notch Nos. 1 and 4 Mines; Red Canyon district: Frey no. 4 mine; White Canyon district: Happy Jack mine.

*Uintah County* Uteland Knoll district.

## INDIUM

Rare metal, indefinite mineral association. Found in contact metamorphic ore deposits and in replacement veins. Associated with scandium.

*Tooele County* Gold Hill district.

## INGRAMITE

An asphaltic pyrobitumen. Occurs in the basal Green River Formation.

*Utah County* Colton: Higgins, James Peak (Brown Bear), Kyune Canyon, Midnight, Miller, Pleasant Valley, Thomas Ranch, Town mines.

*Wasatch County* Soldier Summit: Culmer Brothers, Soldier Summit, U. S. mines.

## IOLITE (See CORDIERITE)

## JALPAITE

Silver copper sulfide,  $Ag_3CuS_2$ . Isometric. Small clusters of round grains, or inclusions in galena and tetrahedrite. Secondary growths in cerussite.

*Utah County* East Tintic district: Burgin mine.

## JAMESONITE

Lead iron antimony sulfide,  $Pb_4FeSb_6S_{14}$ . Monoclinic. Acicular to fibrous crystals. Also fibrous massive to columnar. H. 2.5. G. 5.6. Cleavage good. Brittle. Luster metallic. Color and streak gray-black, sometimes with iridescent tarnish. Opaque.

*Beaver County* San Francisco district: Horn Silver mine.

*Juab County* Tintic district; West Tintic district: Scotia mine.

*Summit County* Park City district: California mine.

*Tooele County* Gold hill district: Gold Hill (U. S.), U. S. mines; Silver Island district: Carrie Mack property.

*Utah County* American Fork district: Mary Ellen and Live Yankee, Yankee mines; East Tintic district: Eureka Lily mine.

## JAROSITE

Basic potassium ferric sulfate,  $\text{KFe}_3(\text{SO}_4)_2(\text{OH})_6$ . Hexagonal. Crystals minute and indistinct. Usually in crusts or coatings. Also granular massive, fibrous, Nodular. H. 2.5-3.5. G. 3.1. Cleavage good. Fracture uneven to conchoidal. Brittle. Luster vitreous to resinous. Color ochreous, amber yellow, brown. Streak pale yellow.

*Beaver County* Granite district: Big Pass group; San Francisco district: Horn Silver mine; Star district: Moscow, Red Warrior, Wild Bill mines.

*Emery County* San Rafael district: Fuemrol no. 2 mine.

*Iron County* Stateline district: Creole, Gold Dome, Johnny, Ofer, Phelps, Utah Spur mines.

*Juab County* Detroit district; Tintic district: Eagle and Blue Bell mines.

*Millard County* Church Hills: Stevens prospect.

*Morgan County* Argenta district: Carbonate Hill, Carbonate Gem mines.

*Piute County* Marysvale district: Copper Cap, Freedom no. 1, Silica Hills, Yellow Jacket mines; Mt. Baldy district: Deer Trail mine.

*San Juan County* Elk Ridge: Notch Nos. 1 and 4 mines; White Canyon district: Fry No. 4, Happy Jack, Jomac mines.

*Sevier County* Monroe Canyon; Rock Candy Mountain.

*Tooele County* Deep Creek Mountains: Dewey, Midland, North Pass, Silver Queen mines; Dugway district: Confidence, Four Metals mines, Kellys Hole; Gold Hill district: Alvarado, Copper Bloom, Copper Queen Midland Mining Company. Cyclone, Gold Hill (U. S.), Rube, Success, U. S. mines; Mercur district: Sparrowhawk mine; Ophir district: Dry Canyon area - Kearsarge mine; Lion Hill area Buffalo mine, Chloride Point, Douglas, Empire, Iron, Lion, Monarch, Northern Light, Woodruff, Zella mines; Ophir Hill area - Admiral Dewey, Cliff mines; Rush Valley district: Argent, Ben Harrison, Calument, Galena King, Honerine, Mescatine, Muerbrook, Salvation-Hercules mines.

*Utah County* East Tintic district: Burgin, Tintic Standard, Trixie mines.

*Washington County* Tutsagubet district: Apex (Dixie), Paymaster mines.

*Wayne County* Coleman Canyon to Oak Creek; Grand Wash to Capitol Wash; Rabbit Valley, Old Dixon prospect.

JASPER (See CRYPTOCRYSTALLINE QUARTZ)

JASPEROID (See CRYPTOCRYSTALLINE QUARTZ)

JEFFERISITE

Hydrous magnesium iron aluminum silicate,  $10(\text{Mg,Fe})0.4(\text{AlFe})_2\text{O}_3 \cdot 10\text{SiO}_2 \cdot 7\text{H}_2\text{O}$ . Hydrated mica belonging to the vericulites. Occurs in broad plates and small scales. H. 1.5. G. 2.3. Cleavage basal perfect. Pearly luster. Color dark yellowish brown. Alteration product. *Tooele County* Gold Hill district: Centennial and Enterprise mines.

## JENKINSITE

Hydrous magnesium iron manganese silicate,  $(\text{Mg,Fe,Mn})_4\text{Si}_3\text{O}_{10} \cdot 3\text{H}_2\text{O}$ . Associated with minerals in altered wall rocks.

*Utah County* East Tintic district.

## JET

Black variety of lignite coal. Organic gem stone. Soft, light in weight. Black color. Takes a velvety polish, can be worked with a lathe. Forms disk-like inclusions in narrow coal seams found along cliffs of Coaly Basin. Most important source of jet in North America.

*Garfield County* Henry Mountains.

*Wayne County* Henry Mountains: Mt. Ellen, Coaly Basin.

## JOHANNITE

Hydrous basic copper uranium sulfate,  $\text{Cu}(\text{UO}_2)_2(\text{SO}_4)_2(\text{OH})_2 \cdot 6\text{H}_2\text{O}$ . Triclinic. Crystals minute, prismatic and tabular. In drusy aggregates, coatings. H. 2 - 2.5. G. 3.3. Cleavage good. Luster vitreous. Color emerald green. Streak pale green. Taste bitter.

*Emery County* San Rafael district: Consolidated, Delta mines.

*Garfield County* Henry Mountains.

*Piute County* Marysvale district: Bullion Monarch, Prospector no. 1 mines.

*San Juan County* Red Canyon district: Frey no. 4, Posey mines; White Canyon district: Happy Jack, Hideout mines.

*Wayne County* Fruita: Oyler mine.

## JORDISITE

Molybdenum disulphide,  $\text{MoS}_2$ . Amorphous. Occurs as a black powdery, colloidal form. Alters to blue ilsemmanite.

*Piute County* Marysvale district: Buddy, Bullion Monarch, Freedom no. 1-2, Prospector no. 1 mines.

*San Juan County* Red Canyon district: Frey no. 4 mine.

KAINITE



Hydrous sulfate and chloride of potassium and magnesium,  $\text{KMg}(\text{SO}_4)\text{Cl}\cdot 3\text{H}_2\text{O}$ . Monoclinic. Granular massive and interbedded with other salts. Cleavage perfect. Fracture even. Brittle. H. 2.5-3. G. 2.2. Luster vitreous. Colorless to white. An evaporite resulting from artificial ponding.

*Tooele County* Salduro; Wendover.

#### KAOLINITE

Hydrous aluminum silicate,  $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_2$ . Triclinic. . Occasionally found in minute, thin, rhombic or hexagonal plates. Claylike masses, either compact or friable. H. 2-2.5. G. 2.6. Cleavage basal. Luster dull to earthy. Color white, often colored by impurities. *Beaver County* San Francisco district: Horn Silver mine. *Box Elder County* Lucin district: Copper Mountain, Tecoma Hill mines.

*Cache County* Smithfield area.

*Emery County* San Rafael district: Delta mine.

*Piute County* Marysvale district: White Horse deposit.

*Salt Lake County* Bingham district: Bingham Copper Pit.

*Sevier County* Henry district: Trinity prospect.

*Tooele County* Gold Hill district: Reaper mine; Granite Mountain district; Oquirrh Mountains: Manning Canyon Shale; Stansbury Mountains: Manning Canyon Shale.

*Utah County* Beverly Hills: Manning Canyon Shale; Cedar Valley; East Tintic district: Burgin, Eureka Standard, Larsen Clay pits, North Lily mines; Fox Hills; Jordan Narrows: Orem, Saratoga, Soldiers Pass quadrangles; Lehi district: Manning Canyon Shale; Lake Mountain: Manning Canyon Shale; Thorpe Hills: Manning Canyon Shale, Wasatch Mountains: Manning Canyon Shale.

*Wasatch County* Keetley area.

*Washington County* Mineral Mountain: Beauty Knoll claims: Silver Reef district.

#### KASOLITE

Hydrous lead uranium silicate,  $\text{Pb}(\text{UO}_2)\text{SiO}_4\cdot \text{H}_2\text{O}$ . Monoclinic. Crystals small, stout prismatic habit, divergent groups, crusts, and granular masses. Cleavage perfect. Brittle. H. 4.5. G. 5.9. Color ocher yellow to brownish yellow. Luster dull to earthy.

*Piute County* Marysvale district

#### KERMESITE

Antimony oxysulfide,  $\text{Sb}_2\text{S}_2\text{O}$ . Monoclinic. Crystals lath-shaped, elongated, Also tufted radiating aggregates. H. 1-1.5. G. 4.6. Cleavage good. Sectile. Luster adaman-

tine. Color cherry red. Streak brownish red.

*Utah County* American Fork district: Bay State mine.

#### KIESERITE

Hydrous magnesium sulfate,  $\text{MgSO}_4\cdot \text{H}_2\text{O}$ . Monoclinic. Mostly massive, coarse to fine granular, and intergrown with other salts. H. 3.5. G. 2.6. Colorless, white or yellowish. Luster vitreous. Cleavage good.

*Grand County* Paradox basin.

*San Juan County* Paradox Valley district.

*Tooele County* Salduro; Wendover.

*Utah County* East Tintic district.

#### KIMOLITE (See Cimolite)

#### KINOITE

Hydrous copper calcium silicate,  $\text{Cu}_2\text{Ca}_2\text{Si}_3\text{O}_{10}\cdot 2\text{H}_2\text{O}$ . Monoclinic. Tabular crystals. Transparent and translucent. H. 5. G. 3.16. Color deep azure blue.

*Beaver County* Rocky district: Bawana mine.

#### KLAPROTHITE

Copper bismuth sulfide,  $\text{Cu}_6\text{Bi}_4\text{S}_9$ . Orthorhombic. Prismatic crystals' Massive. Brittle. H. 2½. G. 6.01. Luster metallic. Color steel gray. Tarnishes to brass yellow or iridescent.

*Utah County* East Tintic district.

#### KOLBECKITE

Hydrous scandium phosphate,  $\text{ScPO}_4\cdot 2\text{H}_2\text{O}$ . Orthorhombic. Occurs in altered variscite nodules. Crystals short prismatic, minute. H. 5. G. 2.44. Colorless, yellowish, bright blue to blue-gray. Transparent. Luster vitreous to pearly.

*Utah County* Clay Canyon.

#### KORNELITE

Hydrous ferric sulfate,  $\text{Fe}_2(\text{SO}_4)_3\cdot 7\text{H}_2\text{O}$ . Monoclinic. Lath-like and acicular crystals. Also tufted aggregates, crusts, globular masses. G. 2.8. Cleavage good. Luster silky. Color pale rosepink to violet.

*Utah County* East Tintic district: Tintic Standard mine.

#### KORNERUPINE

Hydrous magnesium aluminum boron silicate,  $\text{Mg}_3\text{-Al}_6(\text{Si,Al,B})_5\text{O}_{21}(\text{OH})$ . Orthorhombic. In fibrous to columnar aggregates. H. 6.5. G. 3.27. Colorless to white,

brown.

*San Juan County* Moses Rock dike.

#### KRENNERITE

Ditelluride of gold,  $\text{AuTe}_2$ . Orthorhombic. Usually short prismatic crystals. Brittle. H. 2-3. G. 8.62. Luster metallic. Color silver white to light brass yellow when tarnished.

*Utah County* East Tintic district: North Lily, Tintic Standard mines.

#### KYANITE

Aluminum silicate,  $\text{Al}_2\text{SiO}_5$ . Triclinic. Usually in long bladed crystals. H. 5-7.5. G. 3.6. Cleavage good. Luster vitreous. Color blue, white; also green, gray, black. Occurs in schists and gneiss.

*Box Elder County* Grouse Creek Range: Birch, Southern Conley, Western Grouse Creeks.

*Daggett County* Red Creek Complex.

#### LABRADORITE

Calcium sodium aluminum silicate,  $\text{CaAl}_2\text{Si}_2\text{O}_8 \cdot \text{NaAlSi}_3\text{O}_8$ . Triclinic. Variety of plagioclase. Crystals usually twinned. Basal cleavage plates show striations. Cleavage good in two directions. H. 6. G. 2.7. Colorless, white, gray, golden brown. A golden brown gem stone variety is found at Jericho and Clear Lake, occurs in lavas.

*Juab County* East of Jericho; Keg Mountains.

*Millard County* Clear Lake Railroad Station.

*Tooele County* Stansbury Mountains: Mack, Muskrat, North Canyons, Salt Mountain.

#### LANARKITE

Lead oxysulfate,  $\text{Pb}_2\text{SO}_5$ . Monoclinic. Crystals elongated; also massive. Cleavage perfect. Thin laminae flexible. H. 2-2.5. G. 6.9. Luster adamantine to resinous. Color gray to greenish white, pale yellow. Fluoresces yellow.

*Utah County* East Tintic district: Burgin mine.

#### LAUMONTITE

Hydrous calcium sodium aluminum silicate,  $\text{CaAl}_2\text{Si}_4\text{O}_{12} \cdot 4\text{H}_2\text{O}$ . Monoclinic. A zeolite. Common crystal form is a prism. Also columnar, radiating and divergent. H. 3.5-4. G. 2.3. Cleavage good. Luster vitreous to pearly. Color white to yellow or gray.

*Garfield County* Henry Mountains: Bromide, Oro mines.

#### LEADHILLITE

Basic sulfate-carbonate of lead,  $\text{Pb}_4(\text{SO}_4)(\text{CO}_3)_2(\text{OH})_2$ . Monoclinic. Crystals usually pseudo-hexagonal. H. 2.5-3. G. 6.5. Cleavage good. Fracture conchoidal. Rather sectile. Luster resinous to adamantine. Colorless to white, gray, pale green, pale blue, yellowish.

*Juab County* Tintic district: Eureka Hill mine.

#### LEHIITE

Hydrous basic phosphate of sodium, potassium, calcium and aluminum of uncertain formula, perhaps  $(\text{Na,K})_2\text{Ca}_5\text{Al}_8(\text{PO}_4)_8(\text{OH})_{12} \cdot 6\text{H}_2\text{O}$ . Found as crusts and layers comprised of subparallel aggregates of fibers. H. 5.5. G. 2.9. Color white to gray.

*Utah County* Clay Canyon.

#### LEPIDOCROCITE

Basic ferric oxide,  $\text{FeO}(\text{OH})$ . Orthorhombic. Occurs as scales flattened and slightly elongated. Also as rosettes, massive. Brittle. H. 5. G. 4.1. Luster submetallic. Color ruby-red to reddish brown. Streak dull orange. Transparent.

*Wayne County* Fruita: Oyler mine.

#### LETTSOMITE (See CYANOTRICHITE)

#### LEUCHTENBERGITE

Variety of clinocllore,  $\text{Mg}_5(\text{Mg,Al})\text{AlSi}_3\text{O}_{10} \cdot 4\text{H}_2\text{O}$ . Monoclinic. Crystals usually hexagonal in form, often tabular. Cleavage perfect. H. 2-2.5. G. 2.7. Luster pearly. Colorless. Often resembles talc.

*Piute County* Mt. Baldy district: Deer Trail mine.

*Utah County* East Tintic district.

#### LEUCOSPHEENITE

Borosilicate,  $\text{BaNa}_4\text{Ti}_2\text{B}_2\text{Si}_{10}\text{O}_{30}$ . Monoclinic authigenic mineral. Crystals stout prismatic to platy rosettes. Occurs with oil shales in the Green River Formation.

*Duchesne County* Carter Oil Company wells; Sinclair Mortenson well.

*Uintah County* Sun Oil Company South Ouray well.

#### LEUCOXENE (See ANATASE)

#### LEVERRIERITE

Hydrous silicate of aluminum. Monoclinic. Occurs in vermicular aggregates. H. 1.5. G. 2.5. Cleavage good

basal. Colorless to brown.

*Salt Lake County* Bingham district: Highland Boy, Yampa mines.

*Utah County* Clay Canyon.

#### LEWISTONITE

Basic calcium potassium sodium phosphate,  $(Ca,K,Na)_5(PO_4)_3(OH)$ . Hexagonal. Occurs as stout hexagonal prisms, or in sheaf-like aggregates. H. 5. G. 3. Cleavage perfect. Colorless to pale green, white. Similar to apatite. *Utah County* Clay Canyon.

#### LIBETHENITE

Hydrous copper phosphate,  $Cu_2(PO_4)(OH)$ . Orthorhombic. Short prismatic crystals, also equant. H. 4. G. 3.97. Translucent. Light to dark olive green, also dark green.

*Beaver County* Star district: Atlas mine.

#### LIEBIGITE

Hydrous calcium uranium carbonate,  $Ca_2U(CO_3)_4 \cdot 10H_2O$ . Orthorhombic. Crystals equant or short prismatic. Most commonly as scaly or granular aggregates, crusts. H. 2.5-3. G. 2.4. Cleavage good. Luster vitreous to pearly. Color pale green to yellowish green. Fluoresces.

*Grand County* Thompsons district: Black Ape mine.

*San Juan County* Big Indian district: Mi Vida mine; Elk Ridge.

#### LIMONITE

Hydrous basic iron oxide,  $FeO(OH) \cdot nH_2O$ . Amorphous. Occurs in mammillary to stalactitic masses, concretionary, nodular, earthy. H. 5-5.5. G. 3-6.4. Luster vitreous, dull to earthy. Color dark brown to black. Streak yellowish brown. May show play of iridescence. Occurs as gossan capping.

*Beaver County* Beaver Lake district; Bradshaw district: Cave, Hecla mines; Fortuna district: Rocky Hollow; Granite district: Big Pass, Burnt Hollow groups; Lincoln district: Creole, Lincoln, Rattler Iron claims; Newton district: Sheep Rock mine; Pine Grove district: Central Wah Wah Iron deposit, Emma, Iron Duke (Iron Gloery or Ruby), Iron Queen, Mooney, Wilson or Last Chance, King Iron prospects; Pruess district; Blackbird, Cactus mines, Cactus Gulch; Star district: Commonwealth, Harrington-Hickory, Kemple, Mammoth, Progressive, Rebel, Red Warrior, St. Mary's, White Rock mines.

*Box Elder County* Ashbrook district: Vipont mine;

Lucin district: Copper Mountain, Cunepah Tunnel, Jeff-Doran, Tecoma Hill mines; Newfoundland district: Copper Ridge; Promontory district: Lakeview Mining properties; Willard district: Gold Standard mine.

*Daggett County* Birch Creek deposit; Spring Creek deposit.

*Davis County* Antelope Island; Farmington district: Parrish Canyon.

*Grand County* Courthouse Wash; Miners Basin district: Dewey, High Ore, Skylark mines; Little Valley; Salt Valley.

*Iron County* Escalante district: Escalante mine; Gold Springs district: Aetna, Independence, Jennie, Jumbo, Little Buck, Snowflake mines; Iron Springs district: Granite Mountain, Iron Mountain; Stateline district: Creole, Gold Dome, Johnny, Ofer, Phelps, Utah Spur mines.

*Juab County* Deseret district; Detroit district: Iron Blossom mine. Fish Springs district: Carnation, Emma, Galena, Utah mines; Thomas Range: Floride mine; Spring Creek district: Queen of Sheba mine; Tintic district: Black Dragon, Black Jack, Dragon, Empire, Emerald, Grand Central, Iron, Sunbeam mines; West Tintic district: Pyramid, Scotia, Tintic Western, War Eagle mines.

*Kane County* Kitchen Corral Canyon.

*Millard County* Antelope Springs; Leamington district: Fool Creek Canyon.

*Morgan County* Argenta district: Carbonate Hill, Carbonate Gem mines; Hardscrabble district: Norway group.

*Piute County* Antelope Range; Gold Mountain district: Annie Laurie, Sevier mines; Mt. Baldy district: Deer Trail, Green Eyed Monster mines; Ohio district: Bully Boy and Webster mines; Sevier Canyon.

*Salt Lake County* Big Cottonwood district: Carbonate, Cardiff mines; Bingham district: Galena, Old Jordan, Highland Boy, Yampa mines; Little Cottonwood district Alta Consolidated, Cabin, Emma, Flagstaff, Michigan-Utah mines; Smelter district.

*San Juan County* La Sal Mountains; Monticello district: Copper Queen, Duckett mines.

*Sanpete County* Ephraim.

*Sevier County* Henry district: Iron Peaks property; Rock Candy Mountain.

*Summit County* Park City district: Silver King, Woodside mines.

*Tooele County* Blue Bell district: Bogan, The Iron mines; Columbia Mining district: Benmore, Sharp, Sultana mines; Deep Creek Mountains: Iron Blowout mine; Dugway district: Bertha, Black Dragon, Bryan, Confidence, Eagle, Four Metals, Kelly's Hole, Lauris, Metal States, Yellow Jacket mines; East Erickson dis-

trict: Copper Jack, Green's Ridge, Silver Shield mines; Erickson district: Highland Lassie no. 1, Silver Reef mines; Gold Hill district: Alvarado, Boxton, Silver and Gold Mining Company, Unadine mines; Granite Mountain district: Desert, El Dorado, Mountain Queen mines; Mercur district: Mineral Hill mine; Ophir district: Dry Canyon area - Kearsarge, Mono, Queen of the Hills mines; Lion Hill area - Buffalo mine; Ophir Hill area - Admiral Dewey, Chicago, Cliff, Hidden Treasure, Sacramento mines; Rush Valley district: Argent, Ben Harrison, Calumet, Galena King, Honerine, Mescatine, Muerbrook, Salvation - Hercules mines.

*Utah County* American Fork district: Dutchman, Miller, Pittsburgh mines; East Tintic district: Burgin, Iron King, Tintic Standard mines; Lehi district: Hutchings claim; North Tintic district: Selma mine; Payson district: Nelson, Syndicate mines; Provo district: Monarch mine; Santaquin district: Union Chief mine; Utah district: Alpha, Emerald, Lucky Boy, Queen of the West, Spalding, Trotter mines.

*Washington County* Mineral Mountain: Picadilly mine. Tutsagubet district: Apex (Dixie) mine.

*Wayne County* Miners Mountain district: Old Faithful, Wonder Copper no. 1 mines; Rabbit Valley: Old Dixon prospect; Torrey: T. R. Lode no. 1 mine.

*Weber County* Ogden Canyon.

#### LINARITE

Basic lead copper sulfate,  $\text{PbCu}(\text{SO}_4)(\text{OH})_2$ . Monoclinic. Crystals elongated and often tabular. Occurs singly, in crusts, and aggregates. H. 2.5. G. 5.3. Cleavage good. Fracture conchoidal. Brittle. Luster vitreous. Color deep azure blue. Streak pale blue.

*Beaver County* San Francisco district: Horn Silver mine.

*Juab County* West Tintic district: Scotia mine.

*Salt Lake County* Bingham district; Little Cottonwood district: Grizzly mine.

*Summit County* Park City district: Silver King, Woodside mines.

*Utah County* East Tintic district.

#### LITHIOPHORITE

Hydrous aluminum lithium manganese oxide,  $(\text{Al,Li})\text{-MnO}_2(\text{OH})_2$ . Monoclinic. Occurs as fine scales, also compact, botryoidal. H. 3. G. 3.2. Luster dull to metallic. Color Bluish black. Streak blackish gray.

*Grand County* Seven Mile Canyon: Shinarump nos. 1-3 claims.

*Piute County* Marysvale district: Buddy, Bullion Monarch, Freedom no. 1, Prospector nos. 1 and 3 mines.

#### LODESTONE (See MAGNETITE)

#### LORANDITE

Thallium arsenic sulfide,  $\text{TlAsS}_2$ . Monoclinic. Cleavage good. Flexible. H. 2.5. G. 5.5. Luster metallic, adamantine. Color carmine-red, often dark lead-gray on the surface. Frequently covered with an ochre-yellow powder. Streak cherry-red. Transparent to translucent.

*Tooele County* Mercur district.

#### LOUGHLINITE

Hydrous sodium magnesium silicate,  $\text{Na}_2\text{Mg}_3\text{Si}_6\text{O}_{16} \cdot 8\text{H}_2\text{O}$ . Fibrous structure. Color pearly-white, Luster silky. G. 2.2. Very similar to sepiolite in appearance. Authigenic mineral in the Green River Formation.

*Duchesne County* Green River Formation.

#### LUCINITE (See VARISCITE)

#### LUCKITE (See MELANTERITE)

#### LUDWIGITE

Magnesium iron borate,  $(\text{Mg,Fe})_2\text{FeBO}_5$ . Orthorhombic. Occurs in finely fibrous masses, felted aggregates. Also sheaf-like aggregates and rosettes of needle-like crystals. H. 5. G. 3.6. Tough on fracture. Luster silky. Color dark green to greenish black. Streak black to blackish green. *Beaver County* Beaver Lake district: West Spring. *Salt Lake County* Big Cottonwood district: Big Cottonwood, Great Western, Mountain Lake, Mountain View mines; Little Cottonwood district: Alta Stock contact zone, Michigan Utah, Hecla mines.

#### LUZONITE

Copper arsenic sulfide,  $\text{Cu}_3\text{AsS}_4$ . Tetragonal. A dark, reddish, steel-gray mineral with the composition of enargite. Fracture uneven. Streak black. H. 3-4. G. 4.4.

*Utah County* East Tintic district: North Lily, Tintic Standard mines.

#### MAGNESIOARFVEDSONITE

A magnesium amphibole. Occurs as microscopic blue intergrowths on hornblende; and as asbestiform blue aggregates in brown dolomite marlstone. Matted fibrous habit. Color blue, blue gray.

*Duchesne County* Avintaquin Canyon: Green River Formation.

**MAGNESIOFERRITE**

Magnesium iron oxide,  $(\text{Mg,Fe})\text{Fe}_2\text{O}_3$ . Isometric. Rarely in crystals, Massive, granular. H. 5. G. 4.6. Luster metallic to dull. Color black to brownish black. Streak black. Magnetic.

*Summit County* Park City district; Ontario Tunnel.

*Wasatch County* Blue Ledge district; Ontario Tunnel.

**MAGNESIOLUDWIGITE (See LUDWIGITE)****MAGNESIORIEBECKITE**

Hydrous sodium magnesium iron silicate,  $\text{Na}_2\text{Mg}_3\text{Fe}_2\text{-Si}_8\text{O}_{22}(\text{OH})_2$ . Monoclinic. Crystals long prismatic. Also massive, fibrous, or granular. H. 5. G. 3.0-3.19. Color dark blue to black. Luster vitreous, silky.

*Duchesne County* Carter Oil Company wells; Green River Formation; Sinclair Mortenson well.

**MAGNESITE**

Magnesium carbonate,  $\text{MgCO}_3$ . Hexagonal. Crystals rare. Commonly massive, coarse to fine granular to very compact. Earthy to chalky. H. 3. 5-5. G. 3. 1. Cleavage rhombohedral. Fracture conchoidal. Brittle. Luster vitreous. Color white, gray, yellow, brown.

*Beaver County* Rocky district: Old Hickory, Silver Shield Mining Company mines; San Francisco district; White Mountain: Grampian Hill.

*Juab County* Fish Springs district: Carnation, Emma, Galena, Utah mines.

*Salt Lake County* Little Cottonwood district: Clayton Peak stock contact zone.

**MAGNETITE**

Iron oxide,  $\text{Fe}_3\text{O}_4$ . Isometric. Crystals commonly octahedrons. Massive, fine to coarse granular. H. 6. G. 5. 2. Luster metallic. Color iron-black. Streak black. Strongly magnetic. Opaque.

*Beaver County* Antelope district; Beaver Lake district: Bat Ridge, Skylark mines; Blue Mountains; Bradshaw district: Cave mine; English Springs; Granite district: Burnt Hollow group; Lincoln district: Creole, Lincoln, Rattler Iron claims; McGarry district; Pine Grove district: Pine Grove Associates mine. Pruess district: Blackbird, Cactus mines; Rocky district: Adelia, Bawana, Copper Ranch, Maria, Old Hickory mines; San Francisco district: Imperial mine; Star district: Commonwealth, Hub, Kemple, Lady Bryan, Progressive, St. Mary's, Wild Bill mines.

*Box Elder County* Willard district: Twin Pine claim,

*Wasatch Iron and Gold mine.*

*Davis County* Antelope Island.

*Garfield County* Colorado River district; Henry Mountains: Bromide, Cuprum, Oro mines.

*Iron County* Iron Springs district: Granite Mountain, Iron Mountain, Three Peaks (See mine listing under Iron County; Paragonah: Iron Peak; Pinto Iron district.

*Juab County* Deseret district; Thomas Range: Bell Hill mine; West Tintic district: Iron King mine, Lockheed Iron property, Tintic Western mine.

*Kane County* Colorado River district.

*Millard County* Twin Peaks: Black Diamond Iron prospect.

*Salt Lake County* Big Cottonwood district: Big Cottonwood, Kentucky-Utah, Mountain Lake, Woodlawn mines; Bingham district: Little Cottonwood district: Alta Consolidated, Alta Stock contact zone, Michigan-Utah, South Hecla mines; Little Cottonwood stock.

*San Juan County* La Sal Mountains: Middle Mountain, Brumley Ridge; White Canyon district: Happy Jack mine.

*Sevier County* Henry district: Iron Peaks property, Trinity prospect.

*Summit County* Park City district.

*Tooele County* Dugway district: Buckhorn claim; East Erickson district: Ekker Canyon, Silver Shield mines; Gold Hill district: Alvarado, Centennial and Enterprise, Doctor, Unadine mines.

*Utah County* Little Cottonwood stock; Silver Lake district: Deer, Silver Creeks.

*Wasatch County* Rhodes Plateau district: Ferry Iron deposit.

*Washington County* Bull Valley district: Big Mountain, Emma, Pilot, Redtop claims; Mineral Mountain: Emma, Gregerson, Picadilly mines.

*Weber County* Weber district.

**MALACHITE**

Basic copper carbonate,  $\text{Cu}_2\text{CO}_3(\text{OH})_2$ . Monoclinic. Crystals rare. Commonly massive or incrusting. H. 3. 5-4. G. 4. Cleavage fair. Fracture uneven. Luster silky, dull to earthy. Color green. Streak pale green.

*Beaver County* Antelope district; Beaver Lake district: Beaver Harrison, Copper Mountain, OK, Skylark mines; Bradshaw district: Cave, 2 R's mines; Granite district: Big Pass, Garnet, King-of-the-Hills groups; Lincoln district: Creole, Lincoln mines; McGarry district; Pruess district: Cactus mine; Rocky district: Adelia, Bawana, Maria mine; San Francisco district: Horn Silver, Imperial mines; Star district: Cedar-Talisman, Commonwealth, Copper King, Dotson, Gold Crown, Harrington-Hickory, Hoosier Boy, Kemple, Progressive, Rebel, Red Warrior,

St. Mary's, Sundown, White Rock, Wild Bill mines.

*Box Elder County* Ashbrook district: Vipont mine; Lucin district: Copper Mountain, Jeff Doran mines; Newfoundland district: Copper Ridge; Promontory district: Lakeview mine; Willard district: Mormon Girl, Ogden Boilmakers, Overland claims.

*Cache County* Hyrum district: Lucky Star Claim; La Plata area: Sundown claim; Paradise district; Richmond district.

*Daggett County* Red Creek, Yellow Canary Uranium deposit.

*Davis County* Antelope Island; Farmington district: Morning Star group, Parrish Canyon; Wandering Jew mine.

*Duchesne County* Rock Creek.

*Emery County* Castle Dale; Castle Valley; Emery district; San Rafael district: Copper Globe, Delta mines.

*Garfield County* Circle Cliffs: Acme, Blue Goose mines; Henry Mountains: Cuprum claim.

*Grand County* Hoosier mine; La Sal district: Bronite, McCoy mines. Miner's Basin district: Dewey, High Ore, McCormick, Moab no. 1 mines; Salt Valley.

*Iron County* Escalante district: Escalante mine. Iron Springs district: Granite Mountain, Iron Mountain.

*Juab County* Deep Creek Mountains: Gold Bond, Johnson Canyon, Singleton Canyon, Water Canyon mines. Detroit district: Charm, Copperhead, E. P. H., Ibex mines; Thomas Range: Eagle Rock prospect; Tintic district: Boss Tweed, Carissa, Centennial Eureka, Gemini, Gold Chain, Iron Blossom, Sioux, Sunbeam mines; West Tintic district: Lockheed Iron, 1903, Pyramid, Scotia, Tintic Western, War Eagle mines.

*Kane County* Paria Mining Company.

*Millard County* Church Hills: Stevens prospect; Detroit district: Almond, Blue Bell, Major Drum mines; Leamington district: Fool Creek Canyon.

*Morgan County* Morgan district: Chicago-Utah, Iron King, Morgan Consolidated, Morgan Crescent, Red Eagle mines; Round Valley: Copper Mountain mine.

*Piute County* Mt. Baldy district: Clyde, Deer Trail mines; Ohio district: Cascade, Copper Belt, Dalton, Iris, Shamrock, Wedge mines.

*Salt Lake County* Big Cottonwood district: Alta Tunnel and Transportation Company, Antelope, Big Cottonwood, Carbonate, Cardiff, Eclipse, Mountain Lake, Price of Wales, Woodlawn mines; Bingham district: Bingham Copper Pit, Butterfield, Columbia, Commercial, Galena, Highland Boy, Midland, Old Jordan, Old Telegraph, U. S. and Lark, Yampa mines; Little Cottonwood district: Emma, Little Emma mines; Smelter district.

*San Juan County* Big Indian district: Big Indian Copper mine; Elk Ridge: Notch Nos. 5 and 6, Oakie, Wooden-

shoe No. 3 mines; La Sal Mountains; La Sal Quadrangle: Jackpot mine, Lisbon Valley, Climax nos. 1-2, Lisbon Copper mines; Monticello district: Copper Queen, Tuffy Copper mines; Monument Valley district: Oljata, Skyline, Whirlwind mines; Paradox Valley district: Grey Dawn mine; Red Canyon district; San Juan River; White Canyon district; Bell, Four Aces, Fry No. 4, Happy Jack, Hideout, Jomac, Posey mines.

*Sevier County* Salina Creek district: Ball, Lead Hill mines, Sevier Canyon.

*Summit County* Park City district: Comstock, Daly, Daly-Judge, Daly West, Jupiter, Nail Driver, Ontario, Scottish Chief, Silver King, Silver King Consolidated, Woodside mines.

*Tooele County* Deep Creek Mountains: Complex, Devils Pit, Dewey, Eagles Nest, Fortuna, Gold Star, Laura, Monocco, North Pass, Oro del Rey, Overland, Probert, Prosperity, Silver Queen mines; Dutch Mountain; Dugway district: Belcher, Black Maria, Black Dragon, Confidence, Juno, Metal States, Raymond-Bald Eagle mines; East Erickson district: Copper Jack, Jessel Bezzel, Silver Shield mines; Erickson district: Highland Lassie no. 1 mine; Gold Hill district: Alvarado, Calaveras, Centennial, Copperopolis, Enterprise, Copper Bloom, Copper Hill, Copper Queen-Midland Mining Company, Doctor, Frankie, Garrison Monster, Gold Bond, Gold Hill (U. S.), Ida Lull, Lucy L., Minnehaha, Monoco, Napoleon, New Baltimore, Ozark, Pole Star Copper Company, Rea, Silver King, Unadine, Victory no. 1, Yellow Hammer mines; Granite Mountain district: Blue Bell, Cannon Tank Canyon, Desert, El Dorado, Mountain Queen mines; Grantsville district; Greeley district; Mercur district: Mineral Hill mine; Ophir district: Dry Canyon area - Brooklyn, Kearsarge, Mono, Queen of the Hills mines; Foothill area - Lakes of Killarney mine; Lion Hill area - Buffalo mine, Chloride Point; Ophir Hill area - Chicago, Cliff, Hidden Treasure, Sacramento mines; Rush Valley district: Ben Harrison, Calumet, Galena, Honerine, Muerbrook, Salvation Hercules, Southport mines; Silver Island district: Carrie Mack property; Tooele district; Willow Springs district.

*Uintah County* Brown Park area; Brush Creek district: Little Alta mine; Bullionville; Carbonate district: Dyer, Jessie Ewing mines, Red, Willow Creeks; Little Split Mountain; Uteland Knoll district: Ouray.

*Utah County* American Fork district: Miller mine; East Tintic district: Apex Standard mine, Eureka Bullion, Eureka Lily, Eureka Standard, Tintic Standard, Trixie mines; Santaquin district: Black Balsam, Copper Bullion, Sally Ann mines; Thorpe Hills.

*Washington County* Mineral Mountain: Emma, Gregeron mines; Silver Reef district: Buckeye, East Reef, Emily Jane, Maud, Requa mines; Tutsagubet district:

Apex (Dixie), Paymaster mines.

*Wayne County* Capitol Wash; Capitol Wash to Sheets Gulch; Grand Wash to Capitol Wash; Miners Mountain district: Old Faithful, Wonder Copper no. 1 mines; Torrey: T. R. Lode no. 1 mine.

*Weber County* Cold Water Canyon; Sierra Madre district: Eldorado, King Solomon mines; Weber district: New Azurite, Standard Mining Company mines.

#### MALLARDITE

Hydrous manganese sulfate,  $\text{MnSO}_4 \cdot 7\text{H}_2\text{O}$ . Monoclinic. Occurs as fibrous masses and crusts. H. 2. G. 1. 8. Cleavage good. Luster vitreous. Color pale rose. Soluble in water.

*Salt Lake County* Bingham district: Lucky Boy mine.

#### MANGANITE

Basic manganese oxide,  $\text{MnO}(\text{OH})$ . Monoclinic. Crystals prismatic, faces striated vertically. Also grouped in bundles, columnar to coarse fibrous, stalactitic. H. 4. G. . 4. 4. Cleavage good. Fracture uneven. Brittle. Luster submetallic. Color dark steel-gray. Streak reddish brown to nearly black.

*Beaver County* San Francisco district; Star district: Sundown mine.

*Emery County* Muddy River.

*Grand County* Little Grand district: Needles, Salt Wash group.

*Juab County* Tintic district: Victoria mine.

*Millard County* Detroit district: Black Diamond, Guy, Last Chance, Martha, Silica Plug mines.

*San Juan Co unty* La Sal Mountains.

*Summit County* Coalville.

*Tooele County* Erickson district: Huber-Rydalch mine.

#### MANGANOCALCITE

Calcium manganese carbonate,  $(\text{Ca},\text{Mn})\text{CO}_3$ . Hexagonal. Cleavage perfect. Brittle. H. 3-4. 5. G. 3. 5. Luster vitreous. Color rose-red, yellowish gray, brown.

*Piute County* Marysvale district; Mt. Baldy district: Deer Trail mine.

#### MANGANODOLOMITE (See DOLOMITE)

#### MARCASITE

Iron disulfide,  $\text{FeS}_2$ . Orthorhombic. Crystals commonly tabular. Also massive and stalactitic with radiating structure and exterior covered with projecting crystals. Cockscomb structure is typical. H. 6-6. 5. G. 4. 8.

Cleavage poor. Fracture uneven. Brittle. Luster metallic. Color pale bronze yellow. Streak grayish or brownish black.

*Beaver County* Gordon district: Sulphurdale.

*Emery County* San Rafael district: Dirty Devil, Little Susan, Lucky Strike, Pay Day mines.

*Juab County* Tintic district: Bullion Beck, Gemini mines.

*Millard County* Gordon district: Cove Creek, Victor Conqueror mine.

*Morgan County* Morgan district: Chicago-Utah, Iron King, Morgan Consolidated, Red Eagle mines.

*Salt Lake County* Bingham district: Highland Boy, Midland, Yampa mines.

*San Juan County* Elk Ridge: North 1 and 4 mines; White Canyon district: Happy Jack mine.

*Sanpete County* Dry Canyon.

*Utah County* East Tintic district: Burgin, Eureka Standard, Tintic Standard mines.

#### MARTITE (See HEMATITE)

#### MASSICOT

Lead oxide,  $\text{PbO}$ . Orthorhombic. Occurs massive, scaly or earthy. H. 2. G. 9. 5. Cleavage good. Crystals flexible, but not elastic. Luster greasy to dull. Color sulfur yellow. Streak yellow.

*Salt Lake County* Bingham district; Little Cottonwood district: Emma mine.

*Summit County* Park City district.

*Utah County* East Tintic district: Burgin mine.

#### MATILDITE

Silver bismuth sulfide,  $\text{AgBiS}_2$ . Orthorhombic. Massive. Rarely as prismatic crystals. Granular. Brittle. H. 2½. G. 6.9. Color iron black to gray. Fracture uneven.

*Utah County* East Tintic district.

#### MEERSCHAUM (See SEPIOLITE)

#### MELACONITE (See TENORITE)

#### MELANOVANADITE

Hydrous calcium vanadyl vanadate,  $\text{Ca}_2\text{V}_4\text{V}_6\text{O}_{25} \cdot n\text{H}_2\text{O}$ . Triclinic. In velvety, divergent bunches or elongated crystals. H. 2. 5. G. 3. 4. Cleavage good. Brittle. Luster submetallic. Color black. Streak dark reddish brown. Opaque.

*Grand County* Thompsons district: Juniper mine.

*San Juan County* La Sal Quadrangle: Black Hat mine;

Paradox Valley district: Grey Dawn, Vanadium Queen mines.

#### MELANTERITE

Hydrous ferrous sulfate,  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ . Monoclinic. Crystals short prismatic to equant. Usually in stalactitic or concretionary forms, fibrous aggregates or crusts, massive. H. 2. G. 1. 9. Cleavage good. Fracture conchoidal. Brittle. Luster vitreous. Color various shades of green, greenish blue, blue. Taste sweet, astringent. *Emery County* San Rafael district: Dexter group. *Juab County* Tintic district: Swansea mines. *Salt Lake County* Bingham district: Lucky Boy mine. *Tooele County* Mercur district: Brickyard mine; Ophir district: Ophir Hill area- Ophir Hill Consolidated, Ophir Coalition mines; Rush Valley district: Muerbrook mine. *Utah County* East Tintic district: Burgin mine.

#### MERCURY

Native element, Hg. Liquid. Tin-white color. Metallic luster. Very brilliant. Opaque. Occurs as isolated droplets.

*Iron County* Gold Springs district: Homestake mine; State Line district.

*Salt Lake County* Bingham district.

#### MESOLITE

Hydrous sodium calcium aluminum silicate,  $\text{Na}_2\text{Ca}_2\text{Al}_6\text{Si}_9\text{O}_{30} \cdot 8\text{H}_2\text{O}$ . Monoclinic. Occurs in acicular and capillary crystals; delicate divergent tufts. Cleavage good. H. 5. G. 2. 3. Color white or colorless.

*Salt Lake County* Little Cottonwood district.

#### META-ALUMINITE

Hydrous aluminum sulfate,  $\text{Al}_2(\text{SO}_4)(\text{OH})_4 \cdot 5\text{H}_2\text{O}$ . Monoclinic. Minute crystal laths; also microcrystalline. H. soft. G. 1.85. Color white. Luster silky.

*Emery County* San Rafael district: Temple Mountain, Fueamol No. 2 mine.

#### META-AUTUNITE

Hydrous calcium uranium phosphate,  $\text{Ca}(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 6\text{H}_2\text{O}$ . Tetragonal. Forms thin basal plates, or micaceous masses. Color yellow to pale green. Fluorescence yellowgreen. H. 2-2. 5. G. 3. 2. Luster vitreous. Cleavage good. Not brittle.

*Emery County* San Rafael district: Delta mine, Wild Horse Canyon.

*Grand County* Poison Spring Canyon; Thompsons district: Thom claim.

*Piute County* Marysvale district: Freedom no. 2, La Vita, Papsy's Hope mines.

*San Juan County* Elk Ridge: Notch Nos. 1 and 4 mines; White Canyon district: Posey mine.

*Sevier County* Henry district: La Veta prospect.

#### METACINNABAR

Mercuric sulfide, HgS. Isometric. Crystals tetrahedral, with rough faces; massive. H. 3. G. 7. 6. Fracture uneven. Brittle. Luster metallic. Color grayish black. Streak black. Opaque.

*Piute County* Marysvale district: Quicksilver mine. *Tooele County* Grantsville district: Timpie Valley, Ruby Crystal mine.

#### METAHEWETTITE

Hydrous calcium vanadate,  $\text{CaV}_6\text{O}_{16} \cdot 9\text{H}_2\text{O}$ . Monoclinic. Occurs in minute tabular or lath-shaped crystals in pulverulent masses, coatings. H. soft. G. 2. 7. Luster dull to silky. Color deep red. Streak maroon to brownish red.

*Emery County* San Rafael district: Temple Rock, South Temple Wash, Vagabond mine.

*Garfield County* Henry Mountains: Crescent Creek. *Grand County* Pack Creek; Thompsons area; Thompsons district: Cactus Rat mines; Yellow Cat district: Yellow Cat group.

*San Juan County* Paradox Valley district: Grey Dawn mine.

#### METAROSSITE

Hydrous calcium vanadate,  $\text{CaV}_2\text{O}_6 \cdot 2\text{H}_2\text{O}$ . Triclinic. G. 2.45. A dehydration product from rossite. Found as platy to flaky masses and veinlets, which are soft and friable. Luster dull to pearly. Color light yellow. H. soft. *Grand County* Thompsons area; Thompsons district: Parco no. 23 mine.

*San Juan County* Monticello district: Brushy Basin, Spring Creek.

*Wayne County* Coleman Canyon to Oak Creek.

#### METASTIBNITE

An amorphous form of stibnite  $\text{Sb}_2\text{S}_3$ . Luster sub-metallic. Color brick-red. Streak red. H. 2-3. Transparent in thin splinters.

*Summit County* Park City district: Silver King, Woodside mines.



## METASTRENGITE

Hydrous ferric phosphate,  $\text{FePO}_4 \cdot 2\text{H}_2\text{O}$ . Monoclinic. Crystals tabular or stout prismatic. Also as botryoidal masses, and crusts with radial structure. Cleavage good. Fracture uneven. Luster vitreous. H. 3. 5-4. G. 2. 7. Color peach blossom red, reddish violet, rarely moss-green. Occurs in cavities of magnetite.

*Iron County* Iron Spring district: Iron Mountain, Blow-out Hill.

## METATORBERNITE

Hydrous copper uranium phosphate,  $\text{Cu}(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$ . Tetragonal. In tabular crystals, often in rosettes or sheaf-like aggregates. H. 2. 5. G. 3. 6. Cleavage basal perfect. Brittle. Luster vitreous to pearly. Color pale green to dark green.

*Beaver County* Pine Grove district: Staats (Monarch) mine.

*Emery County* Green River district: Mineral Ten claim; San Rafael district: Delta, Dirty Devil mines, Flat Top Mesa, Temple Mountain, South Temple Wash.

*Piute County* Marysvale district: Bullion Monarch, East Slope no. 2, Freedom no. 2, La Vita mines.

*San Juan County* Monument Valley district: Skyline mine; Paradox Valley district: Grey Dawn mine; Red Canyon district: Markey no. 3 mine; White Canyon district: Happy Jack, Posey, White Canyon No. 1 mines, W. N. mines.

*Sevier County* Henry district: La Veta prospect.

*Wayne County* Capitol Wash to Sheets Gulch; Chimney Rock to Tantlus Flat; Coleman Canyon to Oak Creek; Fruita: Oyler mine; Grand Wash to Capitol Wash.

## METATYUYAMUNITE

Hydrous calcium uranium vanadate,  $\text{Ca}(\text{UO}_2)_2(\text{VO}_4)_2 \cdot 3\text{H}_2\text{O}$ . Orthorhombic. Platy to microgranular crystals. Color lemon to greenish yellow. Luster dull. H. 2. G. 3. 8. Cleavage good.

*Emery County* San Rafael district: Delta mine.

*Grand County* Thompsons district: Parco no. 23 mine.

*San Juan County* La Sal Quadrangle: Little Dawn, Sumner, Too High, Valley View, Wedge mines; Monticello district: Harts Draw, Lakes claim, Robertson Pasture, Shay Mountain, Shay Road, Sunshine Mining claim; Paradox Valley district: Grey Dawn mine.

## META-URANOCIRCITE

Hydrous barium uranium phosphate,  $\text{Ba}(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$ . Tetragonal. Crystals are thin tablets, usually

composite, grade into fanlike groups. Cleavage perfect. Not brittle. Thin plates flexible. H. 2-2. 5. G. 4. Luster pearly. Color yellow-green. Fluoresces green.

*Juab County* Honeycomb Hills.

## METAVARISCITE

Hydrous aluminum phosphate,  $\text{Al}(\text{PO}_4) \cdot 2\text{H}_2\text{O}$ . Monoclinic. Crystals thin to thick tabular, or lathlike shapes. H. 3. 5. G. 2. 5. Cleavage good. Luster vitreous. Color pale green. Tests the same as for variscite.

*Box Elder County* Utahlite Hill.

## METAZEUNERITE

Hydrous copper uranium arsenate,  $\text{Cu}(\text{UO}_2)_2(\text{AsO}_4)_2 \cdot 8\text{H}_2\text{O}$ . Tetragonal. Crystals tabular and resemble torbernite. Cleavage perfect basal. H. 2 - 2.5. G. 3. 6. Fracture uneven. Brittle. Luster vitreous to pearly. Color grass-green. Fluorescent yellow-green.

*Emery County* San Rafael district: Consolidated, Delta, Dexter group, Fudemrol no. 2, Green Vein Mesa, Green Vein no. 5, Original Green Vein mines, Pay Day, Vagabond mines.

*Juab County* Tintic district: Centennial Eureka mine.

*San Juan County* Elk Ridge: Notch Nos. 5 and 6, Sandy No. 3 mines; Red Canyon district: Markey no.3 mine; White Canyon district: Happy Jack, Jomac, W. N. mines.

*Wayne County* Torrey.

## MIARGYRITE

Silver antimony sulfide,  $\text{AgSbS}_2$ . Monoclinic. Crystals usually thick tabular; also massive. Cleavage poor. Fracture uneven. Brittle. H. 2. 5. G. 5. 2. Luster metallic. Color iron-black to steel-gray. Streak cherry-red. Nearly opaque.

*Utah County* East Tintic district.

## MICROCLINE

Potassium aluminum silicate,  $\text{KAlSi}_3\text{O}_8$ . Triclinic. Crystals near orthoclase in angles and habit. Multiple twinning. Massive cleavage to granular compact. H. 6-6.5. G. 2. 5. Cleavage good. Brittle. Luster vitreous, pearly. Color white, red, green.

*Davis County* Antelope Island; Wasatch Mountains, Farmington Complex.

*Millard County* House Range: Notch Peak intrusive, Painter Springs.

*Salt Lake County* Little Cottonwood stock.

*San Juan County* White Canyon district: Happy Jack

mine.

*Sevier County* Henry district: Trinity prospect.

*Tooele County* Granite Mountain district.

*Utah County* Little Cottonwood stock.

#### MILLISITE

Hydrous basic phosphate of sodium, calcium, and aluminum,  $(\text{N,K})\text{CaAl}_6(\text{PO}_4)_4(\text{OH})_9 \cdot 3\text{H}_2\text{O}$ . Probably tetragonal. Occurs as chalcedonic crusts or spherules with fibrous structure. H. 5.5. G. 2.8. Cleavage good. Color white to light gray.

*Tooele County* Amatrice Hill.

*Utah County* Clay Canyon.

#### MIMETITE

Lead chloride arsenate,  $\text{Pb}_5(\text{AsO}_4)_3 \text{Cl}$  Monoclinic. Crystals prismatic. Often in rounded barrel shapes. Also in mammillary crusts. H. 3. 5-4. G. 7.2. Cleavage poor. Fracture uneven. Brittle. Luster resinous. Color pale yellow, orange-yellow, white, colorless.

*Iron County* Escalante district: Escalante mine; Iron Springs district: Granite Mountain, Iron Mountain.

*Juab County* Tintic district: Eureka Hill mine.

*Millard County* Church Hills: Stevens prospect.

*Summit County* Park City district.

*Tooele County* Gold Hill district: Gold Hill (U.S.), New Baltimore, Red Jacket mines; Rush Valley district: Honerine mine.

*Utah County* East Tintic district: Burgin mine.

#### MINIUM

Lead oxide,  $\text{Pb}_3\text{O}_4$ . Tetragonal. Found only massive, earthy, or pulverulent; in microscopic crystalline scales. H. 2. 5. G. 9. 1. Color scarletred or brownish red. Luster greasy or dull, Streak orange-yellow.

*Juab County* Tintic district: Gemini, Godiva mines.

*Utah County* East Tintic district: Burgin mine.

#### MIRABILITE

Hydrous sodium sulfate,  $\text{Na}_2^9\text{SO}_4 \cdot 10\text{H}_2\text{O}$ . Monoclinic. Crystals short prismatic, resemble borax. Also massive as crusts, granular, stalactitic. H. 1-2. G. 1.5. Cleavage good. Fracture conchoidal. Luster vitreous. Colorless to white.

*Box Elder County* Shores of Great Salt Lake.

*Davis County* Shores of Great Salt Lake.

*Salt Lake County* Shores of Great Salt Lake.

#### MIXITE

Hydrous basic copper bismuth arsenate,  $\text{Cu}_{12}\text{Bi}_2(\text{AsO}_4)_6(\text{OH})_{12} \cdot 6\text{H}_2\text{O}$ . Hexagonal. In hair-like crystals, tufted groups, or incrusting. Also compact, in reniform masses. H. 3-4. G. 3. 8. Luster dull. Color emerald-green to bluish green, pale green or white. Streak lighter than color.

*Juab County* Tintic district: Ajax, Boss Tweed, Carissa mines.

#### MOLYBDENITE

Molybdenum disulfide,  $\text{MoS}_2$ . Hexagonal. Occurs in hexagonal tabular or in short barrel-shaped prisms. Commonly foliated massive, or in scales. H. 1-1.5. G. 4.6. Cleavage basal perfect. Laminae flexible, but not elastic. Sectile. Luster metallic. Color lead-gray. Streak greenish. Greasy feel. Resembles graphite. Opaque.

*Beaver County* Beaver Lake district; Granite district: Big Pass, Bismuth, Contact groups; Pine Grove district: Pine Grove Associates mine; Pruess district: Blackbird, Cactus mines; Star district.

*Emery County* San Rafael district: Lucky Strike mine.

*Juab County* West Tintic district.

*Millard County* House Range: Amasa Valley, Notch Peak intrusive.

*Morgan County* Arthur Fork.

*Piute County* Marysvale district: La Vita prospect.

*Salt Lake County* Big Cottonwood district: Alta-Gladstone Vein no. 5, Third Chance mines; Bingham district: Bingham Copper pit, Carr Fork mine; Little Cottonwood stock.

*San Juan County* La Sal Mountains.

*Tooele County* Gold Hill district: Cane Springs, Rube, Reaper, Yellow Hammer mines.

*Uintah County* Ute Knoll district: Ouray.

*Utah County* American Fork district; Silver Lake district: Deer Creek.

*Weber County* Sierra Madre district.

#### MOLYBDITE (See FERRIMOLYBDITE)

#### MONAZITE

Phosphate of the cerium metals,  $(\text{Ce,L a,Y,Th})(\text{PO}_4)$ . Monoclinic. Crystals flattened, elongated, sometimes prismatic. H. 5-5.5. G. 4. 6-5.4. Cleavage good. Fracture uneven. Brittle. Luster variable, resinous, waxy, vitreous. Color yellowish or reddish brown to brown, also shades of yellow, greenish, and nearly white.

*Box Elder County* Park Valley district.

*Emery County* Muddy River tributaries, seven fossil placers in Ferron Sandstone.

*Garfield County* Escalante; Henry Mountains on southwest flanks; Kaiparowits Plateau, fossil placer six miles south of Escalante in Straight Cliffs Sandstone.

*Kane County* Kaiparowits Plateau: Rees Canyon, Croten Canyon, and Sunday Canyon, fossil placers in Straight Cliffs Sandstone.

*Morgan County* Arthur Fork.

*Sevier County* Monroe Canyon.

*Tooele County* East Erickson district: South Pine Canyon.

*Uintah County* Jenson.

*Wayne County* Caineville.

#### MONHEIMITE (See SMITHSONITE)

#### MONIMOLITE

Lead calcium antimonate,  $(\text{Pb,Ca})_3\text{Sb}_2\text{O}_8$ . Isometric. Octahedral and rare cubic crystals. H.  $4\frac{1}{2}$ -6. G. 5.9-7.3. Luster greasy to adamantine. Color yellow, gray-green, dark brown.

*Tooele County* Gold Hill district: U. S. Mine.

#### MONTGOMERYITE

Hydrous basic calcium aluminum phosphate,  $\text{Ca}_2\text{Al}_2(\text{PO}_4)_3(\text{OH})\cdot 7\text{H}_2\text{O}$ . Monoclinic. Laths flattened and elongated. H. 4. G. 2. 5. Cleavage good. Color usually deep green, rarely pale green to colorless. Luster vitreous.

*Utah County* Clay Canyon.

#### MONTICELLITE

Calcium magnesium silicate,  $\text{CaMgSiO}_4$ . Orthorhombic. Occurs in small prismatic crystals or grains. H. 5. G. 3. 2. Colorless to gray.

*Salt Lake County* Little Cottonwood district: Clayton Peak stock contact zone.

*Utah County* American Fork district.

#### MONTMORILLONITE

Hydrous magnesium aluminum silicate,  $(\text{Na,Ca})_{0.33}(\text{Al,Mg})_2\text{Si}_4\text{O}_{10}(\text{OH})_2\cdot n\text{H}_2\text{O}$ . Monoclinic. A member of the smectite group. A clay mineral. Occurs massive, claylike. H. 1-1.5. G. 2. 5. Luster feeble. Color white, grayish, rose-red, bluish.

*Garfield County* Cannonville; Henry Mountains: Crescent Creek; Henrieville; Tropic.

*Grand County* Wilson Mesa district.

*Iron County* Escalante district: Escalante mine.

*Juab County* Honeycomb Hills; Thomas Range: Spor

Mountain, Bell Hill, Blowout, Blue Chalk, Dell no. 5, Eagle Rock, Floride no. 5, Fluorine Queen, Green Crystal, Hogsback, Northend, Rainbow, Roadside mines. *Piute County* Marysvale district.

*Salt Lake County* Bingham district: U. S. and Lark mine. *Sevier County* Aurora; Henry district: Trinity prospect, Redmond, Rock Candy Mountain.

*Summit County* Park City district: Daly, Ontario mines. *Utah County* East Tintic district: North Lily mine; Fox Hills.

*Wasatch County* Keetley area.

*Washington County* Silver Reef district.

#### MONTROSEITE

Basic iron vanadium oxide,  $(\text{V,Fe})\text{O}(\text{OH})$ . Orthorhombic. Microscopic bladed crystals. Color black. Opaque. Luster submetallic. H. soft. G. 4. 1. Streak black. Cleavage perfect. Brittle.

*Emery County* San Rafael district: Calyx, Temple Mountain, Rex no. 2 mines.

*Grand County* Thompsons district: Juniper, Parco no. 23 mines.

*San Juan County* Big Indian district: Big Buck, Cal Uranium, Homestake, La Sal, Mi Vida, Radon, Rattlesnake mines; La Sal Quadrangle: Black Hat, Firefly-Pigmy, Little Peter, Valley View, Yellow Bird mines; Paradox Valley district: Grey Dawn, Vanadium Queen mines.

#### MORDENITE

Hydrous calcium sodium potassium aluminum silicate,  $(\text{Ca,Na}_2\text{K}_2)\text{Al}_2\text{Si}_{10}\text{O}_{24}\cdot 7\text{H}_2\text{O}$ . Monoclinic. Found in minute crystals. Also in hemispherical or reniform concretions with fibrous structure. H. 3 - 4. G. 2. 2. Cleavage good. Color white, yellowish, pinkish. A zeolite.

*Piute County* Marysvale district: Quicksilver mine.

*Utah County* East Tintic district.

#### MORGANITE (See BERYL)

#### MUSCOVITE

Essentially  $\text{KAl}_2(\text{AlSi}_3\text{O}_{10})(\text{OH})_2$ . Monoclinic. Crystals tabular, may resemble orthorhombic or hexagonal symmetry. Foliated, in scales, crypto-crystalline, compact massive. H. 2 - 2.5. G. 2.7 - 3.1. Cleavage perfect basal. Folia flexible and elastic. Luster vitreous, silky, pearly. Transparent and colorless in thin sheets. Thicker sheets may be yellow, brown, green, or red. *Beaver County* Beaver Lake district: Skylark mine;

Star district: Hub, Lady Bryan, Moscow mines; Newton district: Sheep Rock mine; Rocky district: Copper Ranch mine.

*Box Elder County* Ashbrook district: Vipont mine; Lucin district: Tecoma Hill mines; Rosebud district; Willard district: Mormon Girl claim.

*Daggett County* Red Creek Complex.

*Juab County* Goshute Indian Reservation; House Range: Painter Springs; Spring Creek district: Queen of Sheba mine.

*Piute County* Marysvale district.

*Salt Lake County* Big Cottonwood district: Mountain Lake mine; Bingham district: Bingham Copper pit; Little Cottonwood stock.

*Sevier County* Henry district; Trinity prospect.

*Summit County* Park City district: Daly-Judge, Silver King, Silver King Consolidated, Woodside mines.

*Tooele County* Gold Hill district: Yellow Hammer mine; Granite Mountain district; Ophir district: Lion Hill area; Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.

*Utah County* American Fork district: Pittsburgh mine; East Tintic district.

*Wasatch County* Bonanza Flat; Snake Creek district.

*Washington County* Silver Reef district.

#### MOTTRAMITE

Hydrous zinc copper lead vanadate,  $(\text{Zn,Cu})\text{Pb}(\text{VO}_4)(\text{OH})$ . Orthorhombic. Drusy crusts of intergrown Brittle, H. 3-3½. G. 6.2. Luster greasy. Color grass green to olive green, reddish brown.

*Iron County* Escalante district: Escalante mine.

#### NAHCOLITE

Sodium bicarbonate,  $\text{NaHCO}_3$ . Monoclinic. Prismatic crystals and friable crystal aggregates, porous masses. Cleavage good. Fracture conchoidal. H. 2. 5. G. 2.2. Luster vitreous. Colorless to white. Soluble in water. Found in cores and cuttings from the Green River Formation.

*Duchesne County* Carter Oil Company wells; Green River Formation; Sinclair Mortenson well.

*Uintah County* Sun Oil Company South Ouray well.

#### NATROALUNITE

Basic sodium aluminum sulfate,  $\text{NaAl}_3(\text{SO}_4)_2(\text{OH})_6$ . Hexagonal. Rarely in crystals; occurs as druses in massive alunite. Massive, granular to dense. Cleavage distinct. Brittle. H. 3. 5 - 4. G. 2. 7. Luster vitreous. Color white when pure.

*Piute County* Marysvale district: Al Kee-Mee prospect.

#### NATROJAROSITE

Basic sodium ferric sulfate,  $\text{NaFe}_3(\text{SO}_4)_2(\text{OH})_6$ . Hexagonal. Occurs in earthy masses or crusts, comprised of tiny crystals. H. 3. G. 3. 2. Cleavage good. Color cinnamon-brown. Fracture conchoidal. Luster vitreous. Brittle. Transparent to translucent.

*Tooele County* Gold Hill district: Gold Hill (Western Utah) mine.

#### NATROLITE

Hydrous sodium aluminum silicate,  $\text{Na}_2\text{Al}_2\text{Si}_3\text{O}_{10} \cdot 2\text{H}_2\text{O}$ . Orthorhombic. Prismatic crystals, usually in radiating crystal groups. Also fibrous, massive, granular, compact. H. 5 - 5. 5. G. 2. 3. Cleavage perfect. Luster vitreous. Colorless to white, tints of yellow, red. Transparent to translucent.

*Piute County* Marysvale district: Silica Hills.

*Tooele County* Rush Valley district.

#### NATRON

Hydrous sodium carbonate,  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ . Monoclinic. Cleavage distinct. Fracture conchoidal Brittle. H. 1 - 1. 5. G. 1. 8. Luster vitreous. Colorless to white. Taste alkaline. Effloresces rapidly in dry air. Occurs as crystalline, granular, or columnar crusts, as mealy coatings, efflorescence.

*Tooele County* Deep Creek Valley.

#### NAVAJOITE

Hydrous vanadium oxide, probably  $\text{V}_2\text{O}_5 \cdot 3\text{H}_2\text{O}$ . Probably monoclinic. Fibrous appearance. Occurs as a coating around grains, and as in thin seams. H. 1 - 2. G. 2.6. Color dark brown. Streak brown. Luster adamantine.

*San Juan County* Monument Valley district: Mitten no. 1 mine.

#### NEIGHBORITE

Sodium magnesium fluoride,  $\text{NaMgF}_3$ . Orthorhombic. Occurs in rounded grains, or in twinned crystals. Color pink and brown. H. 4. 5. G. 3. Luster vitreous. Uneven fracture. Cleavage none. Occurs in Green River Formation.

*Uintah County* Sun Oil Company South Ouray well.

#### NEPHELINE

Sodium potassium aluminum silicate,  $(\text{Na,K})(\text{AlSiO}_4)$ . Hexagonal. Occurs rarely in small prismatic crystals, usually massive, compact, and in embedded grains. H. 5. 5 - 6. G. 2. 6. Cleavage distinct. Luster vitreous, greasy. Colorless, white, or yellowish. Transparent and translucent.

*Tooele County* Sheep Ridge.

#### NICCOLITE

Nickel arsenide.  $\text{NiAs}$ . Hexagonal. Crystals rare, small. Usually massive, reniform, with columnar structure. H. 5-5½. G. 7.78. Color copper red, tarnishes gray to black. Luster metallic.

*Emery County* San Rafael district: Lucky Strike mine.

#### NIGRITE (See ASPHALTUM)

#### NITER

Potassium nitrate,  $\text{KNO}_3$ . Orthorhombic. Mostly found in crusts, silky tufts. Also massive, granular, earthy or mealy. G. 2. G. 2. 1. Cleavage good. Fracture uneven. Brittle. Luster vitreous. Colorless to white, may be tinted. Transparent. Saline taste.

*Iron County* Near Parowan.

*Millar County* Near Fillmore.

#### NOLANITE

Iron vanadate,  $\text{Fe}_3\text{V}_7\text{O}_{16}$ . Hexagonal. Occurs as hexagonal plates and crusts. H. 5-5½. G. 4.69. Color black. Opaque. Submetallic luster. Powder brownish black. *San Juan County* Paradox Valley district: Vanadium Queen mine.

#### NONTRONITE

Hydrous iron aluminum silicate,  $\text{NaO} \cdot 33\text{Fe}_2(\text{Al,Si})_4\text{O}_{10}(\text{OH})_2 \cdot n\text{H}_2\text{O}$ . A member of the smectite group. Monoclinic. A clay mineral. Compact, massive; has opal-like appearance. Earthy. H. 1-1. 5. G. 2. 5. Fragile. Color yellow, greenish-yellow.

*Piute County* Marysvale district.

*Salt Lake County* Bingham district: Bingham Copper Pit.

*Tooele County* Gold Hill district: Gold Hill (U. S.), Unadine mines; Rush Valley district: Honerine mine. *Utah County* East Tintic district.

#### NORSTRANDITE

Aluminum trihydroxide,  $\text{Al}(\text{OH})_3$ . Monoclinic. Occurs

as thick tabular crystals; also as aggregates. H. 3. G. 2.4. Colorless to coral pink, to reddish brown.

*Duchesne County* Green River Formation.

*Uintah County* Green River Formation.

#### NORTHUPITE

Sodium magnesium chloride-carbonate,  $\text{Na}_3\text{MgCl}(\text{CO}_3)_2$ . Isometric. Found as tiny octahedral crystals. Fracture conchoidal. Brittle. H. 3. 5-4. G. 2. 4. Luster vitreous. Colorless; also pale yellow, gray, or brown. Transparent. Found in the Green River Formation. *Duchesne County* Green River Formation.

#### NOSELITE

Sodium aluminum sulfate silicate,  $\text{Na}_4\text{Al}_3\text{Si}_3\text{O}_{12} \cdot \text{SO}_4$ . Isometric. Crystals are rare; commonly massive, in imbedded grains. H. 5. 5. G. 2. 3. Color gray, blue, brown. Luster vitreous. Transparent to translucent.

*San Juan County* La Sal Mountains: Middle Mountain, Brumley Ridge.

#### NOVACEKITE

Hydrous magnesium uraninate arsenate.  $\text{Mg}(\text{UO}_2)_2(\text{AsO}_4)_2 \cdot 12\text{H}_2\text{O}$ . Tetragonal. Crystals rectangular plates. Occurs as crusts of interlocking aggregates. H. 2½. G. 3.7. Color pale yellow, yellow.

*San Juan County* Paradox Valley district: Grey Dawn mine.

#### NSUTITE

Manganese oxide,  $\text{MnO}_2$ . Hexagonal. Platy to wedge like crystals. Porous to dense aggregates. H. 5.5. G. 4.86. Dark gray to black. Opaque.

*Utah County* East Tintic district: Burgin mine.

#### OBSIDIAN

Volcanic glass. Rock of gemstone qualities. Color black, red, gray, brown. H. 5-6. G. 2. 4. Luster vitreous. Thin chips transparent to translucent.

*Box Elder County* Promontory district: Lakeview Mining properties.

*Juab County* Keg Mountains.

*Millard County* Black Rock; White Mountain.

*Piute County* Marysvale district.

#### OCTAHEDRITE (See ANATASE)

#### OKENITE

Basic hydrous calcium silicate,  $H_2CaSi_2O_6 \cdot H_2O$ . Triclinic. A zeolite. Occurs in minute blade-shaped crystals. Commonly fibrous; also compact. Cleavage perfect. H. 4. 5-5. G. 2. 3. Color white, with a shade of yellow or blue.

*Salt Lake County* Bingham district: Bingham Copper Pit.

*Utah County* East Tintic district.

#### OLIGOCLASE

Sodium, calcium aluminum silicate,  $NaAlSi_3O_8 \cdot CaAl_2Si_2O_8$ . Triclinic. A plagioclase feldspar. Commonly massive, compact. H. 6. G. 2. 6. Cleavage good two directions. Twinning common. Luster vitreous to pearly. Colorless to white. Translucent.

*Davis County* Antelope Island.

*Grand County* La Sal Mountains, North Mountain.

*Millard County* House Range, Notch Peak intrusive.

*Tooele County* Gold Hill district: Alvarado mine.

#### OLIVENITE

Basic copper arsenate,  $Cu_2(AsO_4)OH$ . Orthorhombic. Crystals variable in habit, elongated or short prismatic, acicular. Also granular, reniform, massive. H. 3. G. 4. 4. Cleavage poor. Fracture conchoidal to uneven. Luster adamantine to vitreous, pearly. Color shades of gray, brown, yellow, green. Translucent to opaque.

*Juab County* Tintic district: Carissa, Gold Chain, Mammoth, Ophonga mines; West Tintic district: Scotia mine.

*Summit County* Park City district: Silver King, Woodside mines.

*Tooele County* Gold Hill district: Gold Hill (U. S.), Pole Star Copper Company mines.

*Utah County* East Tintic district.

#### OLIVINE

Magnesium iron silicate,  $(Mg,Fe)_2SiO_4$ . Orthorhombic. Crystals often flattened. Massive, compact, granular, embedded grains. H. 6. 5-7. G. 3. 3. Cleavage poor. Fracture conchoidal. Brittle. Luster vitreous. Color green, olive-green, sometimes brownish, reddish, yellowish.

*Beaver County* San Francisco district.

*Tooele County* Southern Oquirrh Mountains; Stansbury Mountains: Mack, Muskrat, North Willow Canyons, Salt Mountain.

*Utah County* American Fork district: Deer, Silver Creeks; Fox Hills.

#### ONOFRITE

Mercuric selenide-sulfide,  $Hg(S,Se)$ . Isometric. Similar to metacinnabar. H. 3. G. 7. 6. Fracture subconchoidal to uneven. Brittle. Luster metallic. Color grayish black. Streak black. Opaque.

*Piute County* Marysvale district: Quicksilver mine. Mt. Baldy district: Lucky Boy mine.

#### ONYX (See CALCITE)

#### OPAL

Hydrous silica,  $SiO_2 \cdot nH_2O$ . Amorphous. Massive; often botryoidal, stalactitic, or earthy. H. 5-6. G. 1.9-2. 2. Conchoidal fracture. Luster vitreous to resinous. Colorless, white, pale shades of yellow, red, brown, green, gray, blue. Often has a milky or opalescent appearance, and may display a fine play of colors. *Beaver County* Beaver; Lincoln district: Creole mine; Milford; San Francisco district: Horn Silver mine; Southern San Francisco Mountains: Brimstone Mound. *Daggett County* Red Creek: Yellow Canary uranium deposit.

*Grand County* Near Cisco.

*Iron County* Cima mine.

*Juab County* San Pitch Mountains: Orme property; Thomas Range: Autunite no. 8, Buena no. 1 claims, Nonella prospect, Topaz Mountain.

*Piute County* Marysvale district: J. and L. Alunite mine, Silica Hills.

*Salt Lake County* Bingham district: Galena, Old Jordan mines.

*Sevier County* Fish Lake.

*Tooele County* Gold Hill district: Alvarado, Gold Hill (U. S.), Monoco, Unadine mines.

#### ORPIMENT

Arsenic trisulfide,  $As_2S_3$ . Monoclinic. Crystals short prismatic. Usually in foliated or columnar masses; sometimes with reniform surface. H. 1. 5-2. G. 3. 5. Cleavage good. Cleavage laminae flexible but not elastic. Sectile. Luster resinous, pearly. Color lemon-yellow.

*Box Elder County* Ashbrook district: Vipont mine. *Emery County* San Rafael district: Camp Bird No. 7, Fueamol no. 2 mine.

*Garfield County* Coyote Creek district: Hampton mine.

*Salt Lake County* Bingham district: Butterfield Canyon.

*Tooele County* Mercur district: Brickyard, Golden Gate, Hillside, Mercur, Sacramento, Sunshine mines.

*Washington County* Bull Valley district: Pilot claims.

## ORTHITE (See ALLANITE)

## ORTHOCLASE

Potassium aluminum silicate,  $\text{KAlSi}_3\text{O}_8$ . Monoclinic. Crystals usually elongated prismatic, commonly twinned. Found commonly in crystals or in granular masses which are coarsely cleavable; also fine-grained, massive. H. 6. G. 2. 6. Cleavage good two directions. Luster vitreous. Colorless, white, gray, flesh-red. Varieties are adularia, moonstone, and sanidine.

*Beaver County* Pruess district: Blackbird group, Cactus mine; Rock Corral.

*Iron County* Escalante district: Escalante mine; Gold Springs district: Aetna, Homestake, Independence, Jennie, Jumbo, Little Buck, Snowflake mines; Stateline district: Creole, Gold Dome, Johnny, Ofer, Phelps, Utah Spur mines.

*Juab County* Goshute Indian Reservation; Spring Creek district: Queen of Sheba mine; Thomas Range: Autunite no. 8, Evening Star prospects, Topaz Mountain.

*Millard County* House Range: Notch Peak intrusive, Painter Springs.

*Piute County* Gold Mountain district: Sevier mine; Marysvale district; Ohio district: Wedge mine.

*Salt Lake County* Big Cottonwood Canyon; Big Cottonwood district; Little Cottonwood district; Little Cottonwood stock.

*San Juan County* La Sal Mountains: Middle Mountain, Brumley Ridge.

*Sevier County* Henry district: Trinity prospect.

*Tooele County* Gold Hill district: Rodenhouse Wash, Wilson Consolidated, Yellow Hammer mines; Granite Mountain district; Ophir district: Ophir Hill area — Ophir Hill Consolidated, Ophir Coalition mines.

*Utah County* Alpine district; Little Cottonwood stock.

## OSARIZAWAITE

Hydrous lead copper aluminum sulfate.  $\text{PbCuAl}_2(\text{SO}_4)_2 \cdot (\text{OH})_6$ . Hexagonal. Occurs as fibrous aggregates of minute crystals, commonly showing hexagonal outline. G. 4.0. Earthy. Color green.

*Millard County* Church Hills: Stevens prospect.

## OVERITE

Hydrous basic calcium aluminum phosphate,  $\text{Ca}_3\text{Al}_8(\text{PO}_4)_8(\text{OH})_6 \cdot 15\text{H}_2\text{O}$ . Orthorhombic. Flattened and elongated crystals. Also massive, and subparallel aggregates of coarse plates. H. 3. 5-4. G. 2. 5. Cleavage good. Luster vitreous. Color light apple-green to colorless. *Utah County* Clay Canyon.

## OZOCERITE

Mineral wax. Wax-like in appearance and consistency. Colorless to white when pure; often pale green, yellowish, brownish yellow, brown. Occurs in veins and fillings in brecciated zones.

*Carbon County* Whitmore Canyon.

*Utah County* Colton: Higgins, James Peak (Brown Bear), Kyune Canyon, Midnight, Miller, Pleasant Valley, Thomas Ranch, Town mines.

*Wasatch County* Soldier Summit: Culmer Brothers, Soldier Summit, U. S. mines.

## PALIGORSKITE

Hydrous magnesium aluminum silicate,  $(\text{Mg,Al})_2\text{Si}_4\text{O}_{10}(\text{OH}) \cdot 4\text{H}_2\text{O}$ . Monoclinic. H. soft. G. 2.2. Commonly known as mountain leather from its leather-like appearance.

*Tooele County* Ophir district: Dry Canyon area: Deseret mine.

## PALLADIUM

Native palladium, Pd. Isometric. Occurs in small octahedrons, commonly in grains. H. 4. 5-5. G. 11. 9. Cleavage none. Ductile and malleable. Luster metallic. Color whitish steel-gray. Opaque.

*Salt Lake County* Bingham district: Bingham Copper Pit.

## PARABUTLERITE

Hydrous basic ferric sulfate,  $\text{Fe}(\text{SO}_4)(\text{OH}) \cdot 2\text{H}_2\text{O}$ . Orthorhombic. Occurs as encrustations with butlerite. Cleavage poor. Fracture conchoidal. H. 2. 5. G. 2. 5. Color light orange to orange-brown. Luster vitreous. Transparent.

*Emery County* San Rafael district: Calf Mesa, Dexter group.

## PARAMONTROSEITE

Vanadium oxide,  $\text{VO}_2$ . Orthorhombic. G. 4.0. In part or wholly pseudomorphic after montroseite. Metastable, and alteration product.

*Emery County* San Rafael district: Rex no. 2 mine.

*Grand County* Thompsons district: Juniper mine.

*San Juan County* Big Indian district: Cal Uranium, Homestake, Mi Vida mines; Paradox Valley district: Vanadium Queen mine.

## PARGASITE

Variety of amphibole,  $\text{NaCaMg}_4\text{Al}(\text{Si,Al})_8\text{O}_{22}(\text{OH})_2$ . Monoclinic. Occurs in stout lustrous crystals, also granular. Color green and blue green. H. 5-6. G. 3. 2. Cleavage prismatic. Brittle.

*Utah County* East Tintic district.

#### PASCOITE

Hydrous calcium vanadate,  $\text{Ca}_2\text{V}_6\text{O}_{17}\cdot 11\text{H}_2\text{O}$ . Triclinic. Occurs as granular crusts which rarely show minute lath-like crystals. H. 2. 5. G. 2. 5. Cleavage distinct. Fracture conchoidal. Luster vitreous. Color dark red-orange to yellow-orange. Streak cadmium yellow.

*Emery County* San Rafael district: Calyx mine; Temple Mountain.

*Garfield County* Crescent Creek.

*Grand County* Thompsons district: Black Ape mine.

*San Juan County* Big Indian district: Mi Vida mine.

La Sal Quadrangle: Little Peter mine; Montezuma Canyon: West Cliff House No. 8 mine.

#### PEARCEITE

Silver sulfarsenite,  $\text{Ag}_{16}\text{As}_2\text{S}_{11}$ . Monoclinic. An arsenic analogue of polybasite. Occurs in short tabular six-sided prisms. H. 3. G. 6. 1. Fracture conchoidal. Brittle. Luster metallic. Color and streak black. Opaque.

*Box Elder County* Ashbrook district: Vipont mine.

*Juab County* Tintic district: Bullion Beck, Gemini mines.

*Utah County* East Tintic district: North Lily mine. Tintic Standard mine.

#### PENNINE (See PENNINITE)

#### PENNINITE

Variety of chlorite,  $(\text{Mg,Fe,Al})_6(\text{Si,Al})_4\text{O}_{10}(\text{OH})_8$ . Monoclinic. Occurs as plumose to flaky aggregates. H. 2-2. 5. G. 2. 7. Cleavage perfect. Laminae flexible. Color yellow-green to olive. Luster pearly.

*Piute County* Marysvale district.

*Sevier County* Henry district: Trinity prospect.

*Utah County* East Tintic district.

*Wasatch County* Snake Creek district.

#### PERICLASE

Magnesium oxide,  $\text{MgO}$ . Isometric. Often octahedral crystals. Usually in rounded or irregular grains. H. 5. 5. G. 3. 6. Cleavage perfect. Luster vitreous. Colorless to grayish white, brownish yellow, green, black.

*Salt Lake County* Big Cottonwood district: Big Cottonwood, Mountain Lake mines; Little Cottonwood district: Clayton Peak Stock contact zone.

*Utah County* Silver Lake district: Deer, Silver Creeks.

*Washington County* Mineral Mountain: Emma mine.

#### PETRIFIED WOOD

(See CRYPTOCRYSTALLINE QUARTZ)

#### PETZITE

Silver gold telluride,  $\text{Ag}_3\text{AuTe}_2$ . Isometric. Massive. Fine granular to compact. Cleavage poor. Fracture subconchoidal. Slightly sectile to brittle. H. 2. 5-3. G. 9. Luster metallic. Color steel-gray to iron-black, often tarnished. Opaque.

*Utah County* East Tintic district: Eureka Lily, Eureka Standard, North Lily, Tintic Standard mines.

#### PHARMACOSIDERITE

Hydrous basic ferric arsenate,  $\text{Fe}_3(\text{AsO}_4)_2(\text{OH})_3\cdot 5\text{H}_2\text{O}$ . Isometric. Commonly in cubes; rarely granular. H. 2. 5. G. 2. 8. Cleavage good. Fracture uneven. Rather sectile. Luster adamantine, greasy. Color olive-green to honey yellow, yellowish brown, dark brown, reddish, greenish.

*Juab County* Tintic district: Gold Chain, Mammoth mines; West Tintic district: Scotia mine.

*Tooele County* Gold Hill district: Gold Hill (Western Utah) mine; Mercur district.

#### PHILLIPSITE

Hydrous potassium calcium aluminum silicate,  $(\text{K}_2\text{Na}_2\text{Ca})\text{Al}_2\text{Si}_4\text{O}_{12}\cdot 4\frac{1}{2}\text{H}_2\text{O}$ . Monoclinic. A zeolite. Usually in groups of twinned crystals. H. 4. 5-5. G. 2. 2. Fracture uneven. Brittle. Luster vitreous. Color white, sometimes reddish.

*Tooele County* Rush Valley district.

#### PHLOGOPITE

Basic potassium magnesium aluminum silicate,  $\text{KMg}_3(\text{AlSi}_3\text{O}_{10})(\text{OH})_2$ . Monoclinic. Brown mica. In form and angles near biotite. Cleavage perfect basal. H. 2. 5-3. G. 2. 8. Luster pearly. Color yellowish brown to brownish red.

*Salt Lake County* Little Cottonwood district: Clayton Peak Stock contact zone.

*Sevier County* Henry district: Trinity prospect.

*Tooele County* Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.

*Wasatch County* Snake Creek district.



**PHOSGENITE**

Lead chloride-carbonate,  $Pb_2(CO_3)Cl_2$ . Tetragonal. Crystals short prismatic, usually terminated. Also massive, granular. H. 2-3. G. 6. 1. Cleavage good. Fracture conchoidal. Rather sectile. Luster adamantine. Color yellowish, brownish, greenish, pale rose, gray.  
*Juab County* Tintic district: Eureka Hill mine.

**PHOSPHORITE**

Phosphate rock, of variable composition. Essentially a carbonate fluorapatite in calcareous rocks, and an aluminum phosphate in clay shales. Mississippian phosphate shales are located in Ogden Canyon, Laketown Canyon, and in the East Tintic Mountains. The Permian Phosphoria Formation occurs in northern and north-eastern Utah.

*Daggett County* Uinta Mountains.

*Duchesne County* Uinta Mountains.

*Juab County* East Tintic Mountains in basal Deseret Limestone.

*Rich County* Crawford Mountains; Laketown Canyon; Woodruff Creek.

*Salt Lake County* Dry Canyon.

*Summit County* Franson Canyon; Park City district.

*Uintah County* Brush Creek; Frandson Canyon; Little Brush Creek; Rock Creek.

*Utah County* Spanish Fork Canyon; Little Diamond Fork.

*Wasatch County* Midway; Uinta Mountains.

*Weber County* Ogden Canyon.

**PHOSPHURANYLITE**

Hydrous basic calcium uranium phosphate,  $Ca(UO_2)_4(PO_4)_2(OH)_4 \cdot 7H_2O$ . Orthorhombic. Found as thin coatings or aggregates that appear dense, earthy, or minutely scaly. Cleavage perfect. H. 2. 5. G. 4. 1. Color deep golden yellow to rich yellow. Not fluorescent.  
*Emery County* Green River district: Mineral Ten claim; San Rafael district: Delta mine, Dripping Springs, Wild Horse Canyon, Wild Horse claims.

*Grand County* Thompsons district: Cactus Rat, Cobalt no. 2 mines.

*Piute County* Marysvale district: Freedom no. 2, J. and L. Alunite mines.

*San Juan County* Paradox Valley district: Grey Dawn mine; Red Canyon district: Posey mine; White Canyon district: Gonaway-North Point claims, Happy Jack, Hideout mines.

**PICKERINGITE**

Hydrous magnesium aluminum sulfate,  $MgAl_2(SO_4)_4 \cdot 22H_2O$ . Monoclinic. Acicular crystals. Occurs as radial or matted aggregates, tufted, as crusts or efflorescence. Cleavage poor. Fracture conchoidal. H. 1. 5. G. 1. 8. Luster vitreous. Colorless to white, yellowish, reddish. Taste astringent.

*Salt Lake County* Alum Point.

*San Juan County* White Canyon district: Fry No. 4 mine.

**PINTADOITE**

Hydrous calcium vanadate,  $Ca_2V_2O_7 \cdot 9H_2O$ . Occurs as an efflorescence. Color light to dark green. Soluble in water.

*San Juan County* Pintado Canyon.

**PISANITE**

Hydrous iron copper zinc sulfate,  $(Fe,Cu,Zn)SO_4 \cdot 7H_2O$ . Monoclinic. Equant to short prismatic crystals. Usually in stalactitic or concretionary forms, crusts, massive. H. 2. G. 1. 9. Cleavage basal perfect. Luster vitreous. Color various shades of green, blue. Taste sweet, metallic, astringent.

*Salt Lake County* Bingham district: Galena, Old Jordan mines.

*Utah County* East Tintic district.

**PITCHBLENDE (See URANINITE)**

Massive or colloform uraninite.

**PITTICITE**

Hydrous iron arsenate sulfate,  $Fe_2(AsO_4)(SO_4)(OH) \cdot nH_2O$ . Massive, reniform or stalactitic, and as coatings. H. 2-3. G. 2. 4. Brittle. Fracture earthy to conchoidal. Luster dull to vitreous. Color yellowish, brownish, reddish.

*Emery County* San Rafael district: Fuenrol no. 2 mine.

*Juab County* Tintic district: Carissa mine.

**PLAGIOCLASE**

(See ALBITE, OLIGOCLASE, ANDESINE, LABRADORITE, ANORTHITE)

**PLANCHEITE**

Hydrous copper silicate,  $Cu_8(Si_4O_{11})_2(OH)_4 \cdot H_2O$ . Orthorhombic. Fibrous, often mammillary. H. 5. 5. G. 3. 3. Color blue.

*Beaver County* Beaver Lake district on east side of Beaver Lake Mountains.

## PLATINUM

Native platinum, Pt. Occurs with iridium, rhodium, and palladium. Isometric. Crystals rare, usually in grains or scales. H. 4-4. 5. G. 14-19. Fracture hackly. Malleable and ductile. Luster metallic. Color whitish steel-gray to dark gray.

*Garfield County* Hite in placers.

*Salt Lake County* Bingham district: Bingham Copper Pit.

## PLEONASTE (See HERCYNITE)

## PLUMBOJAROSITE

Basic lead iron sulfate,  $\text{PbFe}_6(\text{SO}_4)_4(\text{OH})_6$ . Hexagonal. Occurs as crusts, lumps, or compact masses. Also earthy. H. soft. G. 3. 6. Cleavage poor. Luster dull to silky. Color golden brown to dark brown.

*Beaver County* San Francisco district: Horn Silver mine; Star district: Hub, Moscow, Red Warrior mines. *Box Elder County* Lucin district: Tecoma Hill mines. *Juab County* Fish Springs district: Carnation, Emma, Galena, Utah mines.

*Piute County* Mt. Baldy district: Deer Trail mine. *Salt Lake County* Big Cottonwood district: Cardiff mine; Little Cottonwood district: Cabin, Flagstaff, South Hecla mines.

*Tooele County* Deep Creek Mountains: Devils Pit, Eagles Nest, Midland, Monocco, Oro del Rey mines; Gold Hill district: Boston, Copper Queen-Midland Mining Company, Cyclone, Garrison Monster, Gold Hill Standard, Monoco, New Baltimore, Red Jacket, Rube, Shay, Silver King, Success mines; Ophir district: Dry Canyon area - Kearsarge mine; Lion Hill area - Buffalo mine, Chloride Point, Douglas, Lion, Zella, Empire, East Side, Iron Monarch, Northern Light, Woodruff mines; Ophir Hill area - Cliff, Hidden Treasure, Sacramento mines; Rush Valley district: Argent, Ben Harrison, Galena King, Honerine, Mescatine, Muerbrook, Salvation - Hercules mines.

*Utah County* American Fork district: Miller, Pittsburgh mines; East Tintic district: Eureka Lily, North Lily, Tintic Standard, Trixie mines.

*Washington County* Tutsagubet district: Apex, Paymaster mines.

## POLYBASITE

Silver copper antimony sulfide,  $(\text{Ag,Cu})_{16}\text{Sb}_2\text{S}_{11}$ . Monoclinic. Short tabular crystals. Cleavage imperfect. Fracture uneven. H. 2-3. G. 6. 1. Luster metallic. Color iron black. Streak black. Opaque.

*Utah County* East Tintic district: Burgin, Eureka Lily, Tintic Standard, Trixie mines.

## POLYHALITE

Hydrous potassium calcium magnesium sulfate,  $\text{K}_2\text{Ca}_2\text{Mg}(\text{SO}_4)_4 \cdot 2\text{H}_2\text{O}$ . Triclinic. Crystals are small and rare; usually massive. Cleavage perfect. H. 3. 5. G. 2. 8. Luster vitreous to resinous. Colorless to white, gray, salmon pink. Transparent.

*Grand County* Cane Creek: Texas Gulf Potash mine, Paradox Basin; Salt Valley; Seven Mile anticline.

*San Juan County* Moab Valley.

*Tooele County* Salduro; Wendover.

## POTASH ALUM

Hydrous potassium aluminum sulfate,  $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ . Isometric. Occurs in hydrothermal alteration zones. Fracture conchoidal. Cleavage poor. H. 2-2. 5. G. 1. 7. Luster vitreous. Transparent. Colorless to white. Taste sweetish and astringent.

*Piute County* Marysvale district: Alum King mine.

*Utah County* East Tintic district.

## POTASH CLAY (See HYDROMICA)

## POWELLITE

Calcium molybdate, with some substitution of tungsten,  $\text{Ca}(\text{W},\text{MoO}_4)$ . Tetragonal. Usually in minute pyramids, or thin tabular crystals. Also massive. H. 3. 5-4. G. 4. 2. Cleavage poor. Fracture uneven. Luster greasy, pearly. Color straw-yellow, brown, greenish, bluish, gray. Fluoresces.

*Beaver County* Beaver Lake district: Beaver-Harrison, OK mines.

*Salt Lake County* Big Cottonwood district: Tungsten Tunnel mine.

*Tooele County* Gold Hill district: Yellow Hammer mine.

## PRASE (See CRYPTOCRYSTALLINE QUARTZ)

## PREHNITE

Basic calcium aluminum silicate,  $\text{Ca}_2\text{Al}_2(\text{Si}_3\text{O}_{10})(\text{OH})_2$ . Orthorhombic. Usually reniform, stalactitic, and in rounded groups of tabular crystals. H. 6-6. 5. G. 2. 9. Luster vitreous. Color usually light green, passing into white. Translucent.

*Salt Lake County* Little Cottonwood district.

*Utah County* Silver Lake district: Deer, Silver Creeks.

**PROCHLORITE**

Chlorite variety, lower in silica than clinocllore. Monoclinic. Massive, foliated, or granular. H. 1-2. G. 2. 8. Color green. Luster feebly pearly. Laminae flexible, not elastic.

*Sevier County* Henry district: Trinity prospect.

**PROSOPITE**

Basic alumino-fluoride of calcium,  $\text{CaAl}_2(\text{F},\text{OH})_8$ . Monoclinic. Crystals more or less tabular. Also massive, granular to powdery. H. 4. 5. G. 2. 8. Cleavage prismatic perfect. Fracture uneven. Brittle. Luster weak vitreous. Colorless to gray or white.

*Tooele County* Dugway district: Buckhorn claim; Wild Cat Mountains: Silver Queen mine.

**PROUSTITE**

Silver arsenic sulfide,  $\text{Ag}_3\text{AsS}_3$ . Hexagonal. Crystals prismatic. Also massive, compact. H. 2-2. 5. G. 5. 5. Cleavage distinct. Fracture conchoidal to uneven. Brittle. Luster adamantine. Color scarlet-vermillion. Streak vermillion. Translucent.

*Beaver County* San Francisco district: Horn Silver mine.  
*Box Elder County* Ashbrook district: Vipont mine.  
*Juab County* Tintic district: Chief Consolidated mine.  
*Tooele County* Ophir district: Ophir Hill area - Jim Fisk mine.

*Utah County* East Tintic district: Eureka Lily, Eureka Standard, Trixie mines.

**PSEUDOBROOKITE**

Ferric titanium oxide,  $\text{Fe}_2\text{TiO}_5$ . Orthorhombic. Crystals usually tabular and elongated; sometimes needle-like. H. 6. G. 4. 4. Cleavage distinct. Fracture uneven. Luster adamantine to greasy. Color dark reddish brown, brownish black, black. Streak reddish brown or ocher-yellow.  
*Juab County* Thomas Range: Topaz Mountain.

**PSEUDOWAVELLITE (See CRANDALLITE)****PSILOMELANE**

Basic barium manganese oxide, probably  $\text{BaMnMn}_8\text{O}_{16}(\text{OH})_4$ . Orthorhombic. Habit massive, botryoidal, crusts. Also stalactitic, earthy, pulverulent. H. 5-6. G. 4. 7. Luster submetallic to dull. Color iron-black. Streak brownish black.

*Emery County* Cedar Mountain district; Muddy River.  
*Grand County* Little Grand district: Tenmile Wash;

Salt Valley.

*Juab County* Abraham Hot Springs; Deep Creek Mountains: Trout Creek mine; Detroit district: Black Boy group, Iron Blossom mine; San Pitch Mountains: Black Jack claims, Orme property; Tintic district: Emerald mine.

*San Juan County* White Canyon district: Happy Jack mine.

*Summit County* Beaver Canyon.

*Tooele County* Erickson district: Huber-Rydalch mine; Mercur district; Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.

*Utah County* East Tintic district: Tintic Standard mine; North Tintic district: Oxen mine, Tip Top Tunnel; Silver Lake district: Deer Creek; Utah district: Alpha, Emerald, Lucky Boy, Queen of the West, Spalding, Trotter mines.

*Weber County* Weber district: Payday claims.

**PTILOLITE**

A zeolite,  $10\text{SiO}_2 \cdot \text{Al}_2\text{O}_3 \cdot (\text{Ca}, \text{K}_2, \text{Na}_2)\text{O} \cdot 7\text{H}_2\text{O}$ . Orthorhombic. Occurs in short capillary needles, in tufts. H. 5. G. 2. 1. Cleavage good. Colorless to white.

*Garfield County* Coyote.

*Piute County* Marysvale district.

**PYRARGYRITE**

Silver antimony sulfide,  $\text{Ag}_3\text{SbS}_3$ . Hexagonal. Crystals commonly prismatic, often twinned. Also massive, compact. H. 2. 5. G. 5. 8. Cleavage distinct. Fracture conchoidal to uneven. Brittle. Luster adamantine. Color deep red. Streak purplish red. Dark ruby silver.

*Beaver County* San Francisco district: Horn Silver mine.  
*Box Elder County* Ashbrook district: Vipont mine.  
*Juab County* Tintic district: Chief Consolidated mine.  
*Salt Lake County* Bingham district: Tiewaukee, Winnamuck, Dixon mines.

*Summit County* Park City district: Park City Consolidated mine.

*Tooele County* Ophir district: Ophir Hill area - Jim Fisk mine.

*Utah County* East Tintic district: Apex Standard mine.

**PYRITE**

Disulfide of iron,  $\text{FeS}_2$ . Isometric. Crystals occur most commonly cubic, often pyritohedral, sometimes octahedral. Faces striated. Frequently massive, fine granular, radiated and stalactitic. H. 6-6. 5. G. 5. Cleavage poor. Fracture conchoidal. Brittle. Luster metallic. Color pale brass yellow. Emits sparks when struck with steel.

*Beaver County* Beaver Lake district: Beaver-Harrison, OK, Skylark mines; Bradshaw district: Cave, Hecla, Nip and Tuck mines; Fortuna district: Rocky Hollow; Gordon district: Sulphurdale; Granite district: Big Pass, Bismuth, Molly mines; Lincoln district: Creole, Lincoln mines; Newton district: Indian Creek, Rob Roy, Sheep Rock mines; Pine Grove district; Pruess district: Blackbird, Cactus, Gold Reef mines; Rocky district: Old Hickory mine; San Francisco district: Beaver Carbonate, Cupric, Horn Silver, King David, Michigan, Washington mines; Star district: Commonwealth, Harrington-Hickory, Hub, Kemple, Lady Bryan, Moscow, Progressive, Red Warrior, St. Mary's, White Rock, Wild Bill Woodhouse mines.

*Box Elder County* Ashbrook district: Vipont mine; Lucin district: Tecoma Hill mines; Newfoundland district: Copper Ridge mine; North shore of Great Salt Lake; Park Valley district; Promontory district: Lakeview Mining properties; Rosebud district: Red Buttes; Willard district: Overland claim.

*Davis County* Farmington district: Morning Star group, Parrish Canyon.

*Duchesne County* Green River Formation.

*Emery County* San Rafael district: Calyx, Dexter Group, Little Susan, Lucky Strike, Lucky Strike no. 2, Maybe, Temple Mountain mines.

*Garfield County* Circle Cliffs: Acme, Lone B, Rocky Mountain, Stud Horse mines; Henry Mountains: Bromide, Oro mines.

*Grand County* Hoosier mine; La Sal district: Bornite mine; Miner's Basin district: Dillon, M. I. F., Moab no. 1, Skylark, Tornado mines; Seven Mile Canyon: Shinarump nos. 1-3 claims.

*Iron County* Gold Springs district: Aetna, Independence, Jennie, Jumbo, Little Buck, Snowflake mines; Iron Springs district: Granite Mountain, Iron Mountain; State Line district.

*Juab County* Deseret district; Detroit district: Charm, Copperhead, E. P. H., Ibex mines; Fish Springs district: Carnation, Emma, Galena, Utah mines; North Tintic district: Tintic Prince mine; Spor Mountain: Bell Hill mine; Tintic district: Black Dragon, Chief Consolidated, Iron Blossom, Lower Mammoth, Sunbeam, Swansea mines; West Tintic district: Iron King, Lockheed, 1903, Scotia, Tintic Western, War Eagle mines.

*Millard County* Antelope Springs; Detroit district: Almond, Blue Bell, Major Drum mines; Gordon district: Black, Philadelphia, Sulphur King, Victor Conqueror mines; House Range: Amasa Valley, North Peak, Painter Springs.

*Morgan County* Argenta district: Carbonate Hill, Carbonate Gem mines; Morgan district: Chicago-Utah, Iron King, Morgan Consolidated, Red Eagle mines.

*Piute County* Gold Mountain district: Annie Laurie, Sevier mines; Marysvale district: La Vita prospect; Mt. Baldy district: Clyde, Deer Trail, Green Eyed Monster mines; Ohio district: Bully Boy and Webster, Cascade, Copper Belt, Dalton, Great Western, Iris, Shamrock mines.

*Salt Lake County* Big Cottonwood district: American Metals, Big Cottonwood, Cardiff, Columbus-Rexall, Howell-Baby McKee, Kentucky-Utah, Maxfield, Silver Mountain, Woodlawn mines; Bingham district: Bingham Copper Pit, Boston Consolidated, Burning Moscow, Broad Gauge, Brooklyn, Butterfield, Caledonia, Carr Fork, Columbia, Commercial, Conger, Colorado, Dalton and Lark, Dixon, Frisco, Fortune, Galena, Highland Boy, Last Chance, Minnie, Montezuma, Nast, Neptune, Old Jordan, Phoenix, Red Wing, Tiewaukee, U. S. and Lark, Winnamuck, Yampa, Yosemite mines; Little Cottonwood district: Albion, Alta-Galdstone Vein no. 5, Alta Consolidated, Columbus Consolidated and Wasatch Drainage Tunnel, Columbus Rexal, Dwyer, Emma, Little Emma, Peruvian Consolidated, South Hecla, Superior mines; Little Cottonwood stock.

*San Juan County* Big Indian district: Big Indian Copper mine; Elk Ridge: King Edward mine; La Sal Quadrangle: Black Hat, Firefly-Pigmy mines; Monticello district: Alam, Blue Bird, Copper Queen, Danish Girl, Dream, Duckett, Gold Queen mines; Paradox Valley district: Grey Dawn, Vanadium Queen mines; Red Canyon district: Markey no. 3 mine; White Canyon district: Blue Lizard, Fry No. 4, Happy Jack, Jomac, White Canyon No. 1, W. N. mines.

*Sanpete County* Dry Canyon.

*Sevier County* Rock Candy Mountain; Salina Creek district: Lead Hill mine.

*Summit County* Marble district; Park City district: California, Comstock, Daly, Daly-Judge, Daly West, J. A. C. Tunnel, Kearns-Keith, Mayflower, New York, Ontario, Silver King, Wabash, Woodside mines.

*Tooele County* Bingham district: May Flower mine; Blue Bell district: Bennion Canyon, Little Valley, Morgan mines; Columbia district: Benmore, Sharp, Sultana mines; Deep Creek Mountains: Congar Hill, Midas, Silver Queen mines; Dugway district: Bertha, Bullion Canyon, Four Metals, Kelly's Hole, Metal States, Surplus mines; East Erickson district: Copper Jack, Dutch Peak, Flying Dutchman, Greens Ridge, Hard-to-Beat Canyon, Indianapolis, Sheeprock, Silver King, Silver Shield, Tintic-Delaware mines; Erickson district: Black Jack, Black Rock, Blain, Deer Trail, Indian Boy, May Farmer, Silver Reef, Utonia mines; Free Coinage district: Gold Hill district: Alvarado, Cane Springs, Calaveras, Cash Boy, Climax, Copper Bloom, Copper Queen-Midland Mining Company, Cyclone, Doctor,

Frankie, Gold Hill (U. S.), New Baltimore, Pole Star Copper Company, Red Jacket, Silver and Gold Mining Company, Success, U. S., Victory no. 1 mines; Granite Mountain district: Desert, El Dorado, Mountain Queen mines; Greeley district; Grantsville district; Mercur district: Mineral Hill mines; North Tintic district: New Bullion, Scranton mines; Ophir district: Dry Canyon area - Mono mine; Lion Hill area - Buffalo mine, Chloride Point; Ophir Hill area - Cliff mine, Hidden Treasure, Ophir Hill Consolidated, Ophir Coalition, Sacramento mines; Osceola district: Rush Valley district, Argent, Ben Harrison, Calument, Galena King, Honerine, Mescatine, Muerbrook, Salvation - Hercules, Tip Top mines; Silver Island district: Carrie Mack property; Tooele district; Wild Cat Mountains: Silver Queen mine.

*Utah County* Brown Park area; Carbonate district: Dyer mine; Sun Oil Company South Ouray well; Ute and Knoll district: Ouray.

*Utah County* Alpine district: Lucky Chance mine; American Fork district: Bog, Dutchman, Mary Ellen and Live Yankee, Pacific, Silver Dipper, Water Fall, Yankee mines; East Tintic district: Apex, Burgin, Eureka Bullion, Eureka Lily, Eureka Standard, Iron King, Larsen Clay pits, Tintic Standard, Trixie, Zuma mines; North Tintic district: Lehi-Tintic, Tintic Empire, Tintic Paymaster, Selma mines; Payson district: Nelson mine; Provo district: Monarch mines; Santaquin district: Black Balsam, Copper Bullion, Santaquin Central mines; Silver Lake district: Milkmaid, Ontario mines.

*Wasatch County* Blue Ledge district: Mayflower mine.

*Washington County* Silver Reef district.

*Wayne County* Fruita: Oyler mine; Miners Mountain district.

*Weber County* Fremont Island district; Sierra Madre district: King Solomon, Napoleon-Maghera mines.

## PYROLUSITE

Manganese dioxide,  $MnO_2$ . Tetragonal. Rarely in crystals that are well-developed, commonly in composite subparallel groupings of minute crystals. Usually massive columnar; also in coatings, concretionary forms, granular to powdery. H. 6 - 6.5. G. 4.4 - 5. Cleavage good. Fracture uneven. Brittle. Luster metallic. Color light steel-gray to iron-gray. Streak black to bluish black. Opaque.

*Beaver County* Blue Mountains: Black Jack, Susie Q. Claims; Indian Peak district; Steelville, Spor properties; Newton district; Black Rock deposit; Pine Grove district; San Francisco district.

*Cache County* Hyrum area: Pig Hole Hollow.

*Daggett County* Daggett Chief property; Spring Creek

deposit.

*Emery County* Cedar Mountains; Muddy River; Rochester; Saucer Basin.

*Garfield County* Boulder Mountain: Pleasant Creek; Hutch Pasture; Panguitch; Table Cliff Plateau; Tushar Range: Hawkins claims.

*Grand County* Bald Mesa; Courthouse Wash; Little Grand district: Black Bird, Colorado Fuel and Iron Company, Desert Rock (Mongol), Dry Lake Wash, Duma Point, Needles, Salt Wash group, Tenmile Wash, White Wash mines; Muleshoe Wash; Salt Valley; Squaw Peak; Wilson Mesa district; White House.

*Iron County* Antelope Range: Black Jack, Lucky Joe, Taylor claims; Cedar Mountains: Black Hawk, Joe Louis claims; Escalante district: Clove, Escalante mines; Stateline district: Creole, Gold Dome, Johnny, Ofer, Phelps, Utah Spur mines; Modena property.

*Juab County* Deep Creek Mountains: Gold Bond, Johnson Canyon, Singleton Canyon mines; Detroit district: Iron Blossom mine, Detroit district: Black Boy group, Charm, Copperhead, E. P. H., Ibex mines; Mt. Nebo district: Black Ledge claims; Thomas district: Fluorine Queen mine; Tintic district: Black Jack Empire, White Cloud; San Pitch Mountains: Black Jack, Orme properties.

*Kane County* Kitchen Corral Canyon.

*Millard County* Detroit district: Almond, Black Diamond, Blue Bell, Guy, Last Chance, Major Drum, Martha, Silica Plug mines.

*Piute County* Antelope Range; Dry Canyon; Marysvale district: Blackbird, Blue Miami Moon no. 1 mines; Mt. Baldy district: Deer Trial mine; Mt. Belknap, Ohio district: Bully Boy and Webster mines, Gilbert claims.

*Rich County* Bear River Range: Lakeview claims.

*Salt Lake County* Big Cottonwood district: Carbonate, Cardiff, Woodlawn mines; Bingham district; Camp Williams: Evans Lime Quarry; Little Cottonwood district: Emma, Little Emma, Michigan - Utah mines.

*Sanpete County* Mt. Pleasant.

*Sevier County* Henry district: Iron Peaks, Georgia, Jumbo, Yellow Hornet, Krotke Iron, Nooday, Trinity mines; Sevier Plateau.

*Summit County* Beaver Canyon; Coalville; Park City district: Daly, Ontario, Silver King, Woodside mines.

*Tooele County* Deep Creek Mountains: Dewey, Fortuna mines, Bluebell district: Bogan, Morgan mines; Columbia district: Benmore, Sharp mines; East Erickson district: Copper Jack, Silver King, Silver Shield mines; Erickson district: Blackjack, Blackrock, Blain, Deer Trail, Indian Boy, May Farmer, Huber - Rydalch, Queen Mary mines; Ophir district: Lion Hill area; Ophir Hill area - Cliff, Ophir Hill Consolidated, Ophir Coalition mines.

*Utah County* East Tintic district: Apex Standard, Black Jack, Burgin, Iron King, Tintic Standard, White Cloud mines; Lehi district: Pfeiffer Canyon area - Blue Rock claim, North Tintic district: Fields, North Tintic, Oxen, Tip Top mines; Utah district: Alpha, Emerald, Lucky Boy, Queen of the West, Spalding, Trotter mines. *Wasatch County* Rhodes Plateau, East Star no. 1, Gray Hawk properties.

*Washington County* Santa Clara district: Black Beauty no. 1 claim; Toquerville: Wallace claims.

*Wayne County* Spring Gulch.

*Weber County* Huntsville; Weber district: Payday claims.

### PYROMORPHITE

Lead chlorophosphate,  $Pb_5(PO_4)_3Cl$ . Hexagonal. Crystals prismatic, equant, rarely tabular. Often rounded barrel-shaped forms. Also globular, reniform forms. H. 3. 5 - 4. G. 6. 5 - 7. 1. Luster resinous to adamantine. Cleavage in traces. Brittle. Color various shades of green, brown, yellow.

*Iron County* Escalante district: Escalante mine.

*Juab County* Spring Creek district: Queen of Sheba mine; Tintic district: Eureka Hill, Mammoth mines.

*Summit County* Park City district: Scottish Chief mine.

*Tooele County* Gold Hill district: Rube mine; Rush Valley district: Honerine mine; North Tintic district: Scranton mine.

*Wasatch County* Blue Ledge district: Glencoe, McHenry, Valeo mines; Snake Creek district: Revelator mine.

### PYROPE (See GARNET)

### PYROPHYLLITE

Hydrous aluminum silicate,  $Al_2Si_4O_{10}(OH)_2$  Monoclinic. Foliated, radiated, or somewhat fibrous; also granular to compact. Basal cleavage. Laminae flexible, not elastic. Feel greasy. H. 1 - 2. G. 2. 8. Luster pearly. Color white, apple-green, grayish white, yellowish. Occurs in the Manning Canyon Shale.

*Tooele County* Oquirrh Mountains: Manning Canyon Shale; Stansbury Mountains: Manning Canyon Shale.

*Utah County* Beverly Hills: Manning Canyon Shale; Cedar Valley, Jordan Narrows: Orem, Saratoga, Soldiers Pass quadrangles; Lake Mountain: Manning Canyon Shale; Lehi district: Manning Canyon Shale; Thorpe Hills: Manning Canyon Shale; Wasatch Mountains: Manning Canyon Shale.

### PYROXENE (See AUGITE, DIOPSIDE, HEDENBERGITE, HYPERSTHENE)

### PYRRHOTITE

Sulfide of iron,  $Fe_{1-x}S$ , with x between 0 and 0.2. Hexagonal. Crystals rare. Practically always massive with granular or lamellar habit. H. 4. G. 4. 6. Fracture uneven. Brittle. Luster metallic. Color bronze-yellow. Tarnishes on exposure. Streak dark grayish black. Magnetic. Opaque.

*Juab County* Trout Creek.

*Salt Lake County* Bingham district.

*Tooele County* Gold Hill district: Gold Hill (U. S.), U. S. mines; Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines; Rush Valley district: Settlement Canyon.

### QUARTZ

Silicon dioxide,  $SiO_2$ . Hexagonal. Crystals commonly prismatic, prism faces usually horizontally striated. Also massive, coarse to fine grained crystalline to cryptocrystalline. H. 7. G. 2. 7. Fracture conchoidal. Luster vitreous. Usually colorless, milky, rose, smoky.

*Beaver County* Bradshaw district; Indian Peak district: Blue Bell, Cougar Spar, Dugout, JB, Nooday, Lost Sheep, Utah mines; Lincoln district: Creole mine; Newton district: Louise, Rob Roy, Sheep Rock mines; Pine Grove district: Monarch; Pruess district: Blackbird, Cactus mines, Cactus Gulch; Rock Corral; San Francisco district; Star district: Thrush, Cabin, Fluorine Ledge, Lucky Boy nos. 1-2, Manassa, Monte Cristo, Quartzite, North Virginia Extension, Virginia nos. 1-5 mines; Wah Wah mountains: Violet claims.

*Box Elder County* Ashbrook district: Vipont mine; Rosebud district.

*Davis County* Antelope Island.

*Emery County* San Rafael district.

*Grand County* Agate Switch; Miners Basin district: Dewey, High Ore mines.

*Iron County* Gold Springs district; Iron Springs district: Granite Mountain, Iron Mountain.

*Juab County* Deseret district: Miller mine; Goshute Indian Reservation; Thomas Range: Autunite no. 8, Bel Hill, Blowout, Dell no. 1, Dell no. 5, Evening Star, Hilltop, Lost Sheep, Nonella, Oversight mines; Topaz Mountain; Tintic district: Sioux mine; San Pitch mine; San Pitch Mountains: Black Jack claims: Spring Creek district; Trout Creek district: Apex mine; West Tintic district: 1903, Tintic Western mines.

*Piute County* Gold Mountain district: Sevier mine; Marysvale district: Quicksilver mine; Mt. Baldy district: Deer Trail mine; Ohio district: Bully Boy and Webster mines.

*Salt Lake County* Bingham district: Bingham Copper

Pit, Galena, Old Jordan, U. S. and Lark mines; Little Cottonwood stock.

*San Juan County* La Sal Mountains; White Canyon district: Happy Jack mine.

*Sevier County* Henry district: Trinity prospect.

*Summit County* Park City district: Daly-Judge, Daly West, Jupiter, Kearns-Keith, Silver King, Silver King Consolidated, Woodside mines.

*Tooele County* Blue Bell district: Bennion Canyon mine; Columbia district: Benmore, Sharp, Iron Hope, Sultana mines; Dugway district: Rattler mine; East Erickson district: Ekker Canyon, Indianapolis, Silver King mines; Gold Hill district: Gold Bond, Rodenhouse Wash, star Dust, Success, U. S. mines; Granite district: Desert, El Dorado, Mountain Queen mines; Mercur district; Ophir district: Dry Canyon area; Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines; North Tintic district: Scranton mine.

*Utah County* Alpine district; American Fork district: Bog mine; Little Cottonwood stock; East Tintic district: Burgin mine; Silver Lake district: Deer, Silver Creeks, Wells Canyon.

*Washington County* Silver Reef district.

*Weber County* Sierra Madre district.

#### QUENSELITE

Hydrous lead manganese oxide,  $\text{PbMnO}_2(\text{OH})$ . Monoclinic. Crystals tabular; sometimes elongated, striated. Thin laminae, flexible. H.  $2\frac{1}{2}$ . G. 6.8. Color black. Luster metallic to adamantine.

*Utah County* East Tintic district: Burgin mine.

#### RABBITTITE

Hydrous basic carbonate of calcium magnesium, and uranium,  $\text{Ca}_3\text{Mg}_3(\text{UO}_2)(\text{CO}_3)_6(\text{OH})_4 \cdot 18\text{H}_2\text{O}$ . Monoclinic. Small acicular crystals. Cleavage prismatic. H. 2.5. G. 2.6. Luster silky. Color pale green. Occurs as an efflorescence.

*Emery County* San Rafael district: Lucky Strike, Lucky Strike no. 2 mines.

#### RACEWINITE

Hydrous aluminum calcium silicate. A zeolite. Coarsely crystalline, but no crystal forms. H. 2.5. G. 1.9. Conchoidal fracture. Black in masses, splinters brown to yellow.

*Salt Lake County* Bingham district: Highland Boy, Yampa mines.

#### RAUVITE

Hydrous calcium uranium vanadate,  $\text{Ca}(\text{UO}_2)_2\text{V}_{10}\text{O}_{28} \cdot 16\text{H}_2\text{O}$ . Occurs as dense botryoidal crusts, coatings. Metacolloid. Color purplish to bluish black. Luster adamantine to waxy. G. 2.9. Streak yellowish brown to olive. Not fluorescent.

*Emery County* San Rafael district: Flat Top Mesa, Migliaccio mine, Temple Mountain, South Temple Mountain, South Temple Wash.

*Grand County* Beaver Mesa: Corvusite nos. 1-3 mines; Thompsons district: Cactus Rat mines.

*Piute County* Marysvale district: La Vita prospect.

*Sevier County* Henry district: La Veta prospect.

#### REALGAR

Arsenic sulfide, AsS. Monoclinic. Crystals short prismatic. Also granular, compact, crusts. H. 1.5-2. G. 3.5. Cleavage good. Sectile. Luster resinous to greasy. Color aurora-red to orange-yellow. Streak orange-red. *Box Elder County* Ashbrook district: Vipont mine.

*Emery County* San Rafael district: Camp Bird No. 7, Fuemrol no. 2 mines.

*Garfield County* Coyote Creek district: Hampton mine.

*Salt Lake County* Bingham district: Butterfield Canyon.

*Tooele County* Mercur district: Brickyard, Golden Gate, Mercur, Sacramento mines.

*Washington County* Beaver Dam Mountains; Bull Valley district: Pilot claims.

#### RECTORITE

Interstratified pyrophyllite and vermiculite.

*Tooele County* Oquirrh Mountains: Manning Canyon Shale; Stansbury Mountains: Manning Canyon Shale.

*Utah County* Beverly Hills: Manning Canyon Shale; Lake Mountain: Manning Canyon Shale, Lehi district: Manning Canyon Shale; Thorpe Hills: Manning Canyon Shale; Wasatch Mountains: Manning Canyon Shale.

#### RED OCHER (See HEMATITE)

#### REEDMERGNERITE

Sodium boron silicate,  $\text{NaBSi}_3\text{O}_8$ . Triclinic. A boron analogue of albite, authigenic in origin. Crystals stubby prisms with characteristic wedge-shaped ends, usually microscopic. H. 6-6.5. G. 2.7. Cleavage basal perfect. Colorless.

*Duchesne County* Carter Oil Company wells; Green River Formation; Sinclair Mortenson well.

#### RHODOCHROSITE

Manganese carbonate,  $\text{MnCO}_3$ . Hexagonal. Distinct crystals not common. Cleavable masses to granular, compact; columnar; crusts. H. 3. 5 - 4. G. 3. 7. Cleavage rhombohedral good. Brittle. Luster vitreous to pearly. Color various shades of pink, yellow, gray, light brown. *Beaver County* Blue Mountains: Black Jack, Susie Q claims; San Francisco district; Star district: Moscow mine.

*Box Elder County* Ashbrook district: Vipont mine. *Grand County* Needles.

*Iron County* Modena property.

*Juab County* Detroit district: Black Boy group.

*Millard County* Detroit district: Almond, Blue Bell, Major Drum mines.

*Piute County* Ohio district: Dalton mine; Tushar Range: Dillon mine.

*Rich County* Bear River Range: Lakeview claims.

*Salt Lake County* Big Cottonwood district: Cardiff mine; Bingham district: Butterfield, Eagle Bird, Lucky Boy, Queen, Winnamuck and Dixon mines; Little Cottonwood district: Michigan-Utah mine.

*Summit County* Park City district: Daly, Ontario mines.

*Tooele County* Erickson district: Utonia claim.

*Utah County* East Tintic district: Burgin, Tintic Standard mines.

*Wasatch County* Blue Ledge district: Mayflower mine.

#### RHODONITE

Manganese silicate,  $\text{MnSiO}_3$ . Triclinic. Crystals commonly tabular, large and rough with rounded edges. Commonly massive, cleavable to compact. H. 5. 5 - 6. G. 3. 6. Cleavage good. Luster vitreous. Color rose-red, pink, brown.

*Summit County* Park City district: Daly, Ontario mines.

*Tooele County* Erickson district: Utonia claim.

#### RHOMBOCLASE

Hydrous iron sulfate,  $\text{HFe}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ . Orthorhombic. Thin tabular plates. Also stalactites with radiating structure. Fracture conchoidal to fibrous. H. 2. G. 2.3. Luster submetallic to greasy. Colorless to white, gray, pale yellow, green or blue.

*Utah County* East Tintic district.

#### RIEBECKITE

Sodium iron silicate,  $\text{Na}_2\text{Fe}_3\text{Fe}_2\text{Si}_8\text{O}_{22}(\text{OH})_2$ . Monoclinic. Prismatic crystals, vertically striated. Cleavage good. H. 4. G. 3. 4. Luster vitreous. Color dark blue to black. Authigenic mineral in Green River Formation. *Duchesne County* Green River Formation.

#### RIPIDOLITE

Hydrous magnesium iron aluminum silicate,  $(\text{Mg,Fe,-Al})_6(\text{Si,Al})_4\text{O}_{10}(\text{O,OH})_8$ . Monoclinic. A chlorite variety. One perfect cleavage. Flexible. H. 2-2½. G. 2.65-2.8. Color green.

*Utah County* East Tintic district.

#### ROCKBRIDGEITE

Basic iron manganese phosphate,  $(\text{Fe,Mn})\text{Fe}_4(\text{PO}_4)_3(\text{OH})_5$ . Orthorhombic. Botryoidal masses and crusts with radial fibrous or columnar structure. Cleavage excellent. Brittle. H. 4. 5. Color dark green to olive-green, greenish black. Occurs in cavities in magnetite. *Iron County* Iron Springs district: Iron Mountain, Blow-out Hill.

#### ROEMERITE

Hydrous ferrous and ferric sulfate,  $\text{FeFe}_2(\text{SO}_4)_2 \cdot 14\text{H}_2\text{O}$ . Triclinic. Occurs as crystalline masses and very crude, equant crystals. Cleavage perfect. H. 3 - 3. 5. G. 2. 2. Color dark brown. Luster oily to vitreous. Transparent. Taste saline, astringent.

*Emery County* San Rafael district: Calf Mesa, Dexter group.

*Utah County* East Tintic district.

#### ROSASITE

Copper zinc carbonate-hydroxide,  $(\text{Cu,Zn})_2(\text{OH})_2(\text{CO}_3)$ . Monoclinic. Cleavage good. Brittle. H. 4. 5. G. 4. 1. Color green to bluish green, sky blue. Occurs in mammillary, botryoidal or warty crusts with fibrous to spherulitic structure.

*Tooele County* Dugway district.

*Washington County* Tutsagubet district: Apex (Dixie) mine.

#### ROSCOELITE

Complex vanadium mineral,  $\text{K}(\text{V,Al,Mg})_3(\text{Al,Si}_3)\text{O}_{10}(\text{OH})_2$ . Monoclinic. Habit is massive. Color green, gray, tan brown. Luster pearly. H. soft. Cleavage good.

*Emery County* San Rafael district: Temple Mountain. *Grand County* Thompsons area; Thompsons district: Cactus Rat, Parco no. 23 mines.

*San Juan County* La Sal Quadrangle: Angle, Black Hat, Brush Basin Nos. 1 and 3, Confusion, Elray, Evening Star, Firefly-Pigmy, Hesperus, Little Dawn, Little Peter, Lucky No. 2, Marjorie Ann, Maud, Morning Star, New Yellow Spot, Sumner, Too High, Uranium Girl, Valley



View, Vista Grande, Wedge, Yellow Bird, Yip Yip mines; Montezuma Canyon: Dixie No. 1, Lucky Boy, Rock, Strawberry, Verdure, West Cliff House No. 8 mines; Paradox Valley district: Grey Dawn, Vanadium Queen mines.

#### ROSE QUARTZ (See QUARTZ)

#### ROSSITE

Hydrous calcium vanadate,  $\text{CaV}_2\text{O}_6 \cdot 4\text{H}_2\text{O}$ . Triclinic. Flaky to glassy and fibrous structure. Color yellow. H. 2 - 3. G. 2. 5. Luster pearly to vitreous. Cleavage good. Brittle.

*Grand County* Thompsons area; Thompsons district: Cactus Rat, Parco no. 23 mines.

#### RUBY SILVER

(See PROUSTITE and PYRARGYRITE)

#### RUTHERFORDINE

Uranyl carbonate,  $(\text{UO}_2)(\text{CO}_3)$ . Orthorhombic. Cleavage perfect. Hardness not known. G. 5. 7. Luster of aggregates dull to earthy. Color yellow to greenish yellow. Occurs as earthy to pulverulent aggregates, and as crusts of tiny laths. Effervescence in acid.

*Emery County* San Rafael district: Delta mine.

*San Juan County* "C" Group claims.

#### RUTILE

Titanium oxide,  $\text{TiO}_2$ . Tetragonal. Crystals commonly prismatic, often slender acicular. Also granular, massive, fine to coarse. H. 6 - 6. 5. G. 4. 2. Cleavage distinct. Fracture conchoidal to uneven. Brittle. Luster adamantine. Color reddish-brown to red.

*Beaver County* Pruess district: Blackbird, Cactus mines.

*Salt Lake County* Bingham district.

*San Juan County* Moses Rock dike.

*Sevier County* Henry district: Trinity prospect.

*Tooele County* Gold Hill district; Mercur district.

*Utah County* East Tintic district.

*Wayne County* Caineville.

#### SABUGALITE

Hydrous acid phosphate of aluminum and hexavalent uranium,  $\text{HAl}(\text{UO}_2)_4(\text{PO}_4)_4 \cdot 16\text{H}_2\text{O}$ . Tetragonal. Occurs as thin plates, typically as densely aggregated crusts. Cleavage perfect. H. 2. 5. G. 3. 2. Color bright yellow to lemon yellow, closely resembling autunite. Luster weakly vitreous. Slightly flexible. Fluoresces

bright lemon yellow.

*Piute County* Marysvale district: Freedom no. 2 mine.

*San Juan County* White Canyon district: Happy Jack mine.

#### SAGENITE (See RUTILE)

#### SALEEITE

Magnesium uraninate phosphate,  $\text{Mg}(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 8-10\text{H}_2\text{O}$ . Tetragonal. Crystals rectangular plates. H.  $2\frac{1}{2}$ . G. 3.27. Color pale yellow, yellowish green. Translucent to transparent. Fluoresces brilliant yellow green.

*San Juan County* Paradox Valley district: Grey Dawn mine.

#### SAMARSKITE

Complex oxide,  $(\text{Fe},\text{Y},\text{U})_2(\text{Nb},\text{Ti},\text{Ta})_2\text{O}_7$ . Orthorhombic. Prismatic. Crystals often rough. Massive and not easily identified. Cleavage indistinct. Fracture conchoidal. Brittle. H. 5 - 6. G. 5. 7. Luster vitreous to resinous. Color velvet black, brown, yellowish brown. Streak dark reddish brown.

*Tooele County* East Erickson district: Hard-to-Beat, Sheeprock Canyons, Silver King mine; Granite Mountain district: Blue Bell mine.

#### SANIDINE (See ORTHOCLASE)

#### SAPONITE

Hydrous magnesium aluminum iron silicate,  $(\text{Mg},\text{Al},\text{Fe})_3(\text{Al},\text{Si})_4\text{O}_{10}(\text{OH})_2$ . Monoclinic. Member of the smectite group. Usually amorphous and impure. Commonly massive. In nodules or cavities. H. soft. G. 2. 2. Luster greasy. Color white, yellowish, grayish green, bluish, reddish.

*Beaver County* Star district.

*Grand County* Richardson district.

*Utah County* East Tintic district.

#### SAPPHIRE (See CORUNDUM)

#### SATIN SPAR (See GYPSUM)

#### SCANDIUM

Rare metal, Sc, indefinite mineral association. Occurs in contact metamorphic deposits and in replacement veins. *Tooele County* Gold Hill district.

## SCAPOLITE

Varied composition from  $(\text{Na,Ca})_4\text{Al}_3(\text{Al,Si})_3\text{Si}_6\text{O}_{24}(\text{Cl,CO}_3,\text{SO}_4)$ , to  $(\text{Ca,Na})_4\text{Al}_3(\text{Al,Si})_3\text{Si}_6\text{O}_{24}(\text{Cl,CO}_3,\text{SO}_4)$ . Tetragonal. Crystals usually prismatic. Usually coarse crystals, or with faint fibrous appearance. H. 5. 5 - 6. G. 2. 7. Luster vitreous. Color white, gray, pale green, bluish, reddish.

*Sevier County* Henry district: Trinity prospect.

*Tooele County* Gold Hill district: Doctor, Gold Bond, Rube mines.

## SCHEELITE

Calcium tungstate,  $\text{CaWO}_4$ . Tetragonal. Habit octahedral, also tabular. Massive, granular, reniform, columnar. H. 4. 5 - 5. G. 6. 1. Cleavage good. Fracture uneven. Luster vitreous. Colorless to white, yellowish white, pale yellow; also greenish, gray reddish, orange-yellow. Fluoresces.

*Beaver County* Bradshaw district: 2 R's group; Granite district: Big Pass, Bismuth, Burnt Hollow, Contact, Garnet, King-of-the-Hills, Major fault, Molly, Oak, Oak Basin, Rattler. Scheelite, Ward mines; Lincoln district: Creole mine; Rocky district: Copper Ranch, Old Hickory mines; San Francisco district: Cupric mine; Star district: Copper King, Little May Lilly mines. *Box Elder County* Ashbrook district: Bovine mine; Grouse Creek Range: Rocky Pass mine; Newfoundland district: Desert Peak, Park Rat Canyon; Rosebud district: A and W, Magnitude mines.

*Davis County* Lucky Boy and Pioche mines.

*Grand County* Ryan Creek Scheelite property.

*Juab County* Deep Creek Mountains: Apex, Eastern Trout Creek, Hornet, MacMillan, Mary mines; Trout Creek district: Apex, Bacon, Trout Creek mines; West Tintic district: Iron King, Tintic western mines.

*Millard County* House Range: Amasa Valley, Horseshoe, Mt. Baldy, New Klondike, Pine Peak, Pinke Peak, Rainbow, South, South Pit, Sidesprings mines, Notch Peak, Painter Springs.

*Salt Lake County* Big Cottonwood district: Mountain Lake, Tungsten Tunnel mines; Little Cottonwood district: South Hecla mine; Little Cottonwood stock. *Tooele County* Deep Creek Mountains: Complex, Probert mine; East Erickson district: Ekker Canyon prospect, Sheepprock Canyon; Gold Hill district: B. Estelle, Centennial and Enterprise, Copper Bloom, Copperopolis, Doctor, E. H. B., Enterprise, Fraction Lode, Frankie, Ida Lull, Lucy L., Mascot, Pole Star Copper Company, Star Dust, Wilson Consolidated, Yellow Hammer mines; Ophir district: Ophir Hill area -

Ophir Hill Consolidated, Ophir Coalition mines. *Utah County* Silver Lake district: Deer Creek, Mayday Extension, Milkmaid mines.

*Washington County* Beaver Dam Mountains.

## SCHOEPITE

Hydrous uranium oxide,  $\text{UO}_3 \cdot 2\text{H}_2\text{O}$ . Orthorhombic. Crystals are usually tabular, also equant or short prismatic. Cleavage basal. H. 2 - 3. G. 4. 8. Luster adamantine. Color sulfur-yellow to citron yellow. Streak yellow. Transparent.

*Emery County* San Rafael district: Delta mine, Green Vein Mesa, Consolidated mine.

*San Juan County* Red Canyon district: Frey no. 4, Posey mines; White Canyon district: Happy Jack, Hideout mines.

*Wayne County* Fruita: Oyler mine.

## SCHROECKINGERITE

Hydrous fluo-carbonate-sulfate of sodium, calcium, and uranium,  $\text{NaCa}_3(\text{UO}_2)(\text{CO}_3)_3(\text{SO}_4)\text{F} \cdot 10\text{H}_2\text{O}$ . Orthorhombic. Found as crusts, clusters, rosettes, or globular aggregates of flattened scales. H 2. 5. G. 2. 5. Cleavage perfect basal. Laminae flexible. Luster vitreous to pearly. Color greenish yellow. Transparent. Strongly fluorescent.

*Emery County* San Rafael district: Delta mine; Bow Knot area; Green River district: Crabapple claim. *Grand County* Cisco: Trader Smith's claims; Seven Mile Canyon; Thompsons district: McCoy, Parco no. 23 mines; Yellow Cat district: Yellow Cat group.

*Juab County* Thomas Range: Good Will, Yellow Chief groups; Topaz Mountain.

*Piute County* Marysvale district: Bullion Monarch, East Slope no. 2, Freedom nos. 1 - 2, Prospector nos. 1 and 3 mines.

*San Juan County* Elk Ridge: Notch Nos. 5 and 6 mines; La Sal Quadrangle: Brushy Basin No. 3, Hesperus mines; White Canyon district: Hideout mine.

*Wayne County* Coleman Canyon to Oak Creek.

## SCORODITE

Hydrous iron arsenate,  $\text{FeAsO}_4 \cdot 2\text{H}_2\text{O}$ . Orthorhombic. Crystals usually pyramidal; also tabular and prismatic. Also massive, crusts, sinterlike, dense to earthy. H. 3. 5 - 4. G. 3. 2. Cleavage imperfect. Fracture subconchoidal. Luster vitreous. Color pale green to brown, sometimes colorless, bluish, violet, yellow.

*Beaver County* San Francisco district: Horn Silver mine;

Star district.

*Emery County* San Rafael district: Temple Mountain, Fuehrer no. 2 mine.

*Juab County* Tintic district: Carissa mine; West Tintic district: Scotia mine.

*Tooele County* Deep Creek Mountains: Bonanza mine. Gold Hill district: Bonanza, Boston, Gold Hill (U. S.), Gold Hill Standard, Mascot, Monte Del Rey, Ozark, Silver and Gold Mining Company, Unadine, U. S. mines; Mercur district.

*Utah County* East Tintic district: Trixie mine.

#### SEARLESITE

Hydrous sodium boron silicate,  $\text{NaBSi}_2\text{O}_6 \cdot \text{H}_2\text{O}$ . Monoclinic. Occurs in minute spherulites composed of radiating fibers. Cleavage perfect. H. 2. 4. Color white. Occurs in the Green River Formation.

*Duchesne County* Carter Oil Company wells; Green River Formation; Sinclair Mortenson well.

*Uintah County* Sun Oil Company South Ouray well.

#### SELENITE (See GYPSUM)

#### SELENIUM

Native element, Se. Hexagonal. Acicular crystals, often hollow and tubelike. Cleavage good. Crystals flexible. Luster metallic. Color gray. Streak red. Transparent in thinnest fragments, red.

*Grand County* Thompsons district: Parco no. 23 mine.

*San Juan County* Paradox Valley district: Vanadium Queen mine.

#### SELIGMANNITE

Lead copper arsenic sulfide,  $\text{PbCuAsS}_3$ . Orthorhombic. Crystals equant, short prismatic to tabular. H. 3. G. 5. 3. Cleavage poor. Fracture conchoidal. Brittle. Luster metallic. Color dark lead-gray to black. Streak chocolate-brown to purple-black. Opaque.

*Salt Lake County* Bingham district.

#### SENARMONTITE

Antimony trioxide,  $\text{Sb}_2\text{O}_3$ . Isometric. Habit octahedral; also granular massive, crusty. H. 2. 0. 2. 5. G. 5. 5. Cleavage intraces. Fracture uneven. Brittle. Luster resinous. Colorless to grayish white. Streak white. Transparent. *Garfield County* Coyote district: Hampton mine. *Tooele County* Deep Creek Mountains: Congar Hill mine.

#### SEPIOLITE

Hydrous magnesium silicate,  $\text{Mg}_2\text{Si}_3\text{O}_8 \cdot 2\text{H}_2\text{O}$ . Orthorhombic. Compact, fine earthy texture, or clay-like. H. 2 - 2. 5. G. 2. Cleavage none. Floats on water in dry masses. Color grayish white, white, yellowish, bluish, reddish. Opaque.

*Beaver County* Mineral Range.

*Duchesne County* Indian Canyon.

*Salt Lake County* Big Cottonwood district: Maxfield mine; Little Cottonwood district.

*San Juan County* White Canyon district: Happy Jack mine.

*Tooele County* Gold Hill district: Cane Spring mine.

Rush Valley district: Honerine mine.

#### SERICITE (See MUSCOVITE)

#### SERPENTINE

Hydrous magnesium silicate,  $(\text{Mg,Fe})_3\text{Si}_2\text{O}_5(\text{OH})_5$ . Monoclinic. Crystals, except as pseudomorphs, unknown. Platy and fibrous varieties. H. 2-5. G. 2. 2-2. 7. Luster greasy, waxy, silky. Color light to dark green.

*Beaver County* Bradshaw district: 2 R's group; Pruess district: Blackbird, Cactus mines; Star district: Hub mine.

*Salt Lake County* Big Cottonwood district.

*Sevier County* Henry district: Trinity prospect.

*Summit County* Park City district: Daly, Ontario mines.

*Tooele County* Gold Hill district: Reaper mine; Rush Valley district: Honerine mine.

*Washington County* Mineral Mountain: Gregerson mine.

#### SERPOPHITE

Hydrous magnesium silicate,  $\text{H}_4\text{Mg}_3\text{Si}_3\text{O}_7 \cdot 2\text{H}_2\text{O}$ . Associated with minerals in contact metamorphic aureoles.

*Utah County* East Tintic district.

#### SHERWOODITE

Hydrous calcium vanadate,  $\text{Ca}_3(\text{VO})_2\text{V}_6\text{O}_{20} \cdot 15\text{H}_2\text{O}$ . Tetragonal. Crystals equant or slightly flattened. Occurs singly or in aggregates. Color dark blue-black. Streak light blue. H. 2. G. 2. 8. Luster vitreous to earthy. Fracture subconchoidal to uneven.

*Grand County* Wilson Mesa district.

**SHORTITE**

Sodium calcium carbonate,  $\text{Na}_2\text{Ca}_2(\text{CO}_3)_3$ . Orthorhombic. Wedge-shaped crystals, tabular or equant, striated. H. 3. G. 2. 6. Cleavage distinct. Fracture conchoidal. Luster vitreous. Colorless to pale yellow. Transparent. Occurs in the Green River Formation.

*Duchesne County* Carter Oil Company wells; Green River Formation; Sinclair Mortenson well.

*Uintah County* Sun Oil Company South Ouray well.

**SICKLERITE**

Lithium iron manganese phosphate,  $(\text{Li,Fe,Mn})(\text{PO}_4)$ . Orthorhombic. Found only massive as an alteration product. H. 4. G. 3. 3. Color yellowish brown to dark brown. Cleavage good. Streak light yellowish brown, brown, reddish brown.

*Juab County* Tintic district.

**SIDERITE**

Ferrous carbonate,  $\text{FeCO}_3$ . Hexagonal. Crystals commonly rhombohedral. Crystal faces curved like dolomite. Often cleavable massive, fine to coarse granular. Also botryoidal, compact and earthy. H. 4. G. 3. 9. Cleavage perfect. Brittle. Luster vitreous to pearly. Color yellowish brown, grayish, greenish.

*Beaver County* Pruess district: Blackbird, Cactus mines.

*Cache County* Paradise district: Mineral Point.

*Iron County* Iron Springs district: Granite Mountain, Iron Mountain.

*Salt Lake County* Big Cottonwood district: Columbus—Rexall mine, Lulu mine; Bingham district: Highland Boy, Yampa mines; Little Cottonwood district: Columbus-Rexall, Emma mines.

*San Juan County* Elk Ridge: King Edward mine.

*Tooele County* Deep Creek Mountains: North Pass prospects; Dugway district: Boston, Bullion Canyon, Great Easter, Nautilus, Pride of the West mines; Gold Hill district: Alvarado, Copper Queen-Midland Mining Company, Gold Hill (U. S.), Midas, Midland mines;

Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.

*Utah County* East Tintic district: Burgin mine; Silver Lake district: Deer, Silver Creeks.

*Wasatch County* Blue Ledge district: Mayflower mine.

**SIDERONATRITE**

Hydrous sodium iron sulfate,  $\text{Na}_2\text{Fe}(\text{SO}_4)_2\text{OH}\cdot 3\text{H}_2\text{O}$ . Orthorhombic. Fibrous, massive. Perfect cleavage. H.

2-2. 5. G. 2. 3. Easily fusible. Color yellow.

*Wayne County* Capitol Reef Monument.

**SIDEROTIL**

Hydrous iron sulfate,  $\text{FeSO}_4\cdot 5\text{H}_2\text{O}$ . Triclinic. G. 2.1-2.2. Crystallographic and physical data are lacking. Occurs in fibrous crusts and divergent groups of needle-like crystals. Color white to yellowish, pale green. *Salt Lake County* Bingham district.

*San Juan County* White Canyon district: Happy Jack mine.

*Tooele County* Gold Hill district: Alvarado mine.

*Utah County* East Tintic district: Tintic Standard mine.

**SILICIFIED BONE and WOOD**

(See CRYPTOCRYSTALLINE QUARTZ)

**SILVER**

Native silver, Ag. Isometric. Crystal habit cubic, octahedral, dodecahedral. Commonly in acicular forms, reticulated. Also massive, flattened scales, coatings, or wiry forms. H. 2. 5-3. G. 10. 5. Cleavage none. Fracture hackly. Ductile and malleable. Luster metallic. Color and streak silver-white; often gray or black due to tarnish. Opaque.

*Beaver County* Star district: Harrington-Hickory, Rebel, White Rock mines.

*Box Elder County* Ashbrook district: Vipont mine; Lucin district: Tecoma Hill mine.

*Cache County* Hyrum area: Lucky Star, Tip Top claims; La Plata area: Yellow Jacket claim.

*Emery County* Emery district.

*Juab County* Deep Creek Mountains: Heavenly Hills prospect; Tintic district: Black Jack Empire, Bullion Beck, Centennial Eureka, Chief Consolidated, Gemini, Grand Central, Mammoth, Swansea mines.

*Morgan County* Strawberry mine.

*Salt Lake County* Bingham district: Dalton and Lark, Galena, Old Jordan, Neptune, Tiewaukee, U. S. and Lark mines.

*Summit County* Park City district: Scottish Chief mine.

*Tooele County* Blue Bell district: Black Hawk mine; Columbia district: Benmore, Sharp mines; Dugway district: Buckhorn, Four Metals mines; Ophir district: Dry Canyon area - Brooklyn, Mono mines; Ophir Hill area - Jim Fisk mine; Wild Cat Mountains: Silver Queen mine.

*Utah County* East Tintic district: Apex Standard, Burgin mines.

*Wasatch County* Blue Ledge district: Mayflower mine.

*Washington County* Silver Reef district: Barbee and

Walker, Thompsons mines.  
*Weber County* Fremont Island district.

### SIMPLOTITE

Hydrous calcium vanadate,  $\text{CaV}_4\text{O}_9 \cdot 5\text{H}_2\text{O}$ . Monoclinic. Occurs as micaceous plates, and as hemispherical aggregates. Color dark-green to black. Cleavage good. H. 1. G. 2. 6. Luster vitreous.  
*San Juan County* Paradox Valley district: Vanadium Queen mine.

### SKLODOWSKITE

Hydrous basic magnesium uranium silicate,  $\text{Mg}(\text{UO}_2)_2 \cdot \text{Si}_2\text{O}_7 \cdot 6\text{H}_2\text{O}$ . Monoclinic. Cleavage perfect. H. soft. G. 3. 7. Brittle. Color pale citron yellow. Luster silky, subvitreous. Not fluorescent.  
*Juab County* Honeycomb Hills.  
*Piute County* Marysvale district: Freedom no. 2 mine.  
*Wayne County* Fruita: Oylar mine.

### SMALTITE

Cobalt nickel arsenide,  $(\text{Co,Ni})\text{As}_{3-x}$ . Isometric. Occurs in crystals, skeletal growths, aggregates. Also massive, dense. Cleavage good. H. 5. 5-6. G. 6. 5. Brittle. Luster metallic. Color tin white and silver gray. Opaque.  
*San Juan County* White Canyon district: Happy Jack mine.

### SMECTITE

Group name for bentonite and fullers earth clay minerals, including beidellite, hectorite, montmorillonite, nontronite, and saponite.  
*Duchesne County* Green River Formation: South Fork Avintaquin Creek, Left Fork Indian Creek, Willow Creek.  
*Juab County* Thomas Range: Spor Mountain.  
*Uintah County* Green River Formation; South of Ouray.

### SMITHSONITE

Zinc carbonate,  $\text{ZnCO}_3$ . Hexagonal. Rarely well crystallized; usually reniform, stalactitic, crusts, granular, earthy. H. 4-4. 5. G. 4. 4. Cleavage rhombohedral. Brittle. Luster vitreous to pearly. Color grayish, greenish, bluish, yellowish, brownish.  
*Beaver County* Granite district: Beaver View mine; Lincoln district: Lincoln mine; Star district: Cedar - Talisman, Gold Crown, Hoosier Boy, Maud S., Moscow, Red Warrior, Vicksburg mines; San Francisco district:

Horn Silver mine.

*Box Elder County* Lucin district: Cunepah Tunnel, Tecoma Hill mine; Promontory district: Lakeview Mining properties; Saline Station.

*Cache County* Hyrum area: Moon, Tip Top claims; Smithfield area.

*Juab County* Mt. Nebo district: Eva, Freddie Lode mines; Tintic district: Bullion Beck, Chief Consolidated, Colorado, Eagle and Bell, Gemini, Godiva, Lower Mammoth, May Day, New Bullion, Yankee, Uncle Sam mines.

*Morgan County* Argenta district: Carbonate Hill, Carbonate Gem mines.

*Salt Lake County* Big Cottonwood district: Alta Tunnel and Transportation Company, Antelope, Carbonate, Cardiff, Prince of Wales, Silver Mountain mines; Little Cottonwood district: Dwyer, Emma, South Hecla mines.  
*Tooele County* Dugway district: Bertha, Bryan, Four Metals, Francis, Juno, Raymond-Bald Eagle mines; Gold Hill district: Garrison Monster mine; North Tintic district: New Bullion, Scranton mines; Ophir district: Dry Canyon area-Brooklyn, Kearsarge mines; Lion Hill area - Chloride Point; Ophir Hill area - Cliff, Hidden Treasure, Sacramento mines; Rush Valley district: Honerine mine.

*Uintah County* Brush Creek district: Little Alta mine.  
*Utah County* American Fork district; East Tintic district: Burgin, Eureka Lily, North Lily, Trixie mines; Payson district: Syndicate mine; Wells Canyon.  
*Washington County* Tutsagubet district: Apex (Dixie) mine.

### SMOKY QUARTZ (See QUARTZ)

### SODALITE

Sodium aluminum silicate with chlorine,  $\text{Na}_4\text{Al}_3\text{Si}_3\text{O}_{12}\text{Cl}$ . Isometric. Crystals rare, commonly massive, in imbedded grains. Cleavage good. H. 5. 5-6. G. 2. 2. Luster vitreous. Color usually blue, also white, gray, green. Transparent to translucent.  
*San Juan County* La Sal Mountains: Middle Mountain, Brumley Ridge.

### SODDYITE

Hydrous uranium silicate,  $(\text{UO}_2)_5(\text{SiO}_4)_2(\text{OH})_2 \cdot 5\text{H}_2\text{O}$ . Orthorhombic. Occurs as distinct crystals, also massive, earthy. Cleavage perfect. H. 3. 5. G. 4. 7. Color dull yellow to canary yellow; amber, greenish yellow. Streak pale yellow. Luster vitreous.  
*Juab County* Honeycomb Hills.

**SODIUM ANALOGUE OF HEWETTITE**

(See BARNESITE)

**SOUMANSITE (See WARDITE)****SPADAITE**

Hydrous magnesium silicate, perhaps  $MgSiO_3 \cdot H_2O$ . Amorphous. Has a massive habit. H. 2. 5. Color reddish. *Tooele County* Deep Creek Mountains: Midas mine; Gold Hill district: Alvarado, Cane Springs, Rube mines.

**SPANGOLITE**

Hydrous basic sulfate of copper and aluminum,  $Cu_6Al(SO_4)(OH)_{12}Cl \cdot 3H_2O$ . Hexagonal. Occurs in very small crystals, either short prismatic or tabular. H. 2. G. 3. 1. Fracture conchoidal. Cleavage good. Brittle. Luster vitreous. Color dark green, Bluish green.

*Juab County* Tintic district.**SPECULARITE (See HEMATITE)****SPESSARITE (See GARNET)****SPHAEROCOBALTITE**

(See COBALTOCALCITE)

**SPHALERITE**

Zinc sulfide,  $ZnS$ . Isometric. Often in tetrahedrons and dodecahedrons. Also cleavable masses, coarse to fine granular, fibrous, concretionary, botryoidal. H. 3. 5-4. G. 4. Cleavage perfect dodecahedral. Brittle. Luster resinous. Color yellow, brown, black, resinous. Color yellow, brown, black, depending upon iron content. Streak brownish to light yellow.

*Beaver County* Bradshaw district: Cave mine; Granite district: Beaver View mine; Lincoln district: Lincoln mine; San Francisco district: Beaver Carbonate, Cupric, Peacock Copper, Washington mines; Star district: Harrington-Hickory, Hub, Moscow, Red Warrior, Vicksburg, White Rock, Wild Bill mines.

*Box Elder County* Ashbrook district: Vipont mine; Lucin district: Tecoma Hill mine; Park Valley district: Century, Susannah mines.

*Emery County* San Rafael district: Calyx, Dirty Devil, Fueimrol No. 2, Lucky Strike mines.

*Grand County* Ryan Creek Scheelite prospect.

*Juab County* Deep Creek Mountains, Trout Creek mine. Fish Springs district: Carnation, Emma, Galena mines; Mt. Nebo district: Ajaxto no. 2, Eva, Freddie Lode,

Highland, Santaquin Chief mines; Tintic district: Bullion Beck, Chief Consolidated, Colorado, Eureka Hill, Iron Blossom, Lower Mammoth, Swamsea mines; Trout Creek district; West Tintic district: Lockheed Iron, Scotia mines.

*Millard County* Leamington district: Wood Canyon. *Piute County* Gold Mountain district: Annie Laurie mine; Mt. Baldy district: Clyde, Deer Trail mines; Ohio district: Bully Boy and Webster, Cascade, Great Western, Shamrock mines.

*Salt Lake County* Big Cottonwood district: American Metals, Antelope, Cardiff, Howell-Baby McKee, Maxfield, Prince of Wales, Reed and Benson, Silver Mountain, Woodlawn mines; Bingham district: Boston Consolidated, Brooklyn, Burning Moscow, Butterfield, Carr Fork, Dalton and Lark, Dixon, Eagle Bird Lode, Frisco, Galena, Highland Boy, Last Chance, Nast, Neptune, Old Jordan, Queen, Tiewaukee, U. S. and Lark, Winnamuck, Yampa, Yosemite mines; Little Cottonwood district: Columbus Consolidated and Wasatch Drainage Tunnel, Swyer, Emma, Little Emma, South Hecla, Superior mines.

*San Juan County* Big Indian district: Mi Vida mine; Monticello district: Blue Bird, Danish Girl, Dream, Gold Queen mines; Paradox Valley district: Grey Dawn mine; White Canyon district: Happy Jack mine.

*Sanpete County* Dry Canyon.

*Sevier County* Salina Creek district: Ball, Lead Hill mines.

*Summit County* Park City district: California, Comstock, Daly, Daly Judge, Daly West, Kearns - Keith, Mayflower, Ontario, Silver King, Woodside mines.

*Tooele County* Bingham district: May Flower mine; Blue Bell district: Bennion Canyon mine; Columbia district: Sharp, Benmore mines; Deep Creek Mountains: Congar Hill, Cyclone, Devils Pit, Eagles Nest, Gold Star, Leap Year, Oro del Rey, Overland mines; Dugway district: Bertha, Bryan, Buckhorn, Eureka, Francis, Kellys Hole, Surplus mines; East Erickson district: Indianapolis, Tintic Delaware mines; Erickson district: Black Jack, Black Rock, Blain, Deer Trail, Indian Boy, May Farmer, Utonia mines; Gold Hill district: Bonanza, Cash Boy, Climax, Copper Queen-Midland Mining Company, Gold Bond, Gold Hill (U. S.), Rube, Silver and Gold Mining Company, Success, U. S. mines; North Tintic district: New Bullion, Scranton mines; Ophir district: Dry Canyon area - Mono mine; Ophir Hill area - Cliff, Hidden Treasure, Ophir Hill Consolidated, Ophir Coalition, Sacramento mines; Rush Valley district: Ben Harrison, Calumet, Galena King, Honerine, Mescatine, Muerbrook, Tip Top mines.

*Utah County* American Fork district: Bay State, Bog, Dutchman, Pacific, Silver Dipper, Water Fall, Yankee

mines; East Tintic district: Burgin, Apex Standard, Eureka Bullion, Eureka Lily, Eureka Standard, North Lily, Tintic Standard, Trixie, Zuma mines; Payson district: Syndicate mine; Silver Lake district: Ontario mine.

*Wasatch County* Blue Ledge district: Glencoe, Mayflower, McHenry, Valeo mines; Snake Creek district: Revelator, West Quincy mines.

#### SPHENE

Calcium titanosilicate,  $\text{CaTiO}(\text{SiO}_4)$ . Monoclinic. Crystals varied in habit, commonly wedge-shaped. Cleavage good. H. 5-5. 5. G. 3. 5. Luster resinous to adamantine. Color gray, green, brown, yellow, black.

*Beaver County* San Francisco district.

*Juab County* West Tintic district.

*Salt Lake County* Little Cottonwood stock.

*San Juan County* La Sal Mountains: Middle Mountain, Brumley Ridge.

*Tooele County* Gold Hill district: Frankie mine; Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.

*Utah County* Little Cottonwood stock: Silver Lake district: Deer Creek.

#### SPINEL

Magnesium aluminate,  $\text{MgAl}_2\text{O}_4$ . Isometric. Habit usually octahedral. Also massive, coarse granular to compact. H. 7. 6-8. G. 3. 5. Octahedral parting. Fracture conchoidal. Brittle. Luster vitreous. Color red to blue, green, brown to nearly colorless.

*Beaver County* Granite district: Garnet group.

*Daggett County* Red Creek Complex.

*San Juan County* Moses Rock dike.

*Summit County* Park City district.

*Tooele County* Gold Hill district: Unadine mine.

*Utah County* American Fork district: Lake Solitude.

*Wasatch County* Clayton Peak.

*Washington County* Mineral Mountain: Emma mine.

#### SPODUMENE

Lithium aluminum silicate,  $\text{LiAl}(\text{SiO}_3)_2$ . Monoclinic. Crystals prismatic. Cleavage perfect. Brittle. H. 6. 5-7. G. 3. 2. Luster vitreous, somewhat pearly. Color greenish white, grayish, yellowish white. Transparent to translucent.

*Juab County* Honeycomb Hills.

#### STAUROLITE

Basic iron aluminum silicate,  $\text{Fe}_2\text{Al}_9\text{Si}_4\text{O}_{22}(\text{OH})_2$ . Orthorhombic. Habit prismatic, cruciform twins very common. H. 7-7. 5. G. 3. 7. Luster resinous to vitreous. Color red-brown to brownish black. Translucent.

*Daggett County* Red Creek Complex.

*Wayne County* Caineville.

#### STEIGERITE

Hydrous aluminum vanadate,  $\text{Al}_2(\text{VO}_4)_2 \cdot 6\frac{1}{2}\text{H}_2\text{O}$ . Cryptocrystalline. Occurs as pulverulent coatings, which resemble gum-like masses, chalcedony and flat plates. Luster waxy. Color canary yellow.

*Grand County* Thompsons district: Cactus Rat mines.

#### STELLERITE

Hydrous calcium aluminum silicate,  $\text{CaAl}_2\text{Si}_7\text{O}_{18} \cdot 7\text{H}_2\text{O}$ . Orthorhombic. A zeolite. Crystals tabular. Cleavage perfect. H. 3. 5-4. G. 2. 1. Associated with volcanic rocks.

*Piute County* Circleville Mountain.

#### STEPHANITE

Silver antimony sulfide,  $\text{Ag}_5\text{SbS}_4$ . Orthorhombic. Crystals short prismatic to tabular. Also massive, compact, or disseminated. H. 2-2. 5. G. 6. 2. Cleavage imperfect. Fracture uneven. Brittle. Luster metallic. Color and streak iron black. Opaque.

*Juab County* Tintic district: Humbug mine.

*Salt Lake County* Little Cottonwood district: Emma, Little Emma mines.

*Tooele County* Ophir district: Dry Canyon area - Mono mine.

#### STERRETTITE (see KOLBECKITE)

#### STIBICONITE

Basic antimony oxide, probably  $\text{Sb}_3\text{O}_6(\text{OH})$ . Isometric. Habit massive, compact. Also as a powder, crust, or botryoidal. H. 4-5. 5. G. 5. 6. Luster pearly to earthy. Color pale yellow, yellowish white, reddish white. Transparent.

*Garfield County* Coyote Creek district: Hampton mine.

*Tooele County* Deep Creek Mountains: Congar Hill mine. Ophir district: Lion Hill area.

## STIBNITE

Antimony trisulfide,  $Sb_2S_3$ . Orthorhombic. Crystals are stout to slender prismatic, often bent and twisted. Commonly in confused aggregates of acicular crystals, in radiated groups, or granular. H. 2. G. 4. 6. Cleavage good. Flexible, not elastic. Slightly sectile. Fracture subconchoidal. Luster metallic. Color and streak lead-gray.

*Box Elder County* Willard district: Dry Lake mine. *Garfield County* Coyote Creek district: Hampton mine. *Juab County* West Tintic district: Tintic Western mine. *Salt Lake County* Little Cottonwood district: Bay State mine.

*Summit County* Park City district: Silver King mine. *Tooele County* Deep Creek Mountains: Congar Hill mines; Gold Hill district: Gold Hill (U. S.) mine; Mercur district: Golden Gate, Sparrowhawk mines; Ophir district: Chloride Point.

*Washington County* Bull Valley district: Pilot claims; Gunlock.

## STILBITE

Hydrous sodium calcium aluminum silicate,  $NaCa_2Al_5Si_{13}O_{36} \cdot 16H_2O$ . Monoclinic. Crystals are usually in the form of cruciform penetration twins. Also sheaf-like aggregates, radiated, globular and columnar. H. 3. 5. G. 2. 1. Cleavage good. Fracture uneven. Brittle. Luster vitreous to pearly. Color white; occasional yellow, brown, reddish.

*Beaver County* Pruess district: Blackbird, Cactus mines. *Salt Lake County* Bingham district: Bingham Copper Pit; Little Cottonwood district.

## STOLZITE

Lead tungstate,  $PbWO_4$ . Tetragonal. Usually in dipyramidal crystals; also thick tabular. H. 2. 5- 3. G. 8. 1. Cleavage imperfect. Fracture conchoidal to uneven. Brittle. Luster resinous. Color reddish brown, brown, yellowish, reddish, green.

*Box Elder County* Grouse Creek Range.

*Salt Lake County* Little Cottonwood district: Emma mine.

*Tooele County* Gold Hill district: Wilson Consolidated mine.

## STRINGHAMITE

Hydrous Copper calcium silicate,  $CuCaSiO_4 \cdot 2H_2O$ . Monoclinic. Crystalline to botryoidal as a fracture filling.

Transparent to translucent. Light to dark blue. *Beaver County* Rocky district: Bawana mine.

## STROMEYERITE

Copper silver sulfide,  $CuAgS$ . Orthorhombic. Prismatic crystals. Bittle. H.  $2\frac{1}{2}$ -3. G. 6.2-6.3. Metallic luster. Color dark steel gray, blue on exposed surface. Usually associated with tetrahedrite and bornite.

*Utah County* East Tintic district: Tintic Standard, Trixie mines.

## STRONTIANITE

Strontium carbonate,  $SrCO_3$ . Orthorhombic. Crystals usually acicular, radiating. Also columnar, fibrous, granular. Cleavage good. H. 3. 5-4. G. 3. 7. Luster vitreous. Color white, gray, yellow, green. Transparent to translucent.

*Sanpete County* Dry Canyon.

## SULFUR

Native sulfur, S. Orthorhombic. Habit dipyramidal, thick tabular. Also massive, reniform, crusts, stalactitic. H. 1. 5 - 2. 5. G. 2. Cleavage poor. Brittle. Fracture conchoidal to uneven. Luster resinous to greasy. Color yellow, greenish, reddish.

*Beaver County* Bradshaw district: Cave mine; Gordon district: Sulphurdale; San Francisco district: Horn Silver mine; Southern San Francisco Mountains: Brimstone Mound; Sulphur district; Wah Wah Valley.

*Davis County* Antelope Island.

*Emery County* Black Dragon Canyon; Cedar Mountain district: Mexican Bend; San Rafael River; San Rafael district: Calf Mesa, Dexter group.

*Iron County* Cima mine; Lund.

*Millard County* Gordon district: Cove Creek, Black, Excelsior, Mariposa, New York, Philadelphia, Prince Albert, Queen Victoria, Sulphur King, Victor Conqueror mines; South Pavant Range: Cove Fort.

*San Juan County* White Canyon: Happy Jack mine.

*Tooele County* Mercur district: Brickyard, Hillside, Sacramento, Sunshine mines; Rush Valley district: Calumet mine.

*Utah County* Spanish Fork Canyon: Diamond Fork; Santaquin district: Union Chief mine.

## SULVANITE

Copper vanadium sulfide,  $Cu_3VS_4$ . Isometric. Crystals cubic; usually massive. H. 3. 5. G. 4. Cleavage basal



perfect. Color bronze-gold. Luster metallic, tarnishing dull. Streak black. Opaque.

*Tooele County* Mercur district.

*Utah County* Thorpe Hills: Cedar Fort member of Oquirrh Formation.

#### SUSSEXITE

Hydrous manganese magnesium borate,  $(\text{Mn,Mg})(\text{BO}_2)(\text{OH})$ . Orthorhombic. Occurs as veinlets or masses with fibrous structure. H. 3-3½. G. 3.3. Color white, buff, straw yellow. Luster silky to earthy.

*Salt Lake County* Big Cottonwood district: Big Cottonwood, Mountain Lake mines.

#### SWARTZITE

Hydrous carbonate of calcium, magnesium, and uranium,  $\text{CaMg}(\text{UO}_2)\text{CO}_3 \cdot 12\text{H}_2\text{O}$ . Monoclinic. Occurs as clusters of tiny prismatic crystals. G. 2. 3. Color green. Fluoresces bright green.

*San Juan County* Elk Ridge: Coral claim.

#### SYLVANITE

Silver gold telluride,  $(\text{Ag,Au})\text{Te}_2$ . Monoclinic. Short prismatic crystals. Often skeletal; also bladed and imperfectly columnar to granular. H. 1. 5 - 2. G. 8. 1. Cleavage perfect. Brittle. Fracture uneven. Luster metallic, brilliant. Color and streak steel-gray to silver-white.

*Iron County* State line district.

*Piute County* Ohio district: Bully Boy and Webster mines.

*Utah County* East Tintic district, Eureka Standard mine.

#### SYLVITE

Potassium chloride, KCl. Isometric. Crystals usually cubic. Also massive, coarsely granular to compact, crusts. H. 2. G. 1. 9. Cleavage perfect cubic. Not as brittle as halite. Luster vitreous. Colorless or white; grayish, bluish, yellowish, reddish. Taste sharp, bitter.

*Grand County* Cane Creek: Texas Gulf Potash mine; Crescent Junction; Paradox Basin; Salt Valley; Seven Mile Canyon.

*San Juan County* Moab Valley; Paradox Valley.

*Tooele County* Great Salt Lake Flats; Salduro; Wendover.

#### SZAIBELYITE

Hydrous manganese magnesium borate,  $(\text{Mg, Mn})\text{BO}_3\text{H}$ . Orthorhombic. Occurs as veinlets or masses

with fibrous structure; embedded nodules, sometimes dense or chalky. H. 3 - 3. 5. G. 2. 6. Fibers not flexible. Luster silky to dull or earthy. Color white to buff or straw yellow.

*Beaver County* Beaver Lake district: West Spring.

*Salt Lake County* Big Cottonwood district: Mountain Lake mine.

#### SZOMOLNOKITE

Hydrous ferrous sulfate,  $\text{FeSO}_4 \cdot \text{H}_2\text{O}$ . Monoclinic. Prismatic crystals. Also globular to stalactitic. H. 2½. G. 3.05. Luster vitreous. Color yellow, reddish brown.

*Utah County* East Tintic district: Burgin, Tintic Standard mines.

#### TABBYITE

An asphaltum. Occurs as minor veins and impregnations.

*Duchesne County* Tabby Creek.

#### TALC

Hydrous magnesium silicate,  $\text{Mg}_3\text{Si}_4\text{O}_{10}(\text{OH})_2$ . Monoclinic. Crystals rare. Usually in foliated massive habit. Also compact. H. 1. G. 2. 7. Cleavage perfect basal. Folia somewhat flexible. Sectile. Luster pearly to greasy. Color apple-green; gray, white; silver-white. Greasy feel.

*Juab County* West Tintic district.

*Salt Lake County* Bingham district: U. S. and Lark mines.

*Tooele County* Gold Hill district: Rube mine; Mercur district; Ophir district: Ophir Hill area - Cliff mine.

#### TENNANTITE

Copper iron arsenic sulfide,  $(\text{Cu,Fe})_{12}\text{As}_4\text{S}_{13}$ . Isometric. Crystals tetrahedral. Also massive, coarse or fine, granular to compact. H. 3 - 4. 5. G. 4. 6 - 5. 1. Fracture subconchoidal to uneven. Rather brittle. Luster metallic. Streak black to brown to cherry-red. Opaque.

*Box Elder County* Ashbrook district: Vipont mine.

*Emery County* San Rafael district: Dexter Group, Temple Mountain mines.

*Juab County* Tintic district.

*Rich County* Swan Creek district: Victoria prospect.

*Salt Lake County* Bingham district: Tiewaukee mine.

*San Juan County* Elk Ridge: King James-Virgene mine; La Sal Quadrangle: Firefly-Pigmay mine.

*Tooele County* Dugway district: Bertha claim; Gold Hill district: Gold Hill (U. S.), Success mines; Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir

Coalition mines.

*Utah County* East Tintic district: North Lily mine.

#### TENORITE

Copper oxide, CuO. Monoclinic. Occurs in paper-thin twinned aggregates and laths. Also in minute scales, earthy masses. H. 3. 5. G. 5. 8-6. 4. Cleavage good. Fracture conchoidal to uneven. Brittle. Scales flexible and elastic. Luster metallic. Color steel-gray to black. *Beaver County* Lincoln district: Creole mine; Rocky district: Bawana mine; San Francisco district: Horn Silver mine.

*Box Elder County* Lucin district: Copper Mountain mine.

*Juab County* Tintic district: Swansea mine.

*Morgan County* Morgan district: Morgan Crescent mine.

*Salt Lake County* Bingham district: Galena, Old Jordan mines.

*Tooele County* Dugway district: Belcher, Kellys Hole, Metal States, Surplus mines; Gold Hill district: Copper Bloom, Frankie, Gold Bond, Lucy L., Monoco, Yellow Hammer mines.

*Washington County* Silver Reef district.

#### TETRADYMITITE

Bismuth tellurium sulfide,  $\text{Bi}_2\text{Te}_2\text{S}$ . Hexagonal. Crystals rarely distinct. Commonly foliated to granular massive, bladed. H. 1. 5-2. G. 7. 3. Cleavage basal perfect. Laminae flexible, not elastic. Slightly sectile. Luster metallic. Color and streak pale steel-gray; tarnishes dull or iridescent. Opaque.

*Piute County* Ohio district: Tunnel Extension No. 2 mine.

*Utah County* American Fork district; East Tintic district.

#### TETRAHEDRITE

Essentially copper, iron, zinc, and silver antimony sulfide,  $(\text{Cu,Fe,Zn,Ag})_{12}\text{Sb}_4\text{S}_{13}$ . Isometric. Habit tetrahedral, frequently in crystals. Also massive, coarse or fine granular to compact. H. 3-4. 5. G. 4. 9. Fracture subconchoidal to uneven. Rather brittle. Luster metallic. Color iron-black. Streak black to brown to cherry-red. Opaque.

*Beaver County* Pruess district: Blackbird group, Cactus mine; Star district: Harrington - Hickory, Rebel, White Rock mines.

*Box Elder County* Willard district: Ogden Boilmakers, Overland claims.

*Emery County* San Rafael district: Dexter Group,

Temple Mountain mines.

*Juab County* Deseret district; Tintic district: Lower Mammoth mine.

*Piute County* Mt. Baldy district: Clyde mine; Ohio district: Bully Boy, Cascade, Copper Belt, Dalton, Great Western, Iris, Shamrock, Tunnel Extension No. 2 mines, Webster mines.

*Salt Lake County* Big Cottonwood district: Cardiff, Columbia-Rexall, Maxfield, Reed and Benson mines, Bingham district: Dixon, Eighty Nine, Old Jordan, Silver Shield, Winnamuck mines; Little Cottonwood district: Columbus Consolidated and Wasatch Drainage Tunnel, Columbus - Rexal, Emma, Peruvian Consolidated, South Hecla, Superior mines.

*Summit County* Park City district: American Flag, Daly, Daly-Judge, Daly West, Mayflower, Ontario, Silver King, Silver King Consolidated, Woodside mines.

*Tooele County* Deep Creek Mountains: Dewey, North Pass, Willow Springs mines; Dugway district: Bertha claim; Erickson district: OK, Silver Reef mines; Gold Hill district: Christmas Mining Company, Copper Bloom, Evans, Pole Star Copper, Rea, Reaper, Unadine, Victory No. 1. mines; Ophir district: Dry Canyon area - Queen of the Hills mine; Ophir Hill area; Rush Valley district: Honerine mine.

*Utah County* American Fork district: Bog, Pacific, Silver Dipper, Water Fall, Hankee mines; East Tintic district: Apex Standard, Burgin, Eureka Bullion, Eureka Lily, Eureka Standard, Iron King, North Lily, Tintic Standard, Trixie mines; Silver Lake district: Milkmaid, Ontario mines.

*Wasatch County* Elkhorn district: Crawford, Nelson, Queen properties.

#### THAUMASITE

Hydrous calcium silicate, carbonate, and sulfate,  $\text{Ca}_3\text{Si}(\text{OH})_6(\text{CO}_3)(\text{SO}_4)\cdot 12\text{H}_2\text{O}$ . Hexagonal. Occurs in masses of interlaced needles. Also massive, compact. H. 3. 5. G. 1. 8. Cleavage poor. Luster vitreous. Colorless to white.

*Beaver County* Rocky district: Bawana, Old Hickory mines.

*Salt Lake County* Bingham district: Bingham Copper Pit.

*Summit County* Park City district.

#### THENARDITE

Sodium sulfate,  $\text{Na}_2\text{SO}_4$ . Orthorhombic. Occurs in crystalline masses, pulverulent crusts, and efflorescences. Cleavage perfect. H. 2. 5-3. G. 2. 7. Slightly brittle. Fracture uneven to hackly. Luster vitreous. Colorless,

grayish, yellowish, reddish. Transparent to translucent.  
*Box Elder County* Shores of Great Salt Lake.  
*Davis County* Shores of Great Salt Lake.  
*Tooele County* Shores of Great Salt Lake.

#### THERMONATRITE

Hydrous sodium carbonate,  $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$ . Orthorhombic. Cleavage difficult. H. 1-1.5. G. 2.2. Some sectile. Luster vitreous. Colorless to white, grayish, yellowish. Transparent. Taste alkaline. Authigenic mineral in the Green River Formation.  
*Duchesne County* Green River Formation.

#### THINOLITE

A calcite pseudomorph. Found as tufa along shores of ancient Lake Bonneville, especially the Provo shoreline, forms cement to gravels.  
*Salt Lake County* Lake Bonneville shorelines.  
*Utah County* Lake Bonneville shorelines.

#### THOMPSONITE

A zeolite,  $\text{NaCa}_2\text{Al}_5\text{Si}_5\text{O}_{20} \cdot 6\text{H}_2\text{O}$ . Orthorhombic. Distinct crystals rare. Commonly columnar, in radiated spherical concretions, and closely compact. H. 5. G. 2.2. Cleavage good. Brittle. Luster vitreous to pearly. Color white, reddish green, brown.  
*Piute County* Marysvale district: Silica Hills.  
*Salt Lake County* Bingham district: Bingham Copper Pit.  
*Tooele County* Rush Valley district: Settlement Canyon.  
*Utah County* East Tintic district.

#### THORITE

Thorium silicate,  $\text{ThSiO}_4$ . Tetragonal. Occurs as short square prisms, and irregular forms. H. 4.5-5. G. 4.5-6.7. Brittle. Color brownish yellow, reddish brown, and dark brown to black.  
*Sevier County* Monroe Canyon.

#### THUCHOLITE

Radioactive mineral hydrocarbon, composition indefinite. Color jet black to brown-black. H. 2.5-4. G. 1.5-2. Luster resinous. Conchoidal fracture. Commonly brittle. Also may be friable. Opaque.  
*Emery County* San Rafael district: Calyx mine, Temple Mountain.

#### THULITE (See ZOISITE)

#### TIEMANNITE

Mercuric selenide,  $\text{HgSe}$ . Isometric. Crystals tetrahedral. Commonly massive, granular compact. H. 2.5. G. 8.2. Fracture uneven to conchoidal. Brittle. Luster metallic. Color steel-gray to dark gray. Streak nearly black. Opaque.  
*Piute County* Marysvale district: Quicksilver mine;  
 Mt. Baldy district: Lucky Boy mine.

#### TINTICITE

Hydrous basic iron phosphate,  $\text{Fe}_6(\text{PO}_4)_4(\text{OH})_6 \cdot 7\text{H}_2\text{O}$ . Probably orthorhombic. Occurs as dense and earthy to porcelaneous masses, composed of submicroscopic crystals. H. 2.5. G. 2.8. Color creamy white.  
*Utah County* East Tintic district: Tintic Standard mine.

#### TITANITE (See SPHENE)

#### TITANOCLINOHUMITE

Magnesium silicate titanium oxide,  $(\text{Mg}_2\text{SiO}_4)_4 \cdot \text{Ti}(\text{OH},\text{F})_2\text{O}_2$ . G. 3.27. Occurs with kimberlite. Bright yellow color.  
*San Juan County* Moses Rock dike.

#### TOBERMORITE

Hydrous calcium silicate,  $\text{Ca}_5\text{Si}_6\text{O}_{17} \cdot 5\text{H}_2\text{O}$ . Orthorhombic. H. 2½. G. 2.4. Luster silky. A zeolite. Occurs as compact, fine-grained aggregates. Color white, gray, pinkish.  
*Emery County* San Rafael district: Delta, Dirty Devil mines.  
*Salt Lake County* Bingham district: Bingham Copper Pit.

#### TOPAZ

Aluminum fluosilicate,  $\text{Al}_2(\text{SiO}_4)(\text{F},\text{OH})_2$ . Orthorhombic. Usually in prismatic crystals. Also in crystalline masses, fine to coarse granular. H. 8. G. 3.4. Cleavage basal perfect. Luster vitreous. Colorless, straw yellow, pink, bluish, greenish.  
*Beaver County* Granite district: Miller mine; Mooney Springs; Pine Grove district: Pine Grove Associates mine; Wah Wah Mountains: Violet claims.  
*Juab County* Dugway Range; Thomas Range; Topaz Mountain.  
*Tooele County* Dugway district; Ophir district: Ophir

Hill area - Hidden Treasure mine.

#### TORBERNITE

Hydrous copper uranium phosphate,  $\text{Cu}(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 8-12\text{H}_2\text{O}$ . Tetragonal. Crystals thin to thick tabular, usually square in outline. Also foliated, micaceous, and scaly aggregates. H. 2-2. 5. G. 3. 2. Cleavage perfect basal. Laminae rather brittle. Luster vitreous, pearly. Color emerald green. Streak paler than the color.

*Beaver County* Newton district: Indian Creek, Sniffer and Mystery claims.

*Emery County* Green River district: Venura, Yellow Queen claims; San Rafael district; Copper Globe district: Flat Top Mesa, Temple Mountain.

*Garfield County* Circle Cliffs: Acme, Black Widow, Blue Goose, Horse Head, Rocky Mountain, Steam Boat mines; Oak Creek prospect; Spotted Dog claim.

*Kane County* Bulloch claims; Virgin River.

*Piute County* Antelope Range; Marysvale district: Bullion Monarch, Copper Butte, Freedom Nos. 1-2, Prospector Nos. 1 and 3 mines.

*San Juan County* La Sal Mountains; Monument Valley district: Skyline mine; Paradox Valley district: Grey Dawn mine; Red Canyon district: Markey no. 3, Posey mines; White Canyon district: Happy Jack, Hideout, W. N. mines.

*Sanpete County* R. A. J. prospect.

*Uintah County* Snow claims.

*Wayne County* Capitol Reef Monument; Fruita: Oyler mine.

#### TOURMALINE

Complex silicate of boron and aluminum,  $\text{XY}_3\text{Al}_6(\text{BO}_3)_3(\text{Si}_6\text{O}_{18})(\text{OH})_4$ . X = Na, Ca and Y = Al, Fe, Li, Mg. Hexagonal. Usually in crystals which are prismatic, vertically striated. Also massive compact, coarse to fine columnar, either radiating or parallel. H. 7-7. 5. G. 3-3. 2. Luster vitreous to resinous. Color varies with composition. Common iron tourmaline (schorlite) is black. Also red, pink, green, blue, yellow.

*Beaver County* Bradshaw district; Lincoln district; Pruess district: Blackbird, Cactus mines, Cactus, Copper Gulches.

*Juab County* Spring Creek district: Queen of Sheba mine.

*Millard County* House Range: Amasa Valley.

*San Juan County* White Canyon district: Happy Jack mine.

*Tooele County* Gold Hill district: Calaveras, Centennial and Enterprise, Copper Bloom, Doctor, Frankie, Gold Bond, Pole Star Copper Company, Reaper, Victory

no. 1, Yellow Hammer mines; Granite Mountain district; Mercur district.

#### TRAVERTINE (See CALCITE)

#### TREMOLITE

Basic calcium magnesium silicate,  $\text{Ca}_2\text{Mg}_5(\text{Si}_8\text{O}_{22})(\text{OH})_2$ . Monoclinic. Crystals prismatic. Often bladed, in radiating columnar aggregates. Also coarse to fine granular, compact. H. 5-6. G. 3-3. 3. Cleavage prismatic. Luster vitreous. Color white to light green.

*Beaver County* Bradshaw district; Granite district: Big Pass, Bismuth mines; Lincoln district; Star district: Lady Bryan, Moscow mines; White Mountain: Grampian Hill.

*Davis County* Bear Canyon.

*Juab County* West Tintic district.

*Millard County* House Range: Amasa Valley, Notch Peak intrusive.

*Salt Lake County* Little Cottonwood district: Alta mine, Alta Stock contact zone.

*Sevier County* Henry district: Trinity prospect.

*Tooele County* Gold Hill district: Lucy L. mine; Ophir district: Ophir Hill area - Cliff, Ophir Hill Consolidated, Ophir Coalition mines.

#### TRIDYMITE

Silicon dioxide,  $\text{SiO}_2$ . Alpha tridymite orthorhombic; beta tridymite hexagonal. Crystals usually thin tabular. Also in twins or united in fan-shaped groups. H. 7. G. 2. 3. Cleavage poor. Fracture conchoidal. Luster vitreous. Colorless to white. Occurs in acidic volcanic rocks. *Tooele County* Fairfield quadrangle.

#### TROILITE (See PYRRHOTITE)

#### TRONA

Hydrous sodium acid carbonate,  $\text{Na}_3\text{H}(\text{CO}_3)_2 \cdot 2\text{H}_2\text{O}$ . Monoclinic. Authigenic mineral from cuttings in Green River Formation. Cleavage perfect. Fracture uneven. H. 2. 5-3. G. 2. 1. Luster vitreous. Colorless, gray, yellowish. Taste alkaline.

*Duchesne County* Green River Formation.

#### TROOSTITE (See WILLEMITE)

#### TSCHEFFKINITE (See CHEVKINITE)

#### TSCHERMIGIT (See AMMONIA ALUM)

## TUNGSTENITE

Tungsten disulfide,  $WS_2$ . Hexagonal. Found only in massive fine scaly or feathery aggregates. H. 2. 5. G. 7. 4. Cleavage basal good. Sectile. Color dark lead-gray. Opaque.

*Salt Lake County* Little Cottonwood district: Emma, Little Emma mines.

## TURQUOIS

Hydrous basic copper aluminum phosphate,  $CuAl_6(PO_4)_4(OH)_8 \cdot 4H_2O$ . Triclinic. Rarely in minute crystals. Usually cryptocrystalline. Massive, reniform, stalactitic. H. 6. G. 2. 7. Luster waxy. Color blue, bluish green, green. Transmits light on thin edges. Resembles chrysocolla.

*Salt Lake County* Bingham district: Bingham Copper Pit.

*Tooele County* East Erickson district: Copper Jack, Jessel Bezzel, Silver Shield mines.

## TYROLITE

Hydrous basic arsenate of copper and calcium,  $Ca_2Cu_9(AsO_4)_4(OH)_{10} \cdot 10H_2O$ . Orthorhombic. Rare in lath-shaped crystals. Usually as fan-shaped and foliated aggregates, crusts, reniform, divergent masses. H. 2. G. 3-3. 2. Cleavage basal perfect. Thin laminae flexible. Sectile. Luster vitreous to pearly. Color apple-green to sky-blue. Streak paler than color.

*Juab County* Tintic district: Ajax, Gold Chain, Mammoth mines.

*Salt Lake County* Little Cottonwood district: Centennial Alta mine.

*Tooele County* Gold Hill district: Gold Hill (U. S.) mine.

## TYUYAMUNITE

Hydrous basic vanadate of uranium and calcium,  $Ca(UO_2)_2(VO_4)_2 \cdot 8-10H_2O$ . Orthorhombic. Occurs as scales and flattened laths; as radial aggregates. Commonly massive, compact to cryptocrystalline; also pulverulent. H. 2. G. 3. 6. Cleavage basal perfect. Luster adamantine, waxy. Color canary-yellow, greenish yellow.

*Daggett County* Red Creek: Yellow Canary Uranium deposit.

*Emery County* Cedar Mountain district; Green River district; San Rafael district: Delta mines, Temple Mountain, South Temple Wash.

*Garfield County* Henry Mountains: Crescent Creek,

Starlight claims; Trachyte district: Trachyte Creek. *Grand County* Pack Creek; Richardson district; Thompsons area; Thompsons district: Cactus Rat, Parco no. 23 mines; Yellow Cat district: Yellow Cat group.

*Kane County* Bulloch claims.

*Piute County* Marysvale district: La Vita prospect. *Rich County* Crawford Mountains.

*San Juan County* Big Indian district: Mi Vida, Radon mines; East Canyon; Elk Ridge; La Sal Quadrangle: Angle, Brushy Basin Nos. 1 and 3, Confusion, Evening Star, Firefly-Pigmy, Hesperus' Jackpot, Little Peter, Lucky No. 1, Marjorie Ann, Maud, Morning Star, New Yellow Spot, Uranium Girl, Vista Grande, Yellow Bird, Yip Yip mines; Lisbon Valley; Monument Valley district: Mitten no. 1, Oljeta, Skyline, Whirlwind mines; Paradox Valley district: Vanadium Queen mine.

*Uintah County* Browns Park: Red Creek.

## UINTAITE (See GILSONITE)

## UINTAHITE (See GILSONITE)

## UMOHOITE

Hydrous uranium molybdate,  $(UO_2)(MoO_4) \cdot 4H_2O$ . Monoclinic. Foliated or platy masses. Somewhat resembling biotite, but lacking micaceous cleavage. H. 1-2. G. 4. 6. Color black to bluish black. Luster bright submetallic. Opaque.

*Piute County* Marysvale district: Freedom nos. 1-2 mines.

## URANINITE

Uranium dioxide,  $UO_2$ . Isometric. Occurs in octahedral, cubic, and sometimes dodecahedral forms. Also massive (pitchblende), dense, reniform. H. 5-6. G. 10. 7. Fracture uneven to conchoidal. Luster submetallic to greasy and dull. Color velvety black, brownish black, grayish, greenish.

*Beaver County* Pine Grove district: Daisy, Producer, Staats (Monarch) mines.

*Emery County* Cedar Mountain district; Green River district: Crabapple, Venura, Yellow Queen claims; San Rafael district: Calf Mesa, Dexter group, Calyx, Delta, Little Susan, Lucky Strike, Lucky Strike no. 2, Magor, Marshbank Canyon, Maybe, Pay Day, Temple Mountain, Rex no. 2 mines.

*Garfield County* Circle Cliffs: Black Widow, Horse Head Stud Horse mines; Oak Creek prospect.

*Grand County* Seven Mile Canyon; Thompsons district: Juniper mine; Yellow Cat district: Eli Malich's Lucky Day, L. A. Sutherland Sock claims.

*Juab County* Honeycomb Hills.

*Morgan County* Arthur Fork.

*Piute County* Marysvale district: Buddy, Bullion Monarch, Freedom Lease, Freedom nos. 1-2, Prospector nos. 1 and 3 mines; Mt. Baldy district: Deer Trail mine.

*San Juan County* Big Indian district: Big Buck, Cal Uranium, Homestake, La Sal, Mi Vida, Radon, Rattlesnake mines; Elk Ridge: Avalanche No. 13, Horsehoe No. 1, King Edward, King James-Virgene, Oakie, Payday, Sandy Nos. 2 and 3, Western Payday, Woodenshoe No. 3 mines; La Sal Quadrangle: Black Hat, Firefly-Pigmy, Little Peter, Yellow Bird mines; Monument Valley: Holiday Mesa, Mitten no. 1, Skyline mines; Paradox Valley district: Grey Dawn, Vanadium Queen mines; Red Canyon district: Frey no. 4, Markey no. 3, Posey mines; White Canyon district: Black Lizard, Fry No. 4, Happy Jack, Hideout, Notch, White Canyon no. 1 W. N. mines.

*Tooele County* East Erickson district: Flying Dutchman, Hard-to-Beat, Sheeprock Canyons, Silver King mines.

*Wayne County* Fruita: Oyler mine.

*Weber County* Ogden Canyon.

URANITE (See AUTUNITE and TORBERNITE)

*Emery County* San Rafael district.

URANOCHER (See URANOPILITE)

URANOCIRCITE (See META-URANOCIRCITE)

URANOPHANE

Hydrous basic calcium uranium silicate,  $\text{Ca}(\text{UO}_2)_2 \cdot \text{Si}_2\text{O}_7 \cdot 6\text{H}_2\text{O}$ . Monoclinic. Crystals are minute needles, with poorly developed faces. Occurs in radiating aggregates, massive, fibrous. Cleavage perfect. H. 2. 5. G. 3. 8. Brittle. Luster vitreous to pearly, dull to waxy. Color lemon yellow, pale straw yellow, honey brown, greenish yellow, orange yellow. Weakly fluorescent.

*Beaver County* Newton district: Sniffer and Mystery claims; Pine Grove district: Staats (Monarch) mine.

*Emery County* San Rafael district: Delta mine.

*Garfield County* Circle Cliffs: Black Widow, Horse Head mines; Henry Mountains.

*Juab County* Honeycomb Hills; Thomas Range: Good Will, Yellow Chief mines, Topaz Mountain.

*Piute County* Marysvale district: Bullion Monarch, Copper Butte, East Slope no. 2, Papsy's Hope, Prospector no. 1 mines.

*San Juan County* Elk Ridge: Sandy No. 3 mine; Monument Valley district: Oljeta, Skyline, Whirlwind mines; Paradox Valley district: Grey Dawn mine; Red Canyon

district: Posey mine; White Canyon district: Bell, Happy Jack, Hideout, White Canyon no. 1 mines.

URANOPILITE

Hydrous basic uranium sulfate,  $(\text{UO}_2)_6\text{SO}_4(\text{OH})_{10} \cdot 12\text{H}_2\text{O}$ . Probably monoclinic. Occurs as velvety crusts, globular, or reniform masses, composed of microscopic crystals, elongated and flattened. G. 3. 8. Cleavage perfect. Luster silky. Color bright yellow. Fluoresces bright yellowish green.

*Piute County* Marysvale district: Bullion Monarch, Prospector no. 1 mines.

*San Juan County* White Canyon district: Happy Jack mine.

*Wayne County* Capitol Wash.

URANOSPATHITE

Hydrous copper uraninate, arsenate, phosphate,  $\text{Cu}(\text{UO}_2)_2[(\text{As,P})\text{O}_4]_2 \cdot 12\text{H}_2\text{O}$ . Probably tetragonal. Occurs as fan shaped groups of flat plates. G. 2.5. Color yellow to pale green, bluish green.

*San Juan County* Paradox Valley district: Grey Dawn mine.

URANOSPINITE

Hydrous calcium uranium arsenate,  $\text{Ca}(\text{UO}_2)_2(\text{AsO}_4)_4 \cdot 10\text{H}_2\text{O}$ . Tetragonal. Crystals thin tabular. H. 2-3. G. 3. 4. Cleavage distinct. Luster pearly. Color lemon-yellow to yellow-green.

*Juab County* Honeycomb Hills.

*Kane County* Paria.

URANOTHALLITE (See LIEBIGITE)

UTAHITE (See CARPHOSIDERITE)

UTAHLITE (See VARISCITE)

UTAH ONYX (See CALCITE)

UVANITE

Hydrous uranium vanadate,  $\text{U}_2\text{V}_6\text{O}_{21} \cdot 15\text{H}_2\text{O}$ . Orthorhombic. Occurs as minute crystalline masses and coatings. Cleavage good. Color brownish yellow.

*Emery County* San Rafael district: Flat Top Mesa, Temple Mountain, Wild Mountain mine, Temple Rock, South Temple Wash.

UVAROVITE (See GARNET)

## VALENTINITE

Antimony trioxide,  $\text{Sb}_2\text{O}_3$ . Orthorhombic. Crystals commonly prismatic or tabular. Occurs as fan-shaped or stellate groups. Also massive, lamellar, columnar, or granular. H. 2. 5-3. G. 5. 7. Cleavage perfect. Brittle. Luster adamantine to pearly. Colorless, white, yellowish, reddish, gray, brownish.

*Garfield County* Coyote Creek district: Hampton mine.  
*Tooele County* Deep Creek Mountains: Conger Hill mine.

## VANADINITE

Lead chloride-vanadate,  $\text{Pb}_5(\text{VO}_4)_3\text{Cl}$ . Hexagonal. Crystals short to long prismatic. Also acicular to hair-like. H. 2. 5-3. G. 6. 8. Fracture uneven to conchoidal. Brittle. Luster resinous to adamantine. Color orange-red, brownish red, brownish, yellow.

*Beaver County* Star district: Harrington-Hickory, Rebel, White Rock mines.

*Box Elder County* Rosebud district: A & W, Magnitude mines.

*Utah County* Santaquin district: Blue Eagle prospect.

## VANADIUM HYDROMICA (See ROSCOELITE)

## VANDENDREISSCHEITE

Hydrous lead uranium oxide,  $\text{PbU}_7\text{O}_{22} \cdot 12\text{H}_2\text{O}$ . Orthorhombic. Occurs as dense microcrystalline aggregates. Color yellow-orange, brownish orange, orange-red. Cleavage good.

*Emery County* San Rafael district: Delta mine.

## VANOXITE

Hydrous vanadium oxide,  $\text{V}_4\text{V}_2\text{O}_{13} \cdot 8\text{H}_2\text{O}$  (?). Occurs in microscopic crystals, bladed. Massive, occurs as a cement in sandstone. Color black. Opaque.

*Garfield County* Henry Mountains; Little Rockies district: Del Monte group, Ekker mine; North Wash district: S. Y. Guthrie group; Trachyte district: Blitz nos. 1-2, June Bell nos. 1-4, Minnie Pearl nos. 1-2, Straight Creek, Trachyte nos. 1-2, V. C. A. claims.

*Grand County* Thompsons area; Thompsons district: Cactus Rat, Parco no. 23 mines.

*San Juan County* Big Indian district: Mi Vida mine.

## VARISCITE

Hydrous aluminum phosphate,  $\text{Al}(\text{PO}_4) \cdot 2\text{H}_2\text{O}$ . Orthorhombic. Crystals rare. Occurs in fine-grained masses,

nodules, veinlets, or crusts. H. 3. 5-4. 5. G. 2. 6. Cleavage good. Fracture uneven. Luster vitreous, waxy. Color green bluish green to colorless.

*Box Elder County* Lucin district: Empire mine; Promontory district: Promontory Point; Snowville,; Utahlite Hill.

*Tooele County* Mercur district: Golden Gate, Mercur, Sparrowhawk mines; Stansbury Mountains: Amatrice Hill.

*Utah County* Clay Canyon.

## VERMICULITE

This term includes a number of micaceous minerals, all hydrated silicates, in part related to chlorites. Alteration products chiefly of micas. Laminae are soft, pliable. Luster pearly, bronze-like. Color white, yellow, brown.

*Davis County* Antelope Island.

*Tooele County* Oquirrh Mountains: Manning Canyon Shale; Stansbury Mountains: Manning Canyon Shale.

*Utah County* Beverly Hills: Manning Canyon Shale; Lake Mountain: Manning Canyon Shale; Lehi district: Manning Canyon Shale; Thorpe Hills: Manning Canyon Shale; Wasatch Mountains: Manning Canyon Shale.

## VESUVIANITE (See IDOCRASE)

## VITROITE (See BERTRANDITE)

## VIVIANITE

Hydrous ferrous phosphate,  $\text{Fe}_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$ . Monoclinic. Usually prismatic, sometimes tabular. Reniform, globular, or incrusting masses. Also earthy. Cleavage perfect. H. 1. 5-2. G. 2. 7. Sectile. Flexible. Luster vitreous. Colorless, weathering pale blue or greenish blue, bluish black.

*Salt Lake County* Bingham district: Bingham Copper Pit.

## VOGLITE

Hydrous calcium copper uranium carbonate, probably  $\text{Ca}_2\text{Cu}(\text{UO}_2)(\text{CO}_3)_4 \cdot 6\text{H}_2\text{O}$ . Triclinic or monoclinic. Occurs as coatings and aggregates of tiny scales. Cleavage perfect. Luster pearly. Color emerald green, bright grass green.

*San Juan County* White Canyon district: White Canyon no. 1 mine.

## VOLBROTHITE

Hydrous copper vanadate,  $\text{Cu}_3(\text{VO}_4)_2 \cdot 3\text{H}_2\text{O}$ . Monoclinic. Occurs as scaly, spongy, or fibrous crusts; also as rosette-like aggregates. H. 3. 5. G. 3. 5. Cleavage perfect. Luster vitreous to pearly. Color dark olive-green, yellowish green.

*Daggett County* Red Creek, Yellow Canary Uranium deposit.

*Grand County* Richardson district.

*San Juan County* Elk Ridge: Notch No. 5 and 6 mines.

*Utah County* Thorpe Hills.

*Washington County* Silver Reef district: B Reef, Tecumseh Hill, Wells mines.

### VOLCHONSKOITE

A chromium nontronite. Monoclinic. H. 2.5, G. 2.1. Color bluish to grass green.

*Grand County* Morrison Formation.

*San Juan County* Morrison Formation.

### VOLTAITE

Hydrous potassium iron sulfate,  $\text{K}_2\text{Fe}_5\text{Fe}_4(\text{SO}_4)_{12} \cdot 18\text{H}_2\text{O}$ . Isometric. Crystals cubic, octahedral. H. 3. G. 2. 7. No cleavage. Fracture conchoidal. Luster resinous. Color greenish black to black. Opaque.

*Emery County* San Rafael district: Calf Mesa, Dexter group.

*Utah County* East Tintic district.

### WAD

Manganese ore composed of a mixture of hydrous manganese oxides. Occurs in earthy or compact masses; also reniform, concretionary, or incrusting. H. 1-6. G. 2. 8-4. 4. Luster dull. Color black, bluish, brownish black. Streak black, bluish black, reddish brown.

*Emery County* Cedar Mountain district.

*Garfield County* Hutch Pasture.

*Juab County* Detroit district: Iron Blossom mine; East Tintic district: Black Jack Empire, White Cloud mines; West Tintic district: War Eagle claim.

*Millard County* Detroit district: Almond, Black, Diamond, Blue Bell, Guy, Last Chance, Martha, Major Drum, Silica Plug mines.

*Salt Lake County* Big Cottonwood district: Antelope, Prince of Wales mines.

*Sevier County* Sevier Plateau: Black Beauty claims.

*Tooele County* Columbia district: Benmore, Sharp mines; Erickson district: Hyber - Rydalch, Queen Mary mines; Ophir district: Lion Hill area - Buffalo, East Side, Empire, Iron, Monarch, Northern Light, Woodruff mines; Ophir Hill area - Hidden Treasure, Ophir Hill

Consolidated, Ophir Coalition, Sacramento mines; Rush Valley district: Honerine mines.

*Utah County* American Fork district: Miller mine; East Tintic district: Tintic Standard mine; Lehi district: Wildcat mine; North Tintic district: Oxen mine, Tip Top Tunnel; Utah district: Alpha, Emerald, Lucky Boy, Queen of the West, Spalding, Trotter mines.

### WARDITE

Hydrous sodium aluminum phosphate,  $\text{NaAl}_3(\text{PO}_4)_2 \cdot (\text{OH})_4 \cdot 2\text{H}_2\text{O}$ . Tetragonal. Crystals are pyramidal. Also granular aggregates and crusts, radially fibrous, concentrically banded spherulites. H. 5. G. 2. 8. Cleavage perfect. Luster vitreous. Color blue-green to pale green, colorless.

*Box Elder County* Utahlite Hill.

*Tooele County* Amatrice Hill.

*Utah County* Clay Canyon.

### WAVELLITE

Hydrous basic aluminum phosphate,  $\text{Al}_3(\text{OH})_3(\text{PO}_4)_2 \cdot 5\text{H}_2\text{O}$ . Orthorhombic. Crystals rare. Usually occurs as hemispherical or globular aggregates with radial structure. Also as crusts or stalactitic. H. 3. 5-4. G. 2. 3. Cleavage perfect. Fracture uneven. Brittle. Luster vitreous. Color greenish white, green, yellow, brownish, blue, white, colorless.

*Salt Lake County* Bingham district: Bingham Copper Pit.

### WEEKSITE

Hydrous potassium uranium silicate,  $\text{K}_2(\text{UO}_2)_2(\text{Si}_2\text{O}_5)_3 \cdot 4\text{H}_2\text{O}$ . Orthorhombic. Occurs chiefly as radiating fibrous clusters. H. 1-2. G. 4. 1. Luster waxy. Color yellow.

*Juab County* Thomas Range: Autunite no. 8, Good Will, Yellow Chief mines, Topaz Mountain.

### WERNERITE (See SCAPOLITE)

### WHEELERITE

A yellowish resin, resembling amber.

*Garfield County* Cannonville.

### WHEWELLITE

Hydrous calcium oxalate,  $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ . Monoclinic. Occurs only as crystals, equant, or prismatic. Cleavage good. H. 2. 5. G. 2. 2. Fracture conchoidal. Brittle.



Colorless, sometimes yellowish, brownish. Transparent. Probably of organic origin.

*San Juan County* Big Indian district: Radon mine.

#### WILLEMITE

Zinc silicate,  $Zn_2SiO_4$ . Hexagonal. Occurs in hexagonal prisms. Usually massive to granular. H. 5. 5. G. 4. 1. Cleavage good. Luster vitreous, resinous. Color yellow-green, flesh-red, brown.

*Beaver County* Star district: Cedar-Talisman, Hoosier Boy mines.

*Iron County* Escalante district: Escalante mine.

#### WIRE SILVER (See SILVER)

#### WOLFRAMITE (See also FERBERITE and HUEBERNITE)

Manganese iron tungstate,  $(Mn,Fe)WO_4$ . Monoclinic. Habit commonly short prismatic crystals, less frequently long prismatic, or tabular. Also lamellar or massive granular. H. 4-4. 5. G. 7. 3. Cleavage good. Fracture uneven. Brittle. Luster submetallic. Color dark gray, brownish black, iron black.

*Beaver County* Newton district: North Creek.

*Tooele County* East Erickson district: Ekker Canyon prospect; Gold Hill district: Kena, Pole Star Copper Company mines; Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.

#### WOLLASTONITE

Calcium silicate,  $CaSiO_3$ . Triclinic. Usually occurs in tabular crystals. Commonly massive, cleavable to fibrous, also compact. H. 5-5. 5. G. 2. 8. Cleavage perfect. Luster vitreous to pearly. Colorless, white, gray. Translucent.

*Beaver County* Bradshaw district; Granite district: Big Pass group; Lincoln district; Pruess district: Blackbird, Cactus mines; San Francisco district: Cupric, Imperial mines.

*Juab County* West Tintic district.

*Millard County* House Range: Amasa Valley, Notch Peak intrusive.

*Salt Lake County* Big Cottonwood district: Maxfield mine; Little Cottonwood district: South Hecla mine. *Tooele County* Gold Hill district: Alvarado, Bonnemort, Cane Springs, Frankie, Gold Hill (U. S.), Silver King mines; Ophir district: Ophir Hill area - Hidden Treasure, Sacramento mines; Rush Valley district: Honerine mine, Soldier Creek.

*Utah County* Silver Lake district: Deer Creek.

#### WULFENITE

Lead molybdate,  $PbMoO_4$ . Tetragonal. Occurs as square tabular crystals. Also massive, coarse to fine granular. H. 2. 5-3. G. 6. 8. Cleavage distinct. Fracture subconchoidal to uneven. Not very brittle. Luster resinous to adamantine. Color orange-yellow, yellowish gray, olive-green, brown, reddish brown.

*Beaver County* Rocky district: Adelia mine; San Francisco district: Horn Silver mine; Star district: Harrington-Hickory, Rebel, White Rock mines.

*Box Elder County* Lucin district: Empire, Tecoma Hill mines; Rosebud district: A and W Magnitude mines. *Iron County* Escalante district: Escalante mine.

*Piute County* Mt. Baldy district: Pluto mine; Ohio district: Bully Boy and Webster mines.

*Rich County* Swan Creek district: Victoria prospect. *Salt Lake County* Big Cottonwood district: Woodlawn mine; Little Cottonwood district: Alta Consolidated, Centennial Alta, City Rocks, Emma, Flagstaff, Little Emma, Michigan - Utah mines.

*Tooele County* Dugway district: Boston, Buckhorn, Four Metals mines; Gold Hill district: Cash Boy, Cyclone, Gold Hill (U. S.), Red Jacket, Standard, Shay mines.

*Utah County* American Fork district: Miller mine.

#### WURTZILITE

Asphaltic pyrobitumen. Color black. Luster vitreous. Sectile. Elastic. Slightly soluble in carbon disulfide. Deep red in thin plates. Occurs as veins in Green River and Uinta Formations.

*Duchesne County* Antelope Canyon; Avintaguin Canyon; Indian Canyon; Rat Hole Canyon; Red Creek.

#### WURTZITE

Zinc sulfide,  $ZnS$ . Hexagonal. Occurs in short prismatic to tabular crystals. Often fibrous, columnar, and as concentric banded crusts. H. 3. 5-4. G. 3. 9. Cleavage good. Luster resinous. Color brownish black. Streak brown.

*Beaver County* San Francisco district: Horn Silver mine.

*Piute County* Mt. Baldy district: Clyde mine.

*Tooele County* Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.

*Uintah County* Sun Oil Company South Ouray well.

*Utah County* East Tintic district: North Lily mine.

#### XANTOPHYLLITE

Brittle, mica, perhaps,  $H_8(Mg,Ca)_{14}Al_{16}Si_5O_{52}$ . Mono-

clinic. Perfect basal cleavage. H. 4-5. G. 3. 1. Brittle. Structure foliated, micaceous. Color leek-green.  
*Salt Lake County* Big Cottonwood district: Big Cottonwood, Mountain Lake mines.

#### XENOTIME

Essentially yttrium phosphate,  $Y(PO_4)$ . Tetragonal. Short to prismatic crystals, often resembling zircon. Occurs as rudely radial aggregates, rosettes. H. 4-5. G. 4. 4-5. 1. Cleavage good. Brittle. Luster vitreous. Color commonly yellowish brown to reddish brown, yellowish, greenish. Translucent to opaque.  
*Morgan County* Arthur Fork.

#### ZEUNERITE

Hydrous copper uranium arsenate,  $Cu(UO_2)_2(AsO_4)_2 \cdot 12H_2O$ . Tetragonal. Crystals are usually rectangular tablets. Color pale-green to emerald green. G. 3. 7.  
*Emery County* San Rafael district: Calf Mesa, Delta mine, Dexter group.  
*Garfield County* Circle Cliffs: Horse Canyon, Stud Horse mines.  
*Juab County* Tintic district: Centennial Eureka mine.  
*Piute County* Marysvale district: Freedom no. 2 mine.

#### ZINKENITE

Lead antimony sulfide, probably  $Pb_6Sb_{14}S_{27}$ . Hexagonal. Crystals seldom distinct. Occurs in columnar and radial fibrous groups, massive. H. 3-3. 5. G. 5. 3. Cleavage indistinct. Fracture uneven. Luster metallic. Color and streak steel-gray. Sometimes tarnished iridescent.  
*Summit County* Park City district: Daly West mine.

#### ZIPPEITE

Hydrous basic uranium sulfate,  $(UO_2)_2(SO_4)(OH)_2 \cdot 4H_2O$ . Orthorhombic. Occurs as fragile crusts and reniform spheroidal aggregates. Also pulverulent to earthy. H. 2. G. 3. 2. Cleavage perfect. Luster dull to earthy. Color orange yellow, orange red, reddish brown. Fluoresces lemon yellow to green.  
*Emery County* Green River district: Sodaroll claim; San Rafael district: Calf Mesa, Consolidated, Delta, Dexter group, Green Vein Mesa, Lone Tree, Lucky Strike, Lucky Strike no. 2 mines, Temple Mountain.  
*Garfield County* Henry Mountains.  
*Grand County* Seven Mile Canyon; Thompsons district: Parco no. 23 mine.  
*Piute County* Marysvale district: Bullion Monarch, Free-

dom no. 2, Prospector no. 1 mines.  
*San Juan County* Elk Ridge: King James-Virgene mine; Red Canyon district: Posey mine; White Canyon district: Happy Jack, Hideout, W. N. mines.  
*Wayne County* Fruita: Oyler mine; Grand Wash to Capitol Wash.

#### ZIRCON

Zirconium silicate,  $ZrSiO_4$ . Tetragonal. Crystals commonly in square prisms, sometimes pyramidal. Also irregular forms, and grains. H. 7. 5. G. 4. 7. Cleavage poor. Fracture conchoidal. Brittle. Luster adamantine. Colorless, pale yellowish, grayish, yellowish green, brownish, reddish brown. Cyrtolite variety found east of Willard, contains uranium, thorium, and the rare earths.  
*Beaver County* San Francisco district: Horn Silver mine.  
*Box Elder County* Willard.  
*Emery County* Emery.  
*Garfield County* Henry Mountains.  
*Kane County* Kaiparowits Plateau.  
*Piute County* Mt. Baldy district: Deer Trail mine.  
*Salt Lake County* Little Cottonwood stock.  
*Tooele County* Gold Hill district: Reaper mine; Granite Mountain district; Mercur district: Mercur mine; Ophir district: Ophir Hill area - Ophir Hill Consolidated, Ophir Coalition mines.  
*Utah County* Little Cottonwood stock; Silver Lake district: Milkmaid mine, Silver Creek.  
*Wayne County* Caineville.

#### ZOISITE

Hydrous calcium aluminum silicate,  $Ca_2Al_3(SiO_4)_3(OH)$ . Orthorhombic. Crystals prismatic, vertically striated. Also massive, columnar to compact. H. 6-6. 5. G. 3. 3. Cleavage good. Fracture uneven to subconchoidal. Brittle. Luster vitreous to pearly. Color grayish white, gray apple-green, rose red. Thulite, a rose-red variety, is found in the Granite district.  
*Beaver County* Granite district: Miller mine.  
*Davis County* Antelope Island.  
*Juab County* Tintic district.  
*Salt Lake County* Little Cottonwood district.  
*Tooele County* Gold Hill district: Alvarado, Bonnemort, Cane Springs, Rube mines; Rush Valley district: Calumet mine.  
*Utah County* East Tintic district.

#### ZUNYITE

Hydrous aluminum silicate,  $Al_{13}Si_5O_{20}(OH,F)_{18}Cl$ .

Isometric. Occurs in minute transparent tetrahedrons. H. 7. G. 2. 9. Colorless to brown. Common zoned. *Juab County* Tintic district: Mintintic property. *Utah County* East Tintic district.

## BIBLIOGRAPHY

- Abou-Zied, S., and J. A. Whelan, 1973, Geology and mineralogy of the Milford Flat Quadrangle, Star district, Beaver County, Utah: Utah Geological and Mineral Survey, Special Studies 46, 23, p.
- Alexander, A. E., 1935, Opalized spherules from Utah: *American Mineralogist*, v. 20, p. 602-603.
- Allen, D. R., 1979, Geology and geochemistry of the Escalante silver vein, Iron County, Utah: Unpublished M. S. Thesis, University of Utah, 71 p.
- Alling, A. N., 1887, On the topaz from the Thomas Range, Utah: *American Journal Science*, v. 133 (ser. 3, v. 33), p. 146-147.
- Allsman, P. T., 1948, Investigation of iron ore reserves of Iron County, Utah: U. S. Bureau Mines Report Investigation 4388, [3 p.].
- American Institute of Mining and Metallurgical Engineers, 1933, Ore deposits of the western states; Lindgren v. 1st ed., 797 p.
- Ames, L. L., and L. B. Sand, 1957, Genesis of the Fox Clay, Utah County, Utah: *Abstract Geological Society of American Bulletin*, v. 68, no. 12, p. 1857.
- Amin, S. R., 1950, Heavy mineral study of the intrusive rocks of the Antelope Range, Piute County, Utah: Unpublished M. S. Thesis, University of Utah, 40 p.
- Anderson, B. J., 1959, Nickel-zinc mineralization in the southern Oquirrh Mountains, Utah: Unpublished M. S. Thesis, University of Utah, 63 p.
- Anderson, W. L., 1957, Geology of the northern Silver Island Mountains, Box Elder and Tooele Counties: Unpublished M. S. Thesis, University of Utah, 131 p.
- Arnold, D. E., 1956, Geology of the northern Stansbury Range, Tooele County, Utah: Unpublished M. S. Thesis, University of Utah, 57 p.
- Atkinson, W. W., Jr., and M. T. Einaudi, 1978, Skarn formation and mineralogy in the contact aureole at Carr Fork, Bingham, Utah: *Economic Geology*, v. 73, p. 1326-1365.
- Baker, A. A., D. C. Duncan and C. B. Hunt, 1952, Manganese deposits of southeastern Utah: U. S. Geological Survey Bulletin 979B, p. 63-157.
- Barnes, W. H., 1955, Hewettite and metaheiwettite: *American Mineralogist*, v. 40, p. 689-691.
- Bauer, H. L., Jr., 1952, Fluorspar deposits, north end of Spor Mountain, Thomas Range, Juab County, Utah: Unpublished M. S. Thesis, University of Utah, 47 p.
- Bell, G. L., 1948, Mirabilite deposits at the south end of Great Salt Lake, Utah (abs.): *Geological Society of American Bulletin*, v. 59, p. 1397.
- Berry, L. G., 1948, Tyrolite, higginsite, and cornwallite: *American Mineralogist*, v. 33, p. 193.
- Bethke, P. M., 1957, The sulfo-selenides of mercury and their occurrences at Marysville, Utah: Unpublished Ph.D. Dissertation, Columbia University, 173 p.
- Billingsly, Paul, and G. W. Crane, 1933, Tintic mining district, in *International Geologic Congress*, 16th, United States, Guidebook 17, Excursion C-1, the Salt Lake Region, p. 101-124.
- Bixby, Maynard, 1916, A catalog of Utah minerals and localities, with descriptive list and notes for collectors: 4th ed., Salt Lake City, 32 P.
- Blake, W. P., 1885, Uintahite, a new variety of asphaltum from the Uintah Mountains, Utah: *Engineer Mining Journal*, v. 40, p. 571.
- Blue, D. M., 1960, Geology and ore deposits of the Lucin mining district, Box Elder County, Utah and Elko County, Nevada: Unpublished M. S. Thesis, University of Utah, 121 p.
- Boutwell, J. M., 1904, Iron ores in the Uinta Mountains, Utah, in *Contributions to Economic Geology 1903*: U. S. Geological Survey Bulletin 225, p. 221-228.
- Boutwell, J. M., 1905, Economic geology of the Bingham mining district, Utah: U. S. Geological Survey Professional Paper 38, 413, p.
- Boutwell, J. M., 1912, Geology and ore deposits of the Park City district, Utah: U. S. Geological Survey Pro-

- fessional Paper 77, 231 p.
- Boutwell, J. M., 1933, Park City mining district, *in* International Geologic Congress, 16th United States, Guidebook 17, Excursion C-1, the Salt Lake Region, p. 69-81.
- Bowyer, Ben, 1963, Yellow Chief uranium mine, Juab County, Utah, *in* Beryllium and mineralization in western Juab County, Utah: Utah Geologic Society Guidebook to the Geology of Utah, no. 17, p. 15-22.
- Briggs, H. E., 1932, *Amatrice: Rocks and Minerals*, v. 7, p. 97.
- Brobst, D. A., 1958, Barite resources of the United States: U. S. Geological Survey Bulletin 1072B, p. 67-130.
- Brophy, G. P. and P. F. Kerr, 1953, Hydrous uranium molybdate in Marysvale ore: U. S. Atomic Energy Commission, REM 3046, p. 46-51.
- Bryan, G. G., 1935, Mineragraphy and paragenesis of the ore of the Park City Consolidated mine, Park City, Utah: Unpublished M. S. Thesis, University of Utah, 54 p.
- Bullock, K. C., 1962, Economic geology of north-central Utah, *in* Geology of the southern Wasatch Mountains and vicinity, Utah: Brigham Young University Geology Studies, v. 9, pt. 1, p. 85-94.
- Bullock, K. C., 1967, Minerals of Utah, Utah Geological and Mineral Survey, Bulletin 76, 237 p.
- Bullock, K. C. 1970, Iron deposits of Utah: Utah Geological and Mineral Survey, Bulletin 88, 101 p.
- Bullock, K. C., 1973, Geology and iron deposits of the Iron Springs district, Iron County, Utah: Brigham Young University, Geology Study, v. 20, pt. 1, p. 27-65.
- Bullock, K. C. 1976, Fluorite occurrences in Utah: Utah Geological and Mineral Survey, Bulletin 110, 89 p.
- Bullock, K. C., D. F. Smouse, G. B. Robinson, Jr., 1960, Minerals and mineral localities of Utah: privately printed by Dr. K. C. Bullock [Department of Geology] Brigham Young University, Provo, Utah, 170 p.
- Buraneck, A. M., 1947, Notes on topaz and associated minerals of Topaz Mountain and adjacent areas: Mineralogic Society of Utah Bulletin, v. 7, p. 36-43.
- Buraneck, A. M., and C. E. Needham, 1949, Directory of Utah mineral resources and consumer's guide: Utah Geologic and Mineralogic Survey Bulletin 36, 95 p.
- Bush, J. B., 1957, Introduction to the geology of the East Tintic mining district, *in* Geology of the East Tintic Mountains and ore deposits of the Tintic Mining Districts: Utah Geology Society Guidebook to the Geology of Utah, no. 12, p. 97-102.
- Bush, J. B., D. R. Cook, T. S. Lovering, and H. T. Morris, 1960, The Chief Oxide-Burgin area discoveries, East Tintic district, Utah: Economic Geology, v. 55, [2 parts], p. 1116-1147 and 1507-1540.
- Buss, W. R., 1950, Bibliography of Utah geology to Dec. 31, 1950: Utah Geology and Mineralogical Survey Bulletin 40, 219 p.
- Butler, B. S., 1913, Geology and ore deposits of the San Francisco and adjacent districts, Utah: U. S. Geological Survey Professional Paper 80, 212, p.
- Butler, B. S., G. F. Loughlin, V. C. Heikes, and others 1920, Ore deposits of Utah: U. S. Geological Survey Professional Paper 111, 672 p.
- Butler, B. S., and W. T. Schaller, 1911, Beaverite: Washington Academy of Science Journal v. 1, p. 26.
- Butler, B. S., and W. T. Schaller, 1917, Magnesioludwigite, a new mineral: Washington Academy of Science Journal v. 7, p. 29.
- Cahoon, H. P., 1954, Saponite near Milford, Utah: America Mineralogist, v. 39, p. 222-230.
- Calkins, F. C., and B. S. Butler, 1943, Geology and ore deposits of the Cottonwood-American Fork area, Utah: U. S. Geology Survey Professional Paper 201, 152 p.
- Callaghan, Eugene, 1938a, Preliminary report on the alunite deposits of the Marysvale region, Utah: U. S. Geological Survey Bulletin 886D, p. 91-134.
- Callaghan, Eugene, 1938b, Manganese deposits of the Drum Mountains, Utah: Economic Geology, v. 33, p. 508-521.

- Callaghan, Eugene, 1939, Volcanic sequence in the Marysvale region in southwest central Utah: American Geophysics Union Trans. pt. III, p. 438-452.
- Carter, W. D., and J. L. Gualtieri, 1965, Geology and uranium-vanadium deposits of the La Sal Quadrangle, San Juan County, Utah: U. S. Geological Survey, Professional Paper 508, 82 p.
- Chao, E. C. T., h. T. Evans, Jr., B. J. Skinner, and C. Milton, 1961, Neighborite, a new mineral from the Green River Formation in Utah: American Mineralogist, v. 46, p. 39.
- Chester, A. H., 1896, A dictionary of the names of minerals: John Wiley and Sons, Inc., New York, New York, 320 p.
- Chorney, Raymond, 1943, Scheelite and the mineral association at the Reaper mine, Gold Hill, Utah: Unpublished M. S. Thesis, University of Utah, 47 p.
- Christiansen, F. W., 1937, Geology and economic possibilities of the alunite deposits in Sevier and Piute Counties, Utah: Unpublshed M. S. Thesis, University of Utah, 97 p.
- Clark, R. W., 1916, A new occurrence of crystallized willemite: America Mineralogist, v. 1, p. 89-91.
- Cohenour, R. E., 1959, Geology of the Sheeprock Mountains, Tooele County: Utah Geology and Mineralogical Survey Bulletin 63, 200 p.
- Cohenour, R. E., 1963a, The beryllium belt of western Utah, *in* Beryllium and uranium mineralization in western Juab County, Utah: Utah Geological Society Guidebook to the Geology of Utah, no. 17, p. 4-7.
- Cohenour, R. E., 1963b, Beryllium and associated mineralization in the Sheeprock Mountains, *in* Beryllium and uranium mineralization in western Juab County, Utah: Utah Geology Society Guidebook to the Geology of Utah, no. 17, p. 8-13.
- Cook, D. R., 1957, Ore deposits of the main Tintic mining district, *in* Geology of the East Tintic Mountains and ore deposits of the Tintic mining districts: Utah Geology Society Guidebook to the Geology of Utah, no. 12, p. 57-79.
- Cook, D. R., 1961, Introduction, *in* Geology of the Bingham mining district and northern Oquirrh Mountains: Utah Geology Society Guidebook to the Geology of Utah, no. 16, p. vi-viii.
- Cook, E. F., 1957, Geology of the Pine Valley Mountains, Utah: Utah Geology and Mineralogical Survey Bulletin 58, 111 p.
- Copper, Margaret, 1954, Bibliography and index of literature on uranium and thorium and radioactive occurrences in the United States, pt. 3, Colorado and Utah: Geology Society America Bulletin v. 65, p. 467-590.
- Crawford, A. L., 1947, Gilsonite and related hydrocarbons from the Uinta Basin, Utah: Mineralogical Society of Utah Bulletin v. 7, p. 44-48.
- Crawford, A. L., and A. M. Buranek, 1943, Utah iron deposits other than those of Iron and Washington Counties, Utah: Utah Geology and Mineralogical Survey Circular 24, [22 p.].
- Crittenden, M. D., Jr., 1951, Manganese deposits of western Utah: U. S. Geology Survey Bulletin 979A, p. 1-62.
- Crittenden, M. D. J. A. Straczek, and R. J. Roberts, 1961, Manganese deposits in the Drum Mountains, Juab and Millard Counties, Utah: U. S. Geology Survey Bulletin 1082H, p. 493-544.
- Cunningham, C. G., T. A. Steven, and C. W. Naeser, 1978, Preliminary structural and mineralogical analysis of the Deer Trail Mountain-Alunite Ridge mining area, Utah: U.S. Geological Survey, Open File Report, 78-314., 2 sheets.
- Dahl, C. L., 1959, Trace ferrides in iron ores from the Iron Springs district, Cedar City, Utah: Unpublished M. S. Thesis University of Utah, 62 p.
- Dane, C. H., 1935, Geology of the Salt Valley anticline and adjacent areas, Grand County, Utah: U. S. Geology Survey Bulletin 863, 184 p.
- Davidson, E. S., 1967, Geology of the Circle Cliffs area, Garfield and Kane Counties, Utah: U.S. Geological Survey, Bulletin 1229, 140 p.
- Davison, J. M., 1896, Wardite, a new basic phosphate of alumina: American Journal of Science v. 4 (2), p. 154.

- Desborough, G. A., 1976, Mineralogy of oil shale in the upper part of the Parachute Creek member of the Green River Formation in the eastern Uinta Basin, Utah: U.S. Geological Survey, Open File Report, 76-381, 27 p.
- Doelling, H. H., 1976, Anatrice Hill variscite deposit, Tooele County, Utah: Utah Geological and Mineral Survey, Utah Geology, v. 3, no. 1, p. 13-22.
- Dolanski, J., 1974, Sulvanite from Thorpe Hills, Utah: American Mineral, v. 59, nos. 3-4, p. 307-313.
- Douglass, R. M., 1954, Geocronite: American Mineral, v. 39, nos. 11-12, p. 908-928.
- Duke, D. A., 1959, Jasperoid and ore deposits in the East Tintic mining district, Utah County, Utah: Unpublished M. S. Thesis, University of Utah, 53 p.
- Dyni, J. R., 1976, Trioctahedral smectite in the Green River Formation, Duchesne County, Utah: U. S. Geological Survey Professional Paper 967, 14 p.
- Earll, F. N., 1957, Geology of the central Mineral Range, Beaver County, Utah: Unpublished Ph. D. Thesis, University of Utah, 109 p.
- Ehlmann, A. J., 1959, Pryophyllite in shales of north central Utah: Utah Engineering Experiment Station Bulletin 94, University of Utah, 105 p.
- Ehlmann, A. J., 1963, Occurrences of sepiolite in Utah and Nevada: Economic Geology, v. 57, no. 7, p. 1085-1094.
- El-Shatoury, H. M., and J. A. Whelan, 1970, Mineralization in the Gold Hill mining district, Tooele County, Utah: Utah Geological and Mineral Survey Bulletin 83, 37 p.
- English, G. L., 1939, Descriptive list of the new minerals 1892-1938: McGraw-Hill Book Company Inc., New York, New York.
- Erickson, M. P., 1952, New locality for Shorttite: American Mineral, v. 37, nos. 3-4, p. 342-344.
- Erickson, M. P., 1963, Volcanic geology of western Juab County, Utah, in Beryllium and uranium mineralization in western Juab County, Utah: Utah Geology Society Guidebook to the Geology of Utah, no. 17, p. 23-25.
- Erickson, M. P., and B. J. Sharp, 1954, Disseminated scheelite in the Little Cottonwood stock, Utah: Economic Geology, v. 49, no. 2, p. 221-223.
- Everett, F. D., 1961, Tungsten deposits of Utah: U. S. Bureau of Mines Information Circular 8014, 44 p.
- Everett, F. D., and S. R. Wilson, 1951, Investigation of the Cougar Spar fluorspar deposit, Beaver County, Utah: U. S. Bureau of Mines Report of Investigation 8420, [12 p.].
- Finch, W. I., 1959, Geology of uranium deposits in Triassic rocks of the Colorado Plateau region: U. S. Geological Survey Bulletin 1074D, p. 125-164.
- Finnell, T. L., P. C. Franks, and H. A. Hubbard, 1963, Geology, ore deposits, and exploratory drilling in the Deer Flat area, White Canyon district, San Juan County, Utah: U. S. Geological Survey, Bulletin 1132, 114 p.
- Frey, Eugene, 1947, Blue Bell fluorite deposits, Beaver County, Utah: U. S. Bureau of Mines Report of Investigation 4091, [11 p.].
- Frey, Eugene, and R. S. Wilson, 1949, Investigation of the Huber-Rydalch manganese deposits, Tooele County, Utah: U. S. Bureau of Mines Report of Investigation 4601, [14 p.].
- Fron del, Clifford, 1943, New data on agricolite, bismoc-lite, koechlinite, and the bismuth arsenates: American Mineralogist, v. 28, p. 536-540.
- Fron del, Clifford, 1956, Mineral composition of gum-mite: American Mineralogist, v. 41, p. 539-568.
- Fron del, Clifford, 1958, Systematic mineralogy of uranium and thorium: U. S. Geological Survey Bulletin 1064, 511 p.
- Fron del, Clifford, 1968, Meta-aluminite, a new mineral from Temple Mountain, Utah: American Mineral, v. 53, nos. 5-6, p. 717-721.
- Fron del, Clifford and J. Ito, 1956, Boltwoodite, a new uranium silicate: Science, v. 124, p. 931.
- Fron del, Clifford, Jun Ito and Arthur Montgomery, 1968, Scandium content of some aluminum phosphates: American Mineral, v. 53, nos. 7-7, p. 1223-1231.

- Fron del, C. J., and R. M. Honea, 1968, Billingsleyite, a new silver sulfosalt: *American Mineral*, v. 53, nos. 11-12, p. 1791-1798.
- Fron del, J. W., 1951, Zeunerite, *in* Studies of uranium minerals: *American Mineral*, v. 36, nos. 3-4, p. 249-255.
- Gardner, W. C., 1954, Geology of the West Tintic mining district and vicinity, Juab County, Utah: Unpublished M. S. Thesis, University of Utah, 43 p.
- Garrells, R. M., and E. S. Larsen, 1959, Geochemistry and mineralogy of the Colorado Plateau uranium ores: U. S. Geological Survey Professional Paper 320, 236 p.
- Gehman, H. M., Jr., 1958, Notch Peak intrusive, Millard County, Utah: *Utah Geology and Mineralogical Survey Bulletin* 62, 50 p.
- Gilluly, James, 1932, Geology and ore deposits of the Stockton and Fairfield quadrangles, Utah: U. S. Geological Survey Professional Paper 173, 171 p.
- Granger, A. E., 1963, The iron province of southwestern Utah, *in* Guidebook to the geology of southwestern Utah: Intermountain Association Petroleum Geologists 12th Annual Field Conference p. 146-150.
- Griffitts, W. R., 1965, Recently discovered beryllium deposits near Gold Hill, Utah: *Economic Geology* v. 60, no. 6, p. 1298-1305.
- Griffitts, W. R., and L. F. Rader, Jr., 1963, Beryllium and fluorine in mineralized tuff, Spor Mountain, Juab County, Utah: U. S. Geological Survey Professional Paper 475B, article 3, p. 16-17.
- Groff, S. L., 1959, The geology of the West Tintic Range and vicinity, Tooele and Juab Counties, Utah: Unpublished Ph. D. Thesis, University of Utah, 176 p.
- Gruner, J. W., and Lynn Gardiner, 1952, Mineral associations in the uranium deposits of the Colorado Plateau: U. S. Atomic Energy Commission, RMO-566, Technical Information Service, Oak Ridge, Tenn. 40 p.
- Gude, A. J., 3rd, E. J. Young, V. C. Kennedy, and L. B. Riley, 1960, Whewellite and celestite from a fault opening in San Juan County, Utah: *American Mineralogist*, v. 45, p. 1257-1265.
- Hall, R. B., 1978, World nonbauxite aluminum resources - alunite: U. S. Geological Survey, Professional Paper 1076A, 35 P.
- Hamilton, H. V., 1960, A descriptive list of minerals from Utah type localities: *Mineralogical Society of Utah Bulletin* v. 9, no. 2, p. 25-32.
- Hamilton, H. V., 1967, A new locality for xanthophyllite: *Rocks and Minerals*: v. 42, no. 4, p. 276.
- Hanley, J. B. E. W. Heinrich and L. R. Page, 1950, Pegmatite investigations in Colorado, Wyoming, and Utah 1942-44: U. S. Geological Survey Professional Paper 227, 125 p.
- Harris, D. V., 1958, The geology of Dutch Peak area, Sheepprock Range, Tooele County, Utah: Brigham Young University Research Studies, Geology Series, v. 5, no. 1, 82 p.
- Hawley, C. C., D. G. Wyant, and D. B. Brooks, 1965, Geology and uranium deposits of the Temple Mountain district, Emery County, Utah: U. S. Geological Survey, Bulletin 1192, 154, p.
- Hawley, C. C., R. C. Robeck, and H. B. Dyer, 1968, Geology, altered rocks, and ore deposits of the San Rafael Swell, Emery County, Utah: U. S. Geological Survey, Bulletin 1239, 115 p.
- Hayes, J. J., 1944, Variscites and phosphates in Utah: *Mineralogical Society of Utah Bulletin*, v. 5, p. 33-47.
- Heinrich, E. W., 1958, Mineralogy and geology of radioactive raw materials: McGraw Hill Book Company, Inc., New York, New York, 654 p.
- Henderson, E. P., and F. L. Hess, 1933, Corvusite and rilandite, new minerals from the Utah-Colo-rado carnotite region: *American Mineralogist*, v. 18, p. 195-205.
- Henderson, J. V., 1971, The origin of pyrophyllite-rectorite in shales of north central Utah: *Utah Geological and Mineral Survey, Special Studies* 34, 46 p.
- Hess, F. L., 1908, Some molybdenum deposits of Maine, Utah, and California, *in* Contributions to

- economic geology, 1907, pt. 1: U. S. Geological Survey Bulletin 340. p. 231-240.
- Hess, F. L., 1922, Uranium bearing asphaltic sediments of Utah: *English Mining Journal* v. 114, p. 272-276.
- Hess, F. L., 1925, Ilsemannite at Ouray, Utah, *in* Contributions to economic geology 1923-24, pt. 1: U. S. Geological Survey Bulletin 750, p. 1-16.
- Hess, F. L., and E. P. Henderson, 1931, Fervanite, a hydrous ferric vanadate: *American Mineralogist*, v. 16, p. 273.
- Hess, F. L., and W. T. Schaller, 1914, Pintadoite and uvanite, two new vanadium minerals from Utah: *Washington Academy Science Journal* v. 4, p. 576-579.
- Hewitt, W. P., 1964, Gold placers in Utah: Utah Geological and Mineral Survey, Circular 47, 29 p.
- Hillebrand, W. F., 1905, Red beryl from Utah: *America Journal of Science*, ser. 4, v. 19, p. 330.
- Hillebrand, W. F., and H. E. Merwin, 1913, Two varieties of calciovolborthite (?) from eastern Utah: *America Journal of Science*, ser. 4, v. 35, p. 441.
- Hillebrand, W. F., H. E. Merwin and F. E. Wright, 1914, Hewettite, metahewettite, and pascoite, hydrous calcium vanadates: *America Phil. Society Proc.*, v. 53, p. 31-54.
- Hindman, J. R., 1976, Stringhamite, a new copper calcium silicate from Utah: *American Mineral*, v. 61, nos. 3-4, p. 189-192.
- Hobbs, S. W., 1945a, Tungsten deposits in the West Tintic mining district, Juab County, Utah: U. S. Geological Survey open-file report, 7 p.
- Hobbs, S. W., 1945b, Tungsten deposits in Beaver County, Utah: U. S. Geological Survey Bulletin 945D, p. 81-111.
- Honea, R. M., 1961, New data on boltwoodite, an alkali uranyl silicate: *American Mineral*, v. 46, nos. 1-2, p. 12-25.
- Huff, L. C., and F. G. Lesure, 1965, Geology and uranium deposits of Montezuma Canyon area, San Juan County, Utah: U. S. Geological Survey, Bulletin 1190, 102 p.
- Hurlbut, C. S., Jr., 1954, Studies of uranium minerals (XV): Schroeckingerite from Argentina and Utah: *American Mineralogist*, v. 39, p. 901-907.
- Ives, R. L., 1948, The Skull Valley area, Utah: *Rocks and Minerals*, v. 23, p. 193-204.
- James, L. P., 1979, Geology, ore deposits and history of the Big Cottonwood mining district, Salt Lake County, Utah: Utah Geological and Mineral Survey, Bulletin, 114, 97 p.
- Johnson, H. S., Jr., 1959a, Uranium resources of the Cedar Mountains area, Emery County, Utah, a regional synthesis: U. S. Geological Survey Bulletin 1087B, p. 23-58.
- Johnson, H. S., Jr., 1959b, Uranium resources of the Green River and Henry Mountains districts, Utah, a regional synthesis: U. S. Geological Survey Bulletin 1087C, p. 59-104.
- Johnson, H. S., Jr., and W. Thordarson, 1966, Uranium deposits of the Moab, Monticello, White Canyon, and Monument Valley districts, Utah and Arizona: U. S. Geological Survey, Bulletin, 1222H, 53 p.
- Johnson, M. G., 1973, Placer gold deposits in Utah: U.S. Geological Survey, Bulletin, 1357, 26 p.
- Kasteler, J. I., and J. H. Hild, 1948, Lead, zinc, silver, copper, bismuth deposits, South Hecla mine, Alta, Salt Lake County, Utah: U. S. Bureau of Mines Report of Investigation 4170, [12 p.].
- Keller, W. D., 1953, Analcime in the Chinle Formation of Utah correlative with the Popo Agie of Wyoming: *Journal of Sedimentary Petrology*, v. 23, no. 1, p. 10-12.
- Kemp, J. F., and Paul Billingsley, 1918, Notes on Gold Hill and vicinity, Tooele County, Utah: *Economical Geology*, v. 13, p. 247-274.
- Kerr, P. F. G. P. Brophy, H. M. Dahl, Jack Green, and L. E. Woolard, 1957, Marysvale, Utah, uranium area: Geological Society of America Special Paper 64, 212 p.



- Kerr, P. F., and P. K. Hamilton, 1954, Pitchblende and manganocalcite at the Deer Trail mine, Marysvale, Utah: U. S. Atomic Energy Commission, Report RME-3096, p. 52-55.
- Kerr, P. F., and P. K. Hamilton, 1958, Chrome mica-clay, Temple Mountain, Utah: *American Mineralogist*, v. 43, p. 34-47.
- Kildale, M. B., and R. C. Thomas 1957, Geology of the halloysite deposits at the Dragon mine, *in* Geology of the East Tintic Mountains and ore deposits of the Tintic mining districts: Utah Geological Society Guidebook to the Geology of Utah, no. 12, p. 94-96.
- King, C. R., 1953, Cove Creek sulphur: *Mining Engineer* v. 5, no. 4 p. 375-378.
- King, W. H., 1947, Drum Mountain manganese project, Juab County, Utah: U. S. Bureau of Mines Report of Investigation 3993, [14 p.].
- King, W. H., and S. R. Wilson, 1949, Investigation of tungsten deposits at Cupric mine property, Beaver County, Utah: U. S. Bureau of Mines Report of Investigation 4590, [13 p.].
- Kinkel, A. R., Jr., 1951, Preliminary report on the Apex and Paymaster mines, Washington County, Utah: U. S. Geological Survey open-file report, 9 p.
- Kunz, G. F., 1906, Utahlite (variscite): *in* U. S. Geological Survey, Mineral resources of the United States, calendar year 1905, p. 1350.
- Larsen, E. S., 3rd, 1940, Overite and montgomeryite, two new minerals from Fairfield, Utah: *American Mineralogist*, v. 25, p. 315-326.
- Larsen, E. S., 3rd, 1942, The mineralogy and paragenesis of the variscite nodules from near Fairfield, Utah: *American Mineralogist*, v. 27, p. 281-300, 352-372, 411-451.
- Larsen, E. S., 3rd, and A. Montgomery, 1940, Sterretite, a new mineral from Fairfield, Utah: *American Mineralogist*, v. 25, p. 513-518.
- Larsen, E. S., 3rd, and W. T. Schaller, 1925, The identity of variscite and pegantite and the dimorphous form, metavariscite: *American Mineralogist*, v. 10, p. 23-28.
- Larsen, E. S., 3rd and E. V. Shannon, 1930a, Two phosphate from Dehrn; dehrnite and crandallite: *American Mineralogist*, v. 15, no. 8, p. 303-306.
- Larsen, E. S., 3rd and E. V. Shannon, 1930b, The minerals of the phosphate nodules near Fairfield, Utah: *American Mineralogist*, v. 15, no. 8, p. 307-337.
- Larsen, W. N., 1957, Petrology and structure of Antelope Island, Davis County, Utah: Unpublished Ph. D. Thesis, University of Utah, 142 p.
- Lee, W. T., 1907, The Cove Creek sulphur beds, Utah, *in* Contributions to Economic Geology, 1906, pt. 1: U. S. Geological Survey Bulletin 315Q, p. 485-489.
- Leith, C. K., 1904, Iron ores in southern Utah, *in* Contributions to Economic Geology, 1903: U. S. Geological Survey Bulletin 225, p. 229-237.
- Leith, C. K., and E. C. Harder, 1908, The iron ores of the Iron Springs district, southern Utah: U.S. Geological Survey Bulletin 338, 102 p.
- Lewis, R. Q., and R. H. Campbell, 1965, Geology and uranium deposits of Elk Ridge and vicinity, San Juan County, Utah: U. S. Geological Survey, Professional Paper, 474-B, 69 p.
- Lewis, R. Q., Sr., and D. E. Trimble, 1959, Geology and uranium deposits of Monument Valley, San Juan County, Utah: U. S. Geological Survey Bulletin 1087D, p. 105-131.
- Lindgren, Waldemar, 1906, The Annie Laurie mine, Piute County, Utah, *in* Contributions to Economic Geology, 1905: U. S. Geological Survey Bulletin 285, p. 87-90.
- Lindgren, Waldemar, F. G. Loughlin, and V. C. Heikes, 1919, Geology and ore deposits of the Tintic mining district, Utah: U. S. Geological Survey Professional Paper 107, 282 p.
- Lindsey, D. A., 1975, Mineralization halos and diagenesis in water-laid tuff of the Thomas Range, Utah: U. S. Geological Survey, Professional Paper 818B, p. B1-B19.
- Lindsey, D. A., H. Ganow, and W. Mountjoy, 1973, Hydrothermal alteration associated with beryllium deposits at Spor Mountain, Utah: U. S. Geological

- Survey, Professional Paper 818A, p. A1-A20.
- Loughlin, G. F., and W. T. Schaller, 1917, Crandallite, a new mineral, Tintic mining district, Utah: *American Journal of Science* v. 43, p. 69.
- Lovering, T. S., and H. T. Morris, 1960, The Chief Oxide-Burgin area discoveries, East Tintic district, Utah: *Economic Geology*, v. 55, no. 6, p. 1116-1148.
- Mackin, J. H., 1947, Some structural features of the intrusions of the Iron Springs district, Utah: *Utah Geology Society Guidebook to the Geology of Utah*, no. 2, 62 p.
- Mackin, J. H., 1954, Geology and iron ore deposits of the Granite Mountain area, Iron County, Utah: *U. S. Geological Survey Mineral Inv. map MF-14*.
- McCarthy, J. H., Jr., and others, 1969, Gold-bearing jasperoid in the Drum Mountains, Juab and Millard Counties, Utah: *U. S. Geological Survey, Circular*, 623, 4 p.
- McConnell, D., 1954, An American occurrence of volkonskoite (Utah), in Ada Swineford and N. V. Plummer, eds., *Clays and Clay Minerals: National Research Council Publication 327*, p. 152-157.
- Means, A. H., 1946, Some new mineral occurrences from the Tintic district, Utah: *American Journal of Science* v. 41, p. 127.
- Merrill, R. B., J. K. Robertson, and P. J. Wyllie, 1972, Dehydration reaction of titanoclinohumite: *Earth Planet, Science Letter*, v. 14, no. 2, p. 259-262.
- Milton, C., 1957, Authigenic minerals of the Green River Formation of the Uinta Basin, *in* *Guidebook to the Geology of the Uinta Basin: Intermountain Association Petroleum Geologists 8th Annual Field Conference* p. 136-143.
- Milton, C., 1971, Authigenic minerals of the Green River Formation, *in* *Trona issue: University of Wyoming, Continental Geology* v. 10, no. 1, p. 57-63.
- Milton, C., 1978, Abelsonite, nickel porphyry, new mineral for Green River Formation, Utah: *American Mineral*, v. 63, nos. 9-10, p. 930-937.
- Milton, C., J. M. Axelrod, and F. S. Grimaldi, 1954, New minerals reedmergerite and eitelite in the Green River Formation (abs.): *Geological Society of America Bulletin* v. 65, p. 1286-1287.
- Milton, C., J. M. Axelrod, and F. S. Grimaldi, 1955, New mineral garrelsite from the Green River Formation (abs.): *Geological Society of America Bulletin* v. 66, p. 1597.
- Milton, C., E. C. T. Chao, J. M. Axelrod, and F. S. Grimaldi, 1960, Reedmergerite, from the Green River Formation, Utah: *American Mineralogist*, v. 45, p. 188-199.
- Milton, C. B. Ingram and I. Breger, 1974, Authigenic magnesioarfvessonite from the Green River Formation, Duchesne County, Utah: *American Mineral*, v. 59, nos. 7-8, p. 830-836.
- Montgomery, A., 1934, A recent find of bixbyite and associated minerals in the Thomas Range, Utah: *American Mineralogist*, v. 19, p. 82-87.
- Montgomery, A., 1970, The phosphate minerals of Fairfield, Utah: *Rocks and Minerals*, no. 374, v. 45, no. 11, p. 667-674; no. 375, v. 45, no. 12, p. 737-745.
- Montgomery, A., 1971, The phosphate minerals of Fairfield, Utah: *Rocks and Minerals: no. 376*, v. 46, no. 1, p. 3-9; no. 377, v. 46, no. 2, p. 75-80.
- Montoya, J. W., 1962, Beryllium-bearing tuff from Spor Mountain, Utah: *U. S. Bureau of Mines, Report of Investigation*, 6084.
- Montoya, J. W., 1969, Bismuthian bindheimite, Mammoth mine, Eureka, Utah: *American Mineral*, v. 54, nos. 11-12, p. 1726-1728.
- Morris, H. T., 1957, General geology of the East Tintic Mountains, Utah, *in* *Geology of the East Tintic Mountains and ore deposits of the Tintic mining districts: Utah Geological Society Guidebook to Geology of Utah*, no. 12, p. 1-56.
- Morris, H. T., 1964a, Geology of the Eureka quadrangle, Utah and Juab Counties, Utah: *U. S. Geological Survey Bulletin* 1142K, p. 1-29.
- Morris, H. T., 1964b, Geology of the Tintic Junction quadrangle, Tooele, Juab, and Utah Counties, Utah: *U. S. Geological Survey Bulletin* 1142 L, p. 1-23.

- Morris, H. T., and T. S. Lovering, 1979, General geology and mines of the East Tintic district, Utah and Juab Counties, Utah: U. S. Geological Survey, Professional Paper 1024, 203 p.
- Morris, S. K., 1980, Geology and ore deposits of Mineral Mountain, Washington County, Utah: Brigham Young University, Geology Studies, v. 27, pt. 2.
- Moss, A. A., 1957, The nature of carphosiderite and allied basic sulfates of iron: *Mineralogical Magazine* v. 31, p. 407.
- Mrose, M. E., and B. Wappner, 1959, New data on the hydrated scandium phosphates, sterrettite, eggonite, and kolbeckite (abs.): 40th Annual Meeting, Mineralogical Society America Program p. 90 A.
- Nolan, T. B., 1935, The Gold Hill mining district, Utah: U. S. Geological Survey Professional Paper 177, 172 p.
- Outerbridge, W. F., M. H. Staatz, R. Meyrowitz, and A. M. Pommer, 1960, Weeksite, a new uranium silicate: *American Mineralogist*, v. 45, p. 39-52.
- Overstreet, W. C., 1967, The geologic occurrence of monazite: U. S. Geological Survey Professional Paper 530, 327 P.
- Pabst, A., 1973, The crystallography and structure of eitelite: *American Mineral*, v. 58, nos. 3-4, p. 211-217.
- Pabst, A., and C. Milton, 1972, Leucosphenite and its occurrence in the Green River Formation of Utah and Wyoming: *American Mineral*, v. 57, no. 11-12, p. 1801-1822.
- Packard, R. L., 1894, Variscite from Utah: *American Journal of Science*, v. 47, ser. 3, p. 297.
- Paddock, R. E., 1956, Geology of the Newfoundland Mountains, Box Elder County, Utah: Unpublished M. S. Thesis, University of Utah, 101 p.
- Palache, Charles, 1934, Minerals from Topaz Mountain, Utah: *American Mineralogist*, v. 19, no. 1, p. 14-15.
- Palache, Charles, Berman, Harry, and Clifford Frondel, 1944, Dana's system of mineralogy, v. 1: 7th ed., John Wiley and Sons, Inc., New York, New York, 834 p.
- Palache, Charles, Berman, Harry, and Clifford Frondel, 1951, Dana's system of mineralogy, v. 2: 7th ed., John Wiley and Sons, Inc., New York, New York, 1124 p.
- Parker, E. W., 1899, Asphalt and bituminous rock: *in* U. S. Geological Survey, 20th Annual Report, Fiscal year ended June 30, 1899, pt. 6, p. 257.
- Parovari, E. R., and R. J. Tracy, 1978, A pyrope-spinel xenolith from Colorado Plateau kimberlite; first known North American occurrence: *Geological Society of America, Abstract with Programs*, v. 10, no. 7, p. 466.
- Penfield, S. L., and A. E. Foote, 1897, Bixbyite, a new mineral and notes on associated topaz: *American Journal of Science* v. 4, p. 105.
- Perry, L. I., 1976, Gold Springs mining district, Iron County, Utah: *Utah Geological and Mineral Survey, Utah Geology*, v. 3, no. 1, p. 23-49.
- Peterson, V. E., 1942, a study of the geology and ore deposits of the Ashbrook silver mining district, Utah: *Economic Geology* v. 37, no. 6, p. 466-502.
- Proctor, P. D., 1953, Geology of the Silver Reef (Harrisburg) mining district, Washington County, Utah: *Utah Geological and Mineral Survey Bulletin* 44, 107 p.
- Quarashi, M. M., W. H. Barnes, and L. G. Berry, 1953, The space group of conicalchalcite, Arizona and Utah: *American Mineral*, v. 38, nos. 5-6, p. 557-559.
- Quinlan, J. J., and J. G. Simos, 1968, Park City district, Utah, *in* Guidebook to Geology of Utah, no. 22, p. 40-55.
- Radtke, A. S., C. M. Taylor, and H. T. Morris, 1969, Micromineralogy of Galena ores, Burgin mine, East Tintic district, Utah: U. S. Geological Survey Professional Paper 614A, 17 p.
- Radtke, A. S., C. M. Taylor, and J. E. Frost, 1967, Bismuth and tin minerals in gold and silver bearing sulfide ores, Ohio mining district, Marysville, Utah: U. S. Geological Survey, Professional Paper 575D, p. D127-D134.
- Raup, O. B., A. J. Gude, E. J. Dwornick, Frank Cuttitta, and H. J. Rose, Jr., 1968, Braitschite, a new hydrous

- calcium rare-earth borate mineral from the Paradox Basin, Grand County, Utah: *American Mineral*, v. 53, p. 1081-1095.
- Ream, L. R., 1979, The Thomas Range, Wah Wah Mountains, and vicinity, western Utah: *Mineralogical Record*, v. 10, no. 5, p. 261-278.
- Rees, D. C., M. P. Erickson, J. A. Whelan, 1973, Geology and diatremes of Desert Mountain, Utah: Utah Geological and Mineral Survey, Special Studies 42, 12 p.
- Reid, J. E., 1978, Skarn alteration of the Commercial Limestone, Carr Fork canyon, Bingham, Utah: *Economical Geology* v, 73, p. 1315-1325.
- Richardson, G. B., 1908, Antimony in southern Utah, *in* Contributions to economic geology, 1907, pt. 1: U. S. Geological Survey Bulletin 340 D, p. 253-256.
- Rodriguez, E. L., 1960, Economic geology of the sulphur deposits at Sulphurdale, Utah: Unpublished M. S. Thesis, University of Utah, 74 p.
- Romney, M. P., 1963, Historical review of mining in Utah: *Mining Congress Journal* v. 49, no. 5, p. 47-52.
- Rosenzweig, A., and E. B. Gross, 1955, Goldichite, a new hydrous potassium ferric sulfate from the San Rafael Swell, Utah: *American Mineralogist*, v. 40, p. 469-480.
- Ross, M., 1959, Mineralogical applications of electron diffraction. II. Studies of some vanadium minerals of the Colorado Plateau: *American Mineralogist*, v. 44, p. 322-341.
- Ross, M., and H. T. Evans, 1964, Studies of the torbernite minerals: *American Mineral*, v. 49, nos. 11-12, p. 1578-1602.
- Sainsbury, C. L., 1962 Helvite near Beaver, Utah: *American Mineralogist*, v. 47, p. 395-398.
- Sand, L. B., and A. J. Regis, 1960, Report on a vein montmorillonite from Tooele County, Utah: *Geological Society of America Bulletin*, v. 71, no. 12, pt. 2, p. 1965.
- Sayre, R. L., 1974, Geology and mineralization of the Church Hills, Millard County, Utah: Utah Geological and Mineral Survey, Special Studies 47, 22 p.
- Schaeffer, F. E., Jr., 1961, Geology of the central and southern Silver Island Mountains, Tooele County, Utah: Unpublished Ph. D. Thesis, University of Utah, 192 p.
- Schaller, W. T., 1912a, Crystallized variscite from Utah: U. S. Geological Survey Bulletin 590, p. 48-65.
- Schaller, W. T., 1912b, The crystallography of variscite: *Washington Academy of Science Journal*, v. 2, p. 143.
- Schaller, W. T., 1916, Lucinite, a new mineral, a dimorphous form of variscite; the crystallography of variscite, *in* Mineralogical Notes, ser. 3: U. S. Geological Survey Bulletin 610, p. 56-68, 60-80.
- Schaller, W. T., 1923, Argentojarosite, a new silver mineral: *Washington Academy of Science Journal* v. 13, p. 233.
- Schaller, W. T., 1940, A probably new phosphate-sulphate of aluminum from Utah: *American Mineralogist*, v. 25, p. 213.
- Schempp, C. A., 1923, Argentojarosite: *American Journal of Science* v. 6, p. 73.
- Schrader, F. C., R. W. Stone and Samuel Sanford, 1917, Useful minerals of the United States: U. S. Geological Survey Bulletin 624, 412 p.
- Shannon, E. V., 1927, Ammoniojarosite, a new mineral of the jarosite group from Utah: *American Mineralogist*, v. 12, p. 424-426.
- Sharp, B. J., 1949, The mineralogy of the Fox clay deposits, Utah: Unpublished M. A. Thesis, University of Utah, 21 p.
- Sharp, B. J., 1958, Mineralization in the intrusive rocks in Little Cottonwood Canyon, Utah: *Geological Society of America Bulletin* v. 69, no. 11, p. 1415-1430.
- Sharp, B. J., 1963, Uranium in fluorite, Spor Mountain, Utah, *in* Beryllium and uranium mineralization in western Juab County, Utah: Utah Geological Society Guidebook to the Geology of Utah, no. 17, p. 14.
- Siefgus, S. S., 1924, A reconnaissance of the Promontory Point mining district, Utah: Unpublished M. S. Thesis, University of Utah, 165 p.

- Sinkankas, John, 1959, Gem stones of North America: D. Van Nostrand Company, Inc., Princeton, N. J., 675 p.
- Smith, J. W., and W. A. Robb, 1966, Ankerite in the Green River Formation Mahogany zone: *Journal of Sedimentary Petrology*, v. 36, no. 2, p. 486-490.
- Smith, J. W., and N. B. Young, 1975, Dawsonite: its geochemistry, thermal behavior, and extraction from Green River oil shale, *in* Proceedings of the Eighth Oil Shale Symposium: Colorado School of Mines Quarterly, v. 70, no. 3, p. 69-93.
- Smith, S. M., 1971, Mineralogy and trace element study of the manganese oxide deposits in the Burgin mine, East Tintic district, Utah County, Utah: Brigham Young University, Geology Studies, v. 18, pt. 3, p. 105-122.
- Smith, T. L., 1957, The geology of Antimony Canyon area, Garfield and Piute Counties, Utah: Unpublished M. S. Thesis, University of Utah, 39 p.
- Staatz, M. H., 1963, Geology of the beryllium deposits in the Thomas Range, Juab County, Utah: U. S. Geological Survey Bulletin, 1142M, p. 1-36.
- Staatz, M. H., and W. J. Carr, 1964, Geology and mineral deposits of the Thomas and Dugway Ranges, Juab and Tooele Counties, Utah: U. S. Geological Survey Professional Paper 415, 188 p.
- Staatz, M. H., and W. R. Griffiths, 1961, Beryllium-bearing tuff in the Thomas Range, Juab County, Utah: *Economic Geology*, v. 56, no. 5, p. 941-958.
- Staatz, M. H., and F. W. Osterwald, 1956, Uranium in the fluor spar deposits of the Thomas Range, Utah, *in* Contributions to the geology of uranium and thorium for the United Nations International Conference on peaceful uses of atomic energy, Geneva, Switzerland, 1955: U. S. Geological Survey Professional Paper 300, p. 131-136.
- Staatz, M. H., and F. W. Osterwald, 1959, Geology of the Thomas Range fluor spar district, Juab County, Utah: U. S. Geological Survey Bulletin 1069, 97 p.
- Staples, L. W., 1935, Austinite, a new arsenate mineral from Gold Hill, Utah: *American Mineralogist*, v. 20, p. 112-119.
- Starkey, H. C., and W. Mountjoy, 1973, Identification of a lithium-bearing smectite from Spor Mountain, Utah: *Journal of Research, U. S. Geological Survey*, v. 1, no. 4, p. 415-419.
- Stephens, J. D., 1960, Hydrothermal alteration at the United States mines, West Mountain (Bingham) district, Utah: Unpublished Ph. D. Thesis, University of Utah, 83 p.
- Stern, T. W., and A. D. Weeks, 1952, Second occurrence of bayleyite in the United States: *American Mineralogist*, v. 37, nos. 11-12, p. 1058-1060.
- Stern, T. W. L. R. Stieff, H. T. Evans, Jr., and A. M. Sherwood, 1957, Doloresite, a new vanadium oxide mineral from the Colorado Plateau: *American Mineralogist*, v. 42, p. 587-593.
- Sterrett, D. B., 1908, Precious stones (Utahlite and amatrice or variscite matrix): *in* U. S. Geological Survey, Mineral resources of the United States, calendar year 1907, pt. 2, p. 832.
- Sterrett, D. B., 1909, Precious stones (variscite-Utah): *in* U. S. Geological Survey, Mineral resources of the United States, calendar year 1908, pt. 2, p. 853.
- Sterrett, D. B., 1911, Gems and precious stones (variscite-Utah): *in* U. S. Geological Survey, Mineral resources of the United States, calendar year 1910, pt. 2, p. 894.
- Steven, T. A., and C. G. Cunningham, 1979, Clinoptilolite resources in the Tushar Mountains, west-central Utah: U. S. Geological Survey, Open File Report, 79-535, 22 p.
- Stieff, L. R. T. W. Stern, and A. M. Sherwood, 1956, Coffinite, a uranous silicate with hydroxyl substitution; a new mineral: *American Mineralogist*, v. 41, p. 675-688.
- Stringham, B. F., 1942, Mineralization in the West Tintic mining district, Utah: *Geological Society America Bulletin* 53, no. 2, p. 267-290.
- Stringham, B. F., 1946, Tinticite, a new mineral from Utah: *American Mineralogist*, v. 31, p. 395-400.
- Stringham, B. F., 1953, Granitization and hydrothermal alteration at Bingham, Utah: *Geological Society America Bulletin* v. 64, p. 945-991.

- Stringham, B. F., 1963, Hydrothermal alteration of the southeast part of the Frisco quadrangle, Beaver County, Utah: Utah Geology and Mineralogical Survey Special Studies 4, 20 p.
- Taylor, C. M., A. S. Rudtke, and C. L. Christ, 1973, New data on cuprobismutite: *Journal Resource*, U. S. Geological Survey, v. 1, no. 1, p. 99-103.
- Thaden, R. E., A. F. Trites, Jr., and T. L. Tinnell, 1964, Geology and ore deposits of the White Canyon area, San Juan and Garfield Counties, Utah: U. S. Geological Survey, Bulletin 1125, 166 p.
- Thompson, M. E., B. Ingram, and E. B. Gross, 1956, Abernathyite, a new uranium mineral of the metatorbernite group: *American Mineralogist*, v. 41, p. 82-90.
- Thompson, M. E., C. H. Roach, and W. Braddock, 1956, New occurrences of native selenium: *American Mineralogist*, v. 41, p. 156-157.
- Thompson, M. E. A. D. Weeks, and R. Meyrowitz, 1958a, Simplotite, a new quadrivalent vanadium mineral from the Colorado Plateau: *American Mineralogist*, v. 43, p. 16-24.
- Thompson, M. E., 1958b, Sherwoodite, a mixed vanadium (V) mineral from the Colorado Plateau: *American Mineralogist*, v. 43, p. 749-755.
- Thompson, M. E., A. D. Weeks, and A. M. Sherwood, 1955, Rabbittite, a new uranyl carbonate from Utah: *American Mineralogist*, v. 40, p. 201-206.
- Thomson, K. C., 1973, Mineral Deposits of the Deep Creek Mountains, Tooele and Juab Counties, Utah: Utah Geological and Mineral Survey, Bulletin 99, 76 p.
- Thomson, K. C., and L. I. Perry, 1975, Reconnaissance study of the Stateline mining district, Iron County, Utah: Utah Geological and Mineral Survey, Utah Geology, v. 2, no. 1, p. 27-47.
- Thurston, W. R., M. H. Staatz, D. C. Cox, and others, 1954, Fluorspar deposits of Utah: U. S. Geological Survey Bulletin 1005, 53 p.
- Traver, W. M., 1949, Investigation of Coyote Creek antimony deposits Garfield County, Utah: U. S. Bureau of Mines Report of Investigation 4470, [24 p.].
- Trites, A. F., and R. T. Chew, 1956, Geology of the Happy Jack mine, White Canyon area, San Juan County, Utah: U. S. Geological Survey Bulletin 1009H, p. 235-348.
- Utah Mining Association, 1959, Utah's mining industry: Salt Lake City, Utah Mining Association, 132 p.
- U. S. Bureau of Mines, 1960, Mineral facts and problems: U. S. Bureau of Mines Bulletin 585, 1016 p.
- Walker, G. W., and F. W. Osterwald, 1956, Relation of secondary uranium minerals to pitchblende-bearing veins at Marysvale, Piute County, Utah: U. S. Geological Survey Professional Paper 300, p. 123-129.
- Weeks, A. D., M. L. Lindberg, A. H. Truesdell, and R. Meyrowitz, 1964, Grantsite, a new hydrated sodium calcium vanadate from New Mexico, Colorado and Utah: *American Mineralogist*, v. 49, p. 1511-1526.
- Weeks, A. D., D. R. Ross, and R. F. Marvin, 1963, The occurrence and properties of barnestite, a new hydrated sodium vanadate mineral from Utah: *American Mineralogist*, v. 48, p. 1187-1195.
- Weeks, A. D., and M. E. Thompson, 1954, Identification and occurrence of uranium and vanadium minerals from the Colorado Plateau: U. S. Geological Survey Bulletin 1009B, p. 13-62.
- Weintraub, Judy, 1957, Mineral paragenesis and wall rock alteration at the Ophir mine, Tooele County, Utah: Unpublished M. S. Thesis, University of Utah, 44 p.
- Wells, F. G., 1938, The origin of the iron ore deposits in the Bull Valley and Iron Springs districts, Utah: *Economic Geology*, v. 33, no. 5, p. 477-507.
- Wells, R. C., and B. S. Butler, 1917, Tungstenite, a new mineral: *Washington Academy of Science Journal*, v. 7, p. 596-599.
- Williams, S. A., and J. DeAzveda, 1967, Austinite from Gold Hill, Utah: *American Mineral*, v. 52, nos. 7-8, p. 1224-1226.
- Wilson, C. L., 1959, Park City mining district, Utah, *in* Guidebook to the Geology of the Wasatch and Uinta

- Mountains transition area: Intermountain Association of Petroleum Geologists Guidebook, 10th Annual Field Conference p. 182-188.
- Wilson, S. R., 1950, Investigation of the West Tintic tungsten deposit: U. S. Bureau of Mines Report of Investigation 4640, [19 p.].
- Wilson, S. R., 1958, Gold Hill, Utah: Mineralogical Society of Utah, Field Trip, 13 p.
- Winchell, A. N., 1918, Racewinitite, a peculiar mineral from ore deposits in Utah: Economic Geology, v. 13, p. 611-615.
- Witkind, I. J., 1964, Geology of the Abajo Mountains, San Juan County, Utah: U. S. Geological Survey Professional Paper 453, 110 p.
- Young, E. J., and H. A. Powers, 1960, Chevkinite in volcanic ash: American Mineralogist, v. 45, p. 875-880.
- Young, E. J., A. D. Weeks, and R. Meyrowitz, 1966, Coconinoite, a new uranium mineral from Utah and Arizona: American Mineral v. 51, nos. 5-6, p. 651-663.
- Young, W. E., 1947, Iron deposits, Iron County, Utah: U. S. Bureau of Mines Report of Investigation 4076, [134 p.].
- Zalinski, E. R., 1909, Amatrice, a new gem stone of Utah: Engineers Mining Journal, v. 87, p. 1038-1039.
- Zimmerman, J. T., 1961, Geology of the Cove Creek area, Millard County and Beaver County, Utah: Unpublished M. S. Thesis, University of Utah, 91 p.
- Zoldok, S. W. and S. R. Wilson, 1953, Bull Valley iron-ore deposits, Washington County, Utah: U. S. Bureau of Mines Report of Investigation 4948, [25 p.].

## APPENDIX

### Minerals of Utah

The list below contains 706 names which appeared in Chapter III. Of these, 134 are duplicate mineral names, rock terms, or hydrocarbon names, and were not programmed in the computer analyses reported in the remaining five lists. If a mineral has two names, the one that has priority or more common usage was used in the computer analysis, and the second rank name is indicated as follows: Adularia (See Orthoclase).

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Abelsonite	Altaite	Antigorite
Abernathyite	Alumian	Antlerite
Acanthite	Aluminite	Apatite
Acmite	Alunite	Apjohnite
Actinolite	Alunogen	Apophyllite
Adamite	Amatrice (See Variscite)	Aquamarine (See Beryl)
Adularia (See Orthoclase)	Amethyst (See Quartz)	Aragonite
Aegerite (See Wurtzilite)	Ammonia Alum	Ardunite
Aegirine (See Aegirite)	Ammoniojarosite	Argentite
Aegirite	Amphibole	Argentojarosite
Aeonite (See Wurtzilite)	Analcime (See Analcite)	Argulite (hydrocarbon)
Agate (See Cryst. Quartz)	Analcite	Argyrodite
Agularite	Anatase	Arsenic
Aikinite	Andalusite	Arsenosiderite
Alabaster (See Gypsum)	Andersontie	Arsenobismite
Alaskaite	Andesine	Arseno-yrite
Albertite (hydrocarbon)	Andradite (See Garnet)	Asbestos (See Serpentine)
Albite	Anglesite	Asphalt (See Asphaltum)
Alisonite (See Galena)	Anhydrite	Asphaltum (hydrocarbon)
Allanite	Ankerite	Atacamite
Allewardite (See Rectorite)	Annabergite	Augite
Allophane	Anorthite	Aurichalcite
Almandine (See Spinel)	Anorthoclase	Austinite
Almandite (See Garnet)	Anthophyllite	Autunite

Axinite	Brucite	Cobaltomenite
Azurite	Burbankite	Coconinoite
Balydonite	Bushmanite (See Pickeringite)	Coffinite
Barite	Butlerite	Collophane
Barnesite	Calamine (See Hemimorphite)	Conichalcite
Barytocalcite	Calaverite	Connellite
Basaluminite	Calciovolborthite	Copalite (hydrocarbon)
Bassanite	Calcite	Copiapite
Bassetite	Caledonite	Copper
Bayleyite	Carbonate Apatite	Copper Pitch (See Tenorite)
Beaverite	Carbon Dioxide (gas)	Coquimbite
Becquerelite	Carminite	Cordierite
Biedellite	Carnallite	Corkite
Bentonite (See Montmorillonite)	Carnelian (See Cryp. Quartz)	Coronadite
Bertrandite	Carnotite	Cornwallite
Beryl	Carphosiderite	Corundum
Beta-uranophane (See Beta-uranotile)	Cassiterite	Corvusite
Beta-uranotile	Celadonite	Cosalite
Beudanite	Celestite	Cotunnite
Bickerite (See Austinite)	Cerargyrite	Covellite
Bieberite	Cerussite	Crandallite
Bilinite	Cervantite	Crednerite
Billingsleyite	Chabazite	Cristobalite
Bindheimite	Chalcanthite	Crocidolite (See Riebeckite)
Binnite (See Tennantite)	Chalcedony (See Cryp. Quartz)	Cryolite
Biotite	Chalcocite	Cryptocrystalline Quartz
Berinessite	Chalcophanite	Cryptomelane
Bischofite	Chalcopyllite	Cubanite
Bismite	Chalcopyrite	Cuprite
Bismoclite	Chalcotrichite (See Cuprite)	Cuproadamite (See Adamite)
Bismuth	Chenevixite	Cuprobismutite
Bismuthian bindheimite	Chert (See Cryp. Quartz)	Cuprodescloizite (See Descloizite)
Bismuthinite	Chevkinite	Cuprogoslarite
Bismutite	Chlorite	Cuproplumbite (See Balydonite)
Bixbite (See Beryl)	Chloropal (See Nontronite)	Cuproscheelite (See Cuprotungstite)
Bixbyite	Chlor-Utahite (See Variscite)	Curroskłodowskite
Bloedite	Chrome mica-clay	Cuprotungstite
Boehmite	Chromite	Cyanotrichite
Bog Ore (See Geothite)	Chrysocolla	Cyrtolite (See Zircon)
Boltwoodite	Chrysolite (See Olivine)	Dahllite (See Carbonate apatite)
Boothite	Cimolite	Damourite
Borickite	Cinnabar	Danburite
Borntie	Claudetite	Daubreeite
Boulangerite	Clausthalite	Davisonite
Bournonite	Clinochlore	Dawsonite
Braitschite	Clinoclase	Dehrnite
Braunite	Clinoclasite (See Clinoclase)	Delessite
Bravoite	Clinohumite	Deltaite
Brickerite (See Austinite)	Clinoptilolite	Dennisonite (See Davisonite)
Brochantite	Clinozoisite	Descloizite
Brockite	Cobalt Bloom (See Erythrite)	Diadochite
Bronzite (See Enstatite)	Cobaltite	Diaspore
Brookite	Cobaltocalcite	Dichroite (See Cordierite)



Dickite	Gel-bertrandite (See Bertrandite)	Illite (See Hydromica)
Digenite	Geocronite	Ilmenite
Diposide	Gersdorffite	Ilsemannite
Dolomite	Gibbsite	Indium
Doloresite	Gilsonite (hydrocarbon)	Ingramite (hydrocarbon)
Donkeyite	Glauberite	Iolite (See Cordierite)
Dufrenoyite	Glauconite	Jalpaite
Dumortierite	Goethite	Jamesonite
Dyscarsite	Gold	Jarosite
Eardleyite	Goldichite	Jasper (See Cryp. Quartz)
Eitelite	Gordonite	Jasperoid (See Cryp. Quartz)
Elaterite (See Wurtzilite)	Goslarite	Jefferisite
Elpidite	Goyazite	Jenkinsite
Embolite	Grantsite	Jet (hydrocarbon)
Emplectite	Graphite	Johannite
Enargite	Greenockite	Jordisite
Endellite	Grossularite (See Garnet)	Kainite
Englishite	Guano (rock)	Kaolinite
Enstatite	Gummite	Kasolite
Ephesite	Gunningite	Kermesite
Epidesmine	Gypsite (rock)	Kieserite
Epidote	Gypsum	Kimolite (See Cimolite)
Epsomite	Gryolite	Kinoite
Erinite	Halite	Klaprothite
Erubescite (See Bornite)	Halloysite	Kolbeckite
Erthrite	Halotrichite	Kornelite
Essonite (See Garnet)	Hectorite	Kornerupine
Ettringite	Hedenbergite	Krennerite
Eucarite	Helium (gas)	Kyanite
Famatinite	Helvite	Labradorite
Faratsihite	Hematite	Lanarkite
Ferberite	Hemimorphite	Laumontite
Fernandinite	Hercynite	Leadhillite
Ferrimolybdate	Hessite	Lehiite
Ferrisymplesite	Hetaerolite	Lepidocrocite
Ferrogoslarite	Heulandite	Lettsomite (See Cyanotrichite)
Ferroludwigite (See Ludwigite)	Hewettite	Leuchtenbergite
Ferropallidite (See Szomolnokite)	Higginsite (See Conichalcite)	Leucosphenite
Ferroselite	Hisingerite	Leucoxene (See Anatase)
Fervanite	Hollandite	Leverrierite
Fibroferrite	Hornblende	Lewistonite
Fluellite	Huebnerite	Libethenite
Fluorapatite	Humite	Liebigite
Fluorite	Hummerite	Limonite
Forsterite	Huntite	Linarite
Foshagite	Hyalite (See Opal)	Lithiophorite
Formarierite	Hydromagnesite	Lodestone (See Magnetite)
Francolite (See Fluorapatite)	Hydromica (See Illite)	Lorandite
Freibergite	Hydrozincite	Loughlinite
Galena	Hypersthene	Lucinite (See Variscite)
Garnet	Iceland Spar (See Calcite)	Luckite (See Melanterite)
Garrelsite	Iddingsite	Ludwigite
Gearksutite	Idocrase	Luzonite

Magnesianarfedsonite	Nahcolite	Pisanite
Magnesianoferrite	Natroalunite	Pitchblende (See Uraninite)
Magnesianoludwigite (See Ludwigite)	Natrojarosite	Pitticite
Magnesianoriebeckite	Natrolite	Plagioclase
Magnesianite	Natron	Plancheite
Magnetite	Navajoite	Platinum
Malachite	Neighborite	Pleonasite (See Hercynite)
Mallardite	Nepheline	Plumbojarosite
Manganite	Niccolite	Polybasite
Manganocalcite	Nigrite (hydrocarbon)	Polyhalite
Manganodolomite (See Dolomite)	Niter	Potash Alum
Marcasite	Nolanite	Potash Clay (See Hydromica)
Martite (See Hematite)	Nontronite	Powellite
Massicot	Norstrandite	Prase (See Cryp. Quartz)
Matildite	Northupite	Prehnite
Meerschaum (See Sepiolite)	Noselite	Prochlorite
Melaconite (See Tenorite)	Novacekite	Prosopite
Melanovanadite	Nsutite	Proustite
Melanterite	Obsidian (rock)	Pseudobrookite
Mercury	Octahedrite (See Anatase)	Pseudowavellite (See Crandallite)
Mesolite	Okenite	Psilomeland
Meta-aluminate	Oligoclase	Ptilolite
Meta-autunite	Olivenite	Pyrrargyrite
Metacinnabar	Olivine	Pyrite
Metahewettite	Onofrite	Pyrolusite
Metarossite	Onyx (See Calcite)	Pyromorphite
Metastibnite	Opal	Pyrope (See Garnet)
Metastrengite	Orpiment	Pyrophyllite
Metatorbernite	Orthite (See Allanite)	Pyroxene
Metatyuyamunite	Orthoclase	Pyrrhotite
Meta-uranocircite	Osarizawaite	Quartz
Metavariscite	Overite	Quenselite
Metazeunerite	Ozocerite (hydrocarbon)	Rabbittite
Miargyrite	Paligorskite	Racewinitite
Microcline	Palladium	Rauvite
Millisite	Parabutlerite	Realgar
Mimetite	Paramontroseite	Rectorite
Minium	Pargasite	Red Ocher (See Hematite)
Mirabilite	Pascoite	Reedmergnerite
Mixite	Pearceite	Rohdochrosite
Molybdenite	Pennine (See Penninite)	Rhodonite
Molybdite (See Ferrimolybdite)	Penninite	Rhomboclase
Monazite	Periclase	Riebeckite
Monheimite (See Smithsonite)	Petrified Wood (See Cryp. Quartz)	Ripidolite
Monimolite	Petzite	Rockbridgeite
Montgomeryite	Pharmacosiderite	Roemerite
Monticellite	Phillipsite	Rosasite
Montmorillonite	Phlogopite	Roscoelite
Montroseite	Phosgenite	Rose Quartz (See Quartz)
Mordenite	Phosphorite	Rossite
Morganite (See Beryl)	Phosphuranylite	Ruby Silver (See Proustite and Pyrrargyrite)
Mottramite	Pickeringite	Rutherfordine
Muscovite	Pintadoite	Rutile

Sabugalite	Sterrettite (See Kolbeckite)	Uraninite
Sagenite (See Rutile)	Stibiconite	Uranite (See Autunite and Torbernite)
Saleeite	Stibnite	Uranocher (See Uranopilite)
Samarskite	Stilbite	Uranocircite (See Meta-uranocircite)
Sanidine (See Orthoclase)	Stolzite	Uranophane
Saponite	Stringhamite	Uranopilite
Sapphire (See Corundum)	Stromeyerite	Uranospathite
Satin Spar (See Gypsum)	Strontianite	Uranospinite
Scandium	Sulfur	Uranothallite (See Liebigite)
Scapolite	Sulvanite	Utahite (See Carphosiderite)
Scheelite	Sussexite	Utahlite (See Variscite)
Schoepite	Swartzite	Utah Onyx (rock)
Schroeckingerite	Sylvanite	Uvanite
Scorodite	Sylvite	Uvarovite (See Garnet)
Searlesite	Szaibelyite	Valentinite
Selenite (See Gypsum)	Szomolonokite	Vanadinite
Selenium	Tabbyite (hydrocarbon)	Vanadium Hydromica (See Roscoelite)
Seligmannite	Talc	Vandendriesscheite
Senarmontite	Tennantite	Vanoxite
Sepiolite	Tenorite	Variscite
Sericite (See Muscovite)	Tetradymite	Vermiculite
Serpentine	Tetrahedrite	Vesuvianite (See Idocrase)
Serpophite	Thaumasite	Vitroite (See Bertrandite)
Sherwoodite	Thenardite	Vivianite
Shortite	Thermonatrite	Voglite
Sicklerite	Thinolite	Volborthite
Siderite	Thompsonite	Volchonskoite
Sideronatrite	Thorite	Voltaite
Siderotil	Thucolite (hydrocarbon)	Wad
Silicified Bone and Wood (See Cryp. Quartz)	Thulite (See Zoisite)	Wardite
Silver	Tiemannite	Wavellite
Simplotite	Tinticite	Weeksite
Sklodowskite	Titanite (See Sphene)	Wernerite (See Scapolite)
Smaltite	Titanoclinohumite	Wheelerite (hydrocarbon)
Smectite	Tobermorite	Whewellite
Smoky Quartz (See Quartz)	Topaz	Willemite
Sodalite	Torbernite	Wire Sivler (See Silver)
Soddyite	Tourmaline	Wolframite
Sodium Analogue of Hewettite (See Barnesite)	Travertine (rock)	Wollastonite
Soumansite (See Wardite)	Tremolite	Wufenite
Spadaite	Tridymite	Wurtzilite (hydrocarbon)
Spangolite	Troilite (See Pyrrhotite)	Wurtzite
Specularite (See Hematite)	Trona	Xantophyllite
Spessarite (See Garnet)	Troostite (See Willemite)	Xenotime
Sphaerocobaltite (See Cobaltocalcite)	Tscheffkinitite (See Chevkinite)	Zeunerite
Sphalerite	Tschermittite (See Ammonia alum)	Zinkenite
Sphene	Tungstenite	Zippeite
Spinel	Turquois	Zircon
Spodumene	Tryolite	Zoisite
Staurolite	Tyuyamunite	Zunyite
Steigerite	Uintaite (See Gilsonite)	
Stellerite	Uintahite (See Gilsonite)	
Stephanite	Umohoite	

## Utah Minerals Listed by County

The mineral compilation of the State emphasizes the numerous varieties of minerals found in mines and mining districts. Listings of rock-forming minerals are only given where they may be of local significance; but it should be recalled that most of the common rock-forming minerals would be formed in each county. Counties which have many mines have extensive mineral listings, whereas those with little or no metallic production have limited minerals reported. Tooele County, for instance, with 188 minerals recognized, has the largest mineral listing; whereas Carbon County has only 2. The total number of minerals described in each county is indicated by the number given within parentheses following the county name.

**BEAVER COUNTY (123)**

Actinolite	Clinozoisite	Kinoite
Albite	Copper	Libethenite
Alunite	Corkite	Limonite
Andalusite	Cosalite	Linarite
Anglesite	Covellite	Ludwigite
Anhydrite	Crypto. Quartz	Magnesite
Apatite	Cuprite	Magnetite
Aragonite	Diaspore	Malachite
Argentite	Diopside	Manganite
Argentojarosite	Dufrenoyite	Marcasite
Augite	Epidote	Molybdenite
Aurichalcite	Epsomite	Muscovite
Autunite	Ettringite	Olivine
Azurite	Fluorite	Opal
Barite	Galena	Orthoclase
Beaverite	Garnet	Plancheite
Beryl	Goethite	Plumbojarosite
Bindheimite	Gold	Powellite
Biotite	Goslarite	Proustite
Bismuthinite	Greenockite	Pyrargyrite
Bismutite	Gypsum	Pyrite
Bornite	Hedenbergite	Pyrolusite
Brochantite	Helvite	Quartz
Brucite	Hematite	Rhodo-chrosite
Calcite	Hemimorphite	Rutile
Cerargyrite	Hornblende	Saponite
Cerussite	Huebnerite	Scheelite
Chalcanthite	Huntite	Scorodite
Chalcocite	Hypersthene	Serpentine
Chalcopyrite	Idocrase	Siderite
Chlorite	Ilmenite	Silver
Chrysocolla	Jamesonite	Smithsonite
Clinohumite	Jarosite	Sphalerite
Clinoptilolite	Kaolinite	Sphene

Spinel	Thaumasite	Willemite
Stilbite	Topaz	Wolframite
Stringhamite	Torbernite	Wollastonite
Sulfur	Tourmaline	Wulfenite
Szaibelyite	Tremolite	Wurtzite
Tenorite	Uranophane	Zircon
Tetrahedrite	Vanadinite	Zoisite

**BOX ELDER COUNTY (67)**

Alunite	Diopside	Muscovite
Anglesite	Dufrenoyite	Orpiment
Aragonite	Epidote	Pearceite
Argentite	Epsomite	Plumbojarosite
Argyrodite	Ettringite	Proustite
Arsenopyrite	Fluorite	Pyrargyrite
Azurite	Galena	Pyrite
Barite	Garnet	Quartz
Bindheimite	Glauberite	Realgar
Bismuthinite	Goethite	Phodochrosite
Bismutite	Gold	Scheelite
Bloedite	Gypsum	Silver
Bornite	Halite	Smithsonite
Calcite	Halloysite	Sphalerite
Cerargyrite	Hematite	Stibnite
Cerussite	Hemimorphite	Stolzite
Chalcocite	Haolinite	Tennantite
Chalcopyrite	Kyanite	Tenorite
Chlorite	Limonite	Tetrahedrite
Chrysocolla	Magnetite	Thenardite
Copper	Malachite	Wanadinite
Covellite	Metavariscite	Variscite
Cuprite	Mirabilite	Wulfenite
Diaspore	Monazite	Zircon

**CACHE COUNTY (13)**

Anglesite	Galena	Malachite
Azurite	Gold	Pyrolusite
Cerussite	Hematite	Siderite
Cuprite	Kaolinite	Silver
		Smithsonite

**CARBON COUNTY (2)**

Calcite
Carnotite

**DAGGETT COUNTY (26)**

Anthophyllite	Bornite	Carnotite
Azurite	Brochantite	Chalcocite
Beryl	Carbonate Apatite	Chalcopyrite

Collophane	Kyanite	Pyrolusite	Jarosite	Phosphuranylite	Scorodite
Fluorapatite	Limonite	Spinel	Kaolinite	Pitticite	Silver
Glauconite	Malachite	Staurolite	Malachite	Psilomelane	Sphalerite
Gold	Muscovite	Tyuyamunite	Manganite	Pyrite	Sulfur
Hematite	Opal	Volborthite	Melanterite	Pyrolusite	Torbernite
Hornblende	Phosphorite		Meta-aluminite	Quartz	Tyuyamunite

**DAVIS COUNTY (33)**

Anglesite	Epidote	Microcline	Monazite	Roemerite	Voltaite
Aragonite	Galena	Mirabilite	Montroseite	Roscoelite	Wad
Azurite	Garnet	Oligoclase	Nicollite	Rutherfordine	Zeunerite
Biotite	Glauberite	Pyrite	Orpiment	Schoepite	Zippeite
Bloedite	Gold	Quartz	Parabutlerite	Schroeckingerite	Zircon
Bornite	Halite	Scheelite	Paramontroseite		
Chalcocite	Hematite	Sulfur			
Chalcopyrite	Hornblende	Thenardite			
Chlorite	Limonite	Tremolite			
Chrysocolla	Magnetite	Vermiculite			
Cyprite	Malachite	Zoisite			

**DUCHESNE COUNTY (30)**

Acmite	Hectorite	Phosphorite	Alunogen	Gypsum	Pyrolusite
Analcite	Hematite	Pyrite	Anhydrite	Hematite	Realgar
Anhydrite	Leucosphenite	Reedmergnerite	Arsenopyrite	Ilmenite	Senarmontite
Bassanite	Loughlinite	Riebeckite	Autunite	Johannite	Stibiconite
Burkankite	Magnesoarfvedsonite	Searlesite	Azurite	Laumontite	Stibnite
Carbonate apatite	Magnesoriebeckite	Sepiolite	Beta-Uranotile	Magnetite	Torbernite
Collophane	Malachite	Shortite	Bornite	Malachite	Tyuyamunite
Eitelite	Nahcolite	Smectite	Calcite	Metahewettite	Uraninite
Fluorapatite	Norstrandite	Thermonatrite	Carnotite	Monazite	Uranophane
Gypsum	Northupite	Trona	Chalcopyrite	Montmorillonite	Valentinite
			Chrysocolla	Orpiment	Vanoxite
			Crypto. Quartz	Pascoite	Wad
			Epidote	Platinum	Zippeite
			Epsomite	Ptilolite	Zircon
			Gold	Pyrite	

**EMERY COUNTY (94)**

Abernathyite	Brookite	Dolomite	Actinolite	Carnallite	Grantsite
Alunogen	Butlerite	Dumortierite	Aegerite	Camotite	Gypsum
Anglesite	Carnotite	Epsomite	Aluminite	Celestite	Halite
Anhydrite	Cassiterite	Fernandinite	Andersonite	Chalcocite	Hedenbergite
Ankerite	Celestite	Ferroselite	Anhydrite	Chalcopyrite	Hematite
Arsenic	Cerussite	Fibroferrite	Augite	Chevkinite	Hewettite
Autunite	Chalcanthite	Fourmarierite	Autunite	Chromite	Ilsemannite
Azurite	Chalcopyrite	Galena	Azurite	Chrysocolla	Kieserite
Basaluminite	Chrome mica-clay	Gold	Barite	Coffinite	Liebigite
Bassetite	Cobaltocalcite	Goldichite	Barnesite	Corvusite	Limonite
Bayleyite	Coffinite	Gummitte	Becquerelite	Crypto. Quartz	Lithoophrite
Becquerelite	Copiapite	Gypsum	Biotite	Desclozite	Malachite
Bieberite	Coquimbite	Halotrichite	Boltwoodite	Fervanite	Manganite
Boltwoodite	Corvusite	Hewettite	Bornite	Fluorite	Melanovanadite
Bornite	Cryolite	Hummerite	Braitschite	Galena	Meta-Autunite
Bravoite	Crypto. Quartz	Hydromica	Calciovolborthite	Goethite	Metahewettite
Brochantite	Diadochite	Ilmenite	Calcite	Gold	Metarossite

**GARFIELD COUNTY (44)**

Alunogen	Gypsum	Pyrolusite
Anhydrite	Hematite	Realgar
Arsenopyrite	Ilmenite	Senarmontite
Autunite	Johannite	Stibiconite
Azurite	Laumontite	Stibnite
Beta-Uranotile	Magnetite	Torbernite
Bornite	Malachite	Tyuyamunite
Calcite	Metahewettite	Uraninite
Carnotite	Monazite	Uranophane
Chalcopyrite	Montmorillonite	Valentinite
Chrysocolla	Orpiment	Vanoxite
Crypto. Quartz	Pascoite	Wad
Epidote	Platinum	Zippeite
Epsomite	Ptilolite	Zircon
Gold	Pyrite	

**GRAND COUNTY (81)**

Actinolite	Carnallite	Grantsite
Aegerite	Camotite	Gypsum
Aluminite	Celestite	Halite
Andersonite	Chalcocite	Hedenbergite
Anhydrite	Chalcopyrite	Hematite
Augite	Chevkinite	Hewettite
Autunite	Chromite	Ilsemannite
Azurite	Chrysocolla	Kieserite
Barite	Coffinite	Liebigite
Barnesite	Corvusite	Limonite
Becquerelite	Crypto. Quartz	Lithoophrite
Biotite	Desclozite	Malachite
Boltwoodite	Fervanite	Manganite
Bornite	Fluorite	Melanovanadite
Braitschite	Galena	Meta-Autunite
Calciovolborthite	Goethite	Metahewettite
Calcite	Gold	Metarossite

Metatyuyamunite	Pyrite	Selenium	Fluorite	Metazeunerite	Sicklerite
Montmorillonite	Pyrolusite	Sherwoodite	Galena	Mimetite	Silver
Montroseite	Quartz	Sphalerite	Garnet	Minium	Sklodowskiite
Oligoclase	Rauvite	Steigerite	Geocronite	Mixite	Smectite
Opal	Rhodochrosite	Sylvite	Gold	Molybdenite	Smithsonite
Paramontroseite	Roscoelite	Tyuyamunite	Gypsum	Montmorillonite	Soddyite
Pascoite	Rossite	Uraninite	Halite	Muscovite	Spangolite
Phosphyranylite	Saponite	Vanoxite	Halloysite	Olivenite	Sphalerite
Polyhalite	Scheelite	Volborthite	Hectorite	Opal	Sphene
Psilomelane	Schroekingerite	Zippeite	Hematite	Orthoclase	Spodumene

**IRON COUNTY (48)**

Actinolite	Cinnabar	Mercury	Hemimorphite	Phosgenite	Talc
Albite	Crypto. Quartz	Metastrengite	Heulandite	Pitticite	Tennantite
Analcite	Damourite	Mimetite	Huntite	Plumbojarosite	Tenorite
Andesine	Descloizite	Mottramite	Hydrozincite	Proustite	Tetrahedrite
Anhydrite	Diopside	Niter	Idocrase	Pseudobrookite	Topaz
Annabergite	Ferrimolybdite	Opal	Jamesonite	Psilomelane	Tourmaline
Apatite	Fluorite	Orthoclase	Jarosite	Psilomelane	Tremolite
Argentite	Galena	Pyrite	Labradorite	Pyrrhotite	Tyrolite
Augite	Garnet	Pyrolusite	Leadhillite	Pyrite	Uraninite
Autunite	Goethite	Pyromorphite	Limonite	Pyromorphite	Uranophane
Azurite	Gold	Quartz	Linarite	Pyrrhotite	Uranospinitite
Barite	Gypsum	Rhodochrosite	Magnesite	Quartz	Wad
Biotite	Hematite	Rockbridgeite	Magnetite	Rhodochrosite	Weeksite
Carnotite	Limonite	Siderite	Malachite	Scheelite	Wollastonite
Cerargyrite	Magnetite	Sulfur	Manganite	Schroekingerite	Zeunerite
Chlorite	Malachite	Sylvanite	Melanterite	Scorodite	Zunyite
			Meta-uranocircite		

**JUAB COUNTY (147)**

Actinolite	Bindheimite	Chrysocolla	Allophane	Calcite	Magnetite
Adamite	Biotite	Clinoclase	Aluminite	Carnotite	Malachite
Albite	Bismite	Clinoptilolite	Ammonia Alum	Crypto. Quartz	Monazite
Andalusite	Bismoclite	Clinozoisite	Ammoniojarosite	Cuprite	Pyrolusite
Anglesite	Bismuth	Conichalcite	Anhydrite	Gold	Torbernite
Anhydrite	Bismuthinite	Connellite	Autunite	Gypsum	Tyuyamunite
Ankerite	Bismutite	Copper	Azurite	Ilmenite	Uranospinitite
Aragonite	Bixbyite	Cornwallite	Barite	Limonite	Zircon
Ardunite	Borickite	Cotunnite			
Argentite	Braunite	Covellite			
Arseniosiderite	Brochantite	Crandallite			
Arsenobismite	Calcite	Crypto. Quartz			
Arsenopyrite	Carnotite	Cuprite			
Atacamite	Carphosiderite	Cyanotrichite			
Aurichalcite	Cerargyrite	Daubreeite			
Autunite	Cerussite	Dolomite			
Azurite	Chalcocite	Enargite			
Barite	Chalcophyllite	Enstatite			
Bertrandite	Chalcopyrite	Epidote			
Beryl	Chenevixite	Erinite			
Beta-uranotile	Chlorite	Famatinitite			

**KANE COUNTY (24)**

Allophane	Calcite	Magnetite
Aluminite	Carnotite	Malachite
Ammonia Alum	Crypto. Quartz	Monazite
Ammoniojarosite	Cuprite	Pyrolusite
Anhydrite	Gold	Torbernite
Autunite	Gypsum	Tyuyamunite
Azurite	Ilmenite	Uranospinitite
Barite	Limonite	Zircon

**MILLARD COUNTY (48)**

Albite	Cerussite	Gold
Andesine	Chalcopyrite	Gypsum
Anglesite	Clinoptilolite	Hematite
Anhydrite	Corundum	Idocrase
Anorthite	Crypto. Quartz	Labradorite
Apatite	Cuprite	Limonite
Aragonite	Diopside	Magnetite
Augite	Dolomite	Malachite
Azurite	Fluorite	Manganite
Biotite	Galena	Marcasite
Bixmutite	Garnet	Microcline

Molybdenite	Pyrite	Sulfur
Niter	Pyrolusite	Tourmaline
Oligoclase	Rhodochrosite	Tremolite
Orthoclase	Scheelite	Wad
Osarizawaite	Sphalerite	Wollastonite

**MORGAN COUNTY (24)**

Anglesite	Cuprite	Molybdenite
Azurite	Galena	Monazite
Barite	Gold	Pyrite
Biotite	Hematite	Silver
Cerussite	Jarosite	Smithsonite
Chalcopyrite	Limonite	Tenorite
Chrysocolla	Malachite	Uraninite
Copper	Marcasite	Xenotime

**PIUTE COUNTY (93)**

Albite	Gearsutite	Orthoclase
Allophane	Goethite	Phosphuranylite
Aluminite	Gold	Pinninite
Alunite	Gypsum	Plumbojarosite
Anatase	Halite	Potash Alum
Anglesite	Halloysite	Ptilolite
Anhydrite	Hematite	Pyrite
Argentite	Hydrozincite	Pyrolusite
Autunite	Isemannite	Quartz
Azurite	Jarosite	Rauvite
Barite	Johannite	Rhodochrosite
Beta-uranotile	Jordisite	Sabugalite
Biotite	Kaolinite	Schroekingierite
Calcite	Kasolite	Sklodowskite
Celadonite	Leuchtenbergite	Sphalerite
Cerargyrite	Limonite	Stellerite
Cerussite	Lithiophorite	Sylvanite
Chabazite	Malachite	Tetrahedrite
Chalcopyrite	Manganocalcite	Thomsonite
Chlorite	Meta-autunite	Tiemannite
Cinnabar	Metacinnabar	Torbernite
Clinocllore	Metatorbernite	Tyuyamunite
Cobaltomenite	Molybdenite	Umohoite
Cristobalite	Montmorillonite	Uraninite
Cuprobismutite	Mordenite	Uranophane
Dickite	Muscovite	Uranopilite
Emplectite	Natroalunite	Wulfenite
Fluellite	Natrolite	Wurtzite
Fluorite	Nontronite	Zeunerite
Galena	Onofrite	Zippeite
Garnet	Opal	Zircon

**RICH COUNTY (12)**

Azurite	Crypto. Quartz	Rhodochrosite
Barite	Galena	Tennantite
Calcite	Phosphorite	Tyuyamunite
Cerussite	Pyrolusite	Wulfenite

**SALT LAKE COUNTY (142)**

Actinolite	Dufrenoyite	Opal
Aikinite	Dyscarsite	Orpiment
Alaskaite	Enargite	Orthoclase
Allanite	Ephesite	Palladium
Allophane	Epidote	Periclase
Anglesite	Ferrimolybdate	Phosphorite
Anorthite	Forsterite	Pickeringite
Apatite	Foshagite	Pisanite
Apjohnite	Galena	Platinum
Apophyllite	Garnet	Plumbojarosite
Aragonite	Glauberite	Prehnite
Argentite	Gold	Pyrargyrite
Arsenopyrite	Goslarite	Pyrite
Aurichalcite	Gypsum	Pyrolusite
Azurite	Gyrolite	Pyrrhotite
Barite	Halite	Quartz
Beaverite	Hematite	Racewinite
Biotite	Hemimorphite	Realgar
Bismite	Heulandite	Rhodochrosite
Bismuth	Hornblende	Rutile
Bismuthinite	Hydromagnesite	Scheelite
Bismutite	Hydromica	Seligmannite
Bloedite	Hypersthene	Serpentine
Bornite	Idocrase	Siderite
Bourmonite	Kaolinite	Siderotil
Brucite	Leverrierite	Silver
Calaverite	Limonite	Smithsonite
Calcite	Linarite	Sphalerite
Calcedonite	Ludwigite	Sphene
Cerargyrite	Magnetite	Stibnite
Cerussite	Malachite	Stilbite
Cervantite	Mallardite	Stolzite
Chabazite	Marcasite	Sussexite
Chalcanthite	Massicot	Szaibelyite
Chalcocite	Melanterite	Talc
Chalcopyrite	Mercury	Tennantite
Chlorite	Mesolite	Tenorite
Chrysocolla	Microcline	Tetrahedrite
Copper	Mirabilite	Thaumasite
Covellite	Molybdenite	Thenardite
Cubanite	Montmorillonite	Thinolite
Cuprite	Muscovite	Thomsonite
Digenite	Nontronite	Tobermorite
Diopside	Okenite	Tremolite

Tungstenite  
Turquoise  
Tyrolite

**SAN JUAN COUNTY (115)**

Aegirite  
Alophanite  
Alunite  
Andersonite  
Anhydrite  
Antlerlite  
Apatite  
Augite  
Autunite  
Azurite  
Barite  
Bayleyite  
Becquerelite  
Beta-uranotile  
Bieberite  
Boltwoodite  
Boothite  
Bornite  
Brochantite  
Calciovolborthite  
Calcite  
Carnallite  
Camotite  
Chalcanthite  
Chalcocite  
Chalcopyrite  
Chromite  
Chrysocolla  
Clausthalite  
Coconinoite  
Coffinite  
Copper  
Corvusite  
Covellite  
Cuprite  
Cuprosklodowskite  
Doloresite  
Donkeyite

**SANPETE COUNTY (14)**

Anhydrite  
Autunite  
Beidellite  
Epsomite  
Galena

Vivianite  
Wavellite  
Wollastonite

Erythrite  
Eucarite  
Fluorite  
Galena  
Garnet  
Gersdorffite  
Goethite  
Gold  
Greenockite  
Gummite  
Gypsum  
Halite  
Hematite  
Hewettite  
Hydromica  
Ilsemanite  
Jarosite  
Johannite  
Jordisite  
Kieserite  
Kornerupine  
Liebigite  
Limonite  
Magnetite  
Malachite  
Manganite  
Marcasite  
Melanovanadite  
Metarossite  
Metatorbernite  
Metatyuyamunite  
Metazeunerite  
Microcline  
Molybdenite  
Montroseite  
Navajoite  
Nolanite

Wulfenite  
Xantophyllite  
Zircon  
Zoisite

Noselite  
Novacekite  
Orthoclase  
Paramontroseite  
Pascoite  
Phosphuranylite  
Pintadoite  
Polyhalite  
Psilomelane  
Pyrite  
Quartz  
Roscoelite  
Rutherfordine  
Sabugalite  
Saleeite  
Schoepite  
Schroekingerite  
Selenium  
Sepiolite  
Simplotite  
Smaltite  
Sodalite  
Sphalerite  
Sphene  
Sulfur  
Swartzite  
Sylvite  
Torbernite  
Tourmaline  
Tyuyamunite  
Uraninite  
Uranophane  
Uranopilite  
Vanoxite  
Voglite  
Whewellite  
Zippeite

**SEVIER COUNTY (47)**

Albite  
Alunite  
Anhydrite  
Antigorite  
Apatite  
Azurite  
Brockite  
Calcite  
Celestite  
Cerussite  
Chalcanthite  
Chalcocite  
Chalcopyrite  
Corundum  
Crypto. Quartz  
Diopside

Epidote  
Galena  
Garnet  
Gypsum  
Halite  
Hematite  
Hercynite  
Hydromica  
Jarosite  
Kaolinite  
Limonite  
Magnetite  
Malachite  
Microcline  
Montmorillonite  
Muscovite

Opal  
Orthoclase  
Pinninite  
Phlogopite  
Prochlorite  
Pyrite  
Pyrolusite  
Quartz  
Rutile  
Scapolite  
Serpentine  
Sphalerite  
Thorite  
Tremolite  
Wad

**SUMMIT COUNTY (61)**

Anglesite  
Argentite  
Azurite  
Balydonite  
Barite  
Bornite  
Boulangerite  
Bournonite  
Brochantite  
Calaverite  
Calcite  
Cerargyrite  
Cerussite  
Chabazite  
Chalcanthite  
Chalcocite  
Chalcopyrite  
Chlorite  
Chrysocolla  
Covellite  
Cuprite

Dolomite  
Epidote  
Fluorite  
Galena  
Garnet  
Gold  
Goslarite  
Gypsum  
Halloysite  
Hematite  
Hemimorphite  
Jamesonite  
Limonite  
Linarite  
Magnesioferrite  
Magnetite  
Malachite  
Manganite  
Massicot  
Metastibnite  
Mimetite

Montmorillonite  
Olivinite  
Phosphorite  
Psilomelane  
Pyrargyrite  
Pyrite  
Pyrolusite  
Pyromorphite  
Quartz  
Rhodochrosite  
Rhodonite  
Serpentine  
Silver  
Sphalerite  
Spinel  
Stibnite  
Tetrahedrite  
Taumasite  
Zinkenite

**TOOELE COUNTY (189)**

Actinolite  
Adamite  
Aikinite  
Albite  
Allanite  
Analcite  
Anatase  
Andalusite

Anglesite  
Anhydrite  
Anorthoclase  
Apatite  
Apophyllite  
Aragonite  
Argentite  
Argentojarosite

Arseniosiderite  
Arsenopyrite  
Augite  
Aurichalcite  
Austinite  
Axinite  
Azurite  
Barite



Beaverite	Gold	Polyhalite	Wolframite	Wulfenite	Zircon
Beidellite	Graphite	Powellite	Wollastonite	Wurtzite	Zoisite
Bertrandite	Gypsum	Prosopite			
Beryl	Halite	Proustite	<b>UINTAH COUNTY (46)</b>		
Beudandite	Halloysite	Psilomelane			
Biotite	Hedenbergite	Pyrargyrite	Abelsonite	Collophane	Malachite
Bischofite	Hematite	Pyrite	Alumian	Dawsonite	Molybdenite
Bismite	Hemimorphite	Pyrolusite	Analcite	Dolomite	Monazite
Bismuth	Hessite	Pyromorphite	Apophyllite	Elpidite	Nahcolite
Bismuthinite	Hornblende	Pyrrhotite	Autunite	Fluorapatite	Neighborite
Bismutite	Huebnerite	Quartz	Azurite	Galena	Norstrandite
Bloedite	Humite	Realgar	Barytocalcite	Garrelsite	Phosphorite
Bornite	Hydromica	Rectorite	Bornite	Glauconite	Pyrite
Boulangerite	Hydrozincite	Rhodochrosite	Burbankite	Gold	Searlesite
Brochantite	Hypersthene	Rhodonite	Calcite	Gypsum	Shortite
Calaverite	Iddingsite	Rosasite	Carbonate apatite	Halotrichite	Smectite
Calcite	Idocrase	Rutile	Carnotite	Hectorite	Smithsonite
Carminite	Ilmenite	Samarskite	Cerargyrite	Hematite	Torbernite
Carnallite	Jamesonite	Scapolite	Cerussite	Ilsemanite	Tyuyamunite
Carphosiderite	Jarosite	Scheelite	Chalcocite	Leucosphenite	Wurtzite
Cerargyrite	Jefferisite	Scorodite	Chromite		
Cerussite	Kainite	Sepiolite			
Chalcanthite	Kaolinite	Serpentine	<b>UTAH COUNTY (164)</b>		
Chalcocite	Kierserite	Siderite			
Chalcopyrite	Labradorite	Siderotil	Acanthite		Chalcocite
Chenevixite	Limonite	Silver	Actinolite		Chalcophanite
Chlorite	Lorandite	Smithsonite	Albite		Chalcopyrite
Chrysocolla	Magnetite	Spadaite	Allanite		Cimolite
Cinnabar	Malachite	Sphalerite	Allophane		Claudetite
Clinoclase	Manganite	Sphene	Altaite		Clinochlore
Clinzoisite	Melanterite	Spinel	Alunite		Cordierite
Cobaltite	Metacinnabar	Stephanite	Anatase		Coronadite
Conichalcite	Microcline	Stibiconite	Anglesite		Crandallite
Copper	Mimetite	Stibnite	Antlerite		Crednerite
Cornwallite	Molybdenite	Stolzite	Apatite		Crypto. Quartz
Covellite	Monazite	Sulfur	Aragonite		Cryptomelane
Crypto. Quartz	Muscovite	Sulvanite	Argentite		Cubanite
Cuprite	Natrojarosite	Sylvite	Argentojarosite		Cuprite
Cuprotungstite	Natrolite	Talc	Azurite		Cuprogoslarite
Danburite	Natron	Tennantite	Barite		Davisonite
Descloisite	Nepheline	Tenorite	Beidellite		Dehrnite
Diopside	Nontronite	Tetrahedrite	Bilinite		Delessite
Dolomite	Oligoclase	Thenardite	Billingsleyite		Deltaite
Enstatite	Oliveneite	Thomsonite	Biotite		Dickite
Epidesmine	Olivine	Topaz	Bismuthian bindheimite		Dolomite
Epidote	Opal	Tourmaline	Bismuthinite		Eardleyite
Ferberite	Orpiment	Tremolite	Boehmite		Enargite
Ferrimolybdate	Orthoclase	Tridymite	Bornite		Endellite
Ferrisymplesite	Paligorskite	Turquoise	Brochantite		Englishite
Fluorite	Pharmacosiderite	Tyrolite	Brucite		Epidote
Galena	Phillipsite	Uraninite	Calcite		Faratsihite
Garnet	Phlogopite	Variscite	Cerargyrite		Ferrogoslarite
Glauberite	Plumbojarosite	Wad	Cerussite		Fluorite

Freibergite	Limonite
Galena	Luzonite
Garnet	Magnetite
Gearsukite	Malachite
Goyazite	Marcasite
Giggsite	Massicot
Gold	Matildite
Gordonite	Melanterite
Graphite	Miargyrite
Greenockite	Microcline
Gunningite	Millisite
Gypsum	Mimetite
Halloysite	Minium
Halotrichite	Molybdenite
Hematite	Monimolite
Hessite	Montgomeryite
Hetaerolite	Monticellite
Hisingerite	Montmorillonite
Hollandite	Muscovite
Hornblende	Nontronite
Hydromica	Nsutite
Jalpaite	Olivine
Jamesonite	Orthoclase
Jarosite	Overite
Jenkinsite	Pargasite
Kaolinite	Pearceite
Kermesite	Periclase
Klaprothite	Petzite
Kolbeckite	Phosphorite
Kornelite	Plumbojarosite
Krennerite	Polybasite
Lanarkite	Potash Alum
Lehiite	Prehnite
Leuchtenbergite	Psilomelane
Leverrierite	Pyrite
Lewistonite	

**WASATCH COUNTY (33)**

Alunite	Hematite	Siderite
Barite	Idocrase	Silver
Bornite	Kaolinite	Sphalerite
Calcite	Magnesioferrite	Spinel
Carbonate apatite	Magnetite	Tetrahedrite
Cerussite	Montmorillonite	
Chabazite	Muscovite	
Chalcopyrite	Pinninite	
Dickite	Phlogopite	
Fluorapatite	Phosphorite	
Galena	Pyrite	
Garnet	Pyrolusite	
Gold	Pyromorphite	
Halloysite	Rhodochrosite	

**WASHINGTON COUNTY (47)**

Adamite	Chrysocolla	Montmorillonite
Agularite	Copper	Muscovite
Alunite	Crypto. Quartz	Orpiment
Argentite	Cuprite	Plumbojarosite
Aurichalcite	Embolite	Pyrite
Autunite	Gold	Pyrolusite
Azurite	Gypsum	Quartz
Birnessite	Halite	Realgar
Bornite	Halloysite	Rosasite
Calcite	Hematite	Scheelite
Carnotite	Hydrozincite	Silver
Celestite	Jarosite	Smithsonite
Cerargyrite	Kaolinite	Stibnite
Cerussite	Limonite	Tenorite
Chalcocite	Magnetite	Volborthite
Chalcopyrite	Malachite	

**WAYNE COUNTY (33)**

Alunite	Jarosite	Rutile
Anatase	Johannite	Schoepite
Anhydrite	Lepidocrocite	Schroekingerite
Azurite	Limonite	Sideronatriite
Brochantite	Malachite	Skłodowskite
Carnotite	Metarossite	Staurolite
Chalcanthite	Metatorbernite	Torbernite
Chalcopyrite	Metazeunerite	Uraninite
Crypto. Quartz	Monazite	Uranopilitite
Galena	Pyrite	Zippeite
Gypsum	Pyrolusite	Zircon

**WEBER COUNTY (26)**

Anglesite	Magnetite
Azurite	Malachite
Barite	Molybdenite
Biotite	Phosphorite
Bornite	Psilomelane
Calcite	Pyrite
Cerussite	Pyrolusite
Chalcopyrite	Quartz
Epidote	Silver
Fluorite	Uraninite
Galena	
Garnet	
Gold	
Hematite	
Hornblende	
Limonite	

## Utah Minerals Listed by Crystal Systems

The minerals of the State fall into 8 categories: the 6 crystal systems, amorphous minerals, and minerals with an undetermined status. An alphabetical listing of the crystal systems follows with the minerals that fall into each system. The total number of minerals found in each system is indicated by the number in parentheses. It is apparent that the six crystal systems vary greatly in the number of minerals which represent them.

## AMORPHOUS (7)

Allophane  
Cimolite  
Hisingerite  
Jordisite  
Limonite  
Metastibnite  
Opal

## HEXAGONAL (77)

Alumian  
Alunite  
Ammoniojarosite  
Andersonite  
Ankerite  
Apatite  
Argentojarosite  
Arsenic  
Basaluminate  
Beaverite  
Beryl  
Beudantite  
Birnessite  
Bismuth  
Braitschite  
Brockite  
Brucite  
Burbankite  
Calcite  
Carbonate Apatite  
Carphosiderite  
Chabazite  
Chalcophyllite  
Cinnabar  
Cobaltocalcite  
Connellite  
Coquimbite  
Corkite  
Corundum  
Covellite

Crandallite  
Davisonite  
Dehrnite  
Deltaite  
Dolomite  
Eitelite  
Ettringite  
Fluorapatite  
Goyazite  
Graphite  
Greenockite  
Gyrolite  
Hematite  
Ilemnite  
Jarosite  
Lewistonite  
Magnesite  
Manganocalcite  
Mixite  
Molybdenite  
Natroalunite  
Natrojarosite  
Nepheline  
Niccolite  
Nolanite  
Nsutite  
Osarizawaite  
Plumbojarosite  
Proustite  
Pyrargyrite  
Pyromorphite  
Pyrrhotite  
Quartz  
Rhodochrosite  
Selenium  
Siderite  
Smithsonite  
Spangolite  
Tetradymite  
Thaumasite

Tourmaline  
Tridymite (beta)  
Tungstenite  
Vanadinite  
Willemite  
Wurtzite  
Zinkenite

## ISOMETRIC (58)

Aguilarite  
Altaite  
Ammonia alum  
Analcite  
Argentite  
Argyrodite  
Arsenobismite  
Bindheimite  
Bismuthian bindheimite  
Bixbyite  
Bornite  
Bravoite  
Cerargyrite  
Chromite  
Clausthalite  
Cobaltite  
Copper  
Cuprite  
Digenite  
Donkeyite  
Embolite  
Fluorite  
Galena  
Garnet  
Gersdorffite  
Gold  
Halite  
Helvite  
Hercynite  
Jalpaite  
Magnesioferrite  
Magnetite  
Metacinnabar  
Monimolite  
Northupite  
Noselite  
Onofrite  
Palladium  
Periclase  
Petzite  
Pharmacosiderite  
Platinum  
Potash Alum

Pyrite  
Senarmontite  
Silver  
Smaltite  
Sodalite  
Sphalerite  
Spinel  
Stibiconite  
Sulvanite  
Sylvite  
Tennantite  
Tetrahedrite  
Tiemannite  
Uraninite  
Voltaite

## MONOCLINIC (170)

Acmite  
Actinolite  
Aegirite  
Allanite  
Aluminate  
Annabergite  
Antigorite  
Apjohnite  
Arsenosiderite  
Arsenopyrite  
Augite  
Azurite  
Balydonite  
Barnesite  
Barytocalcite  
Bassanite  
Bassetite  
Bayleyite  
Beidellite  
Beta-uranotile  
Bieberite  
Bilinite  
Biotite  
Bischofite  
Bismite  
Bloedite  
Boothite  
Boulangerite  
Brochantite  
Butlerite  
Calaverite  
Carnotite  
Celadonite  
Chevkinite  
Chlorite

Chrome mica-clay	Kermesite	Ripidolite	Bournonite
Claudetite	Kieserite	Rosasite	Brookite
Clinochlore	Kinoite	Roscoelite	Calciovolborthite
Clinoclase	Kornelite	Saponite	Calcedonite
Clinohumite	Lanarkite	Searlesite	Carminite
Clinoptilolite	Laumontite	Serpentine	Carnallite
Clinzoisite	Leadhillite	Simplotite	Camotite
Cobaltomenite	Leuchtenbergite	Sklodowskite	Celesite
Coconinoite	Leucosphenite	Sphene	Cerussite
Cornwallite	Leverrierite	Spodumene	Cervantite
Crednerite	Linarite	Stilbite	Chalcocite
Cryolite	Lithioplörite	Stringhamite	Chenevixite
Cuprobismutite	Lorandite	Swartzite	Chrysocolla
Damourite	Magnesioriebeckite	Sylvanite	Conichalcite
Delessite	Malachite	Szomolnokite	Cordierite
Dickite	Mallardite	Talc	Cosalite
Diopside	Manganite	Tenorite	Cotunnite
Doloresite	Melanterite	Tremolite	Cubanite
Dufrenoy'site	Mesolite	Trona	Cuprogoslarite
Endellite	Metahewettite	Umohoite	Cuprosklodowskite
Englishite	Metastrengite	Uranophane	Cyanotrichite
Ephesite	Metavariscite	Uranopilite	Danburite
Epidote	Miargyrite	Vivianite	Dawsonite
Erythrite	Mimetite	Voglite	Descloizite
Faratsihite	Mirabilite	Volborthite	Diaspore
Ferberite	Monazite	Volchonskoite	Dumortierite
Fervanite	Montgomeryite	Whewellite	Dyscarsite
Foshagite	Montmorillonite	Wolframite	Elpidite
Garrel'site	Mordenite	Xantophyllite	Emplectite
Gearksutite	Muscovite		Enargite
Geocronite	Nahcolite	ORTHORHOMBIC (139)	Enstatite
Gibbsite	Natron		Epidesmine
Glauconite	Navajoite	Acanthite	Epsomite
Glauberite	Nontronite	Adamite	Erinite
Goldichite	Norstrandite	Aikinite	Eucarite
Grantsite	Orpiment	Aluminite	Ferrimolyb'dite
Gunningite	Orthoclase	Andalusite	Ferrogostarite
Gypsum	Paligorskite	Anglesite	Ferroselite
Halotrichite	Pargasite	Anhydrite	Fibroferrite
Halloysite	Pearceite	Anthophyllite	Fluellite
Hectorite	Penninite	Antlerite	Forsterite
Hedenbergite	Phillipsite	Aragonite	Fourmarierite
Hessite	Phlogopite	Ardunite	Goethite
Heulandite	Pickeringite	Atacamite	Goslarite
Hewettite	Pisanite	Aurichalcite	Hemimorphite
Hollandite	Polybasite	Austinite	Humite
Hornblende	Prochlorite	Barite	Huntite
Heubnerite	Prosopite	Becquerelite	Hypersthene
Hydromagnesite	Pyrophyllite	Bertrandite	Iddingsite
Hydrozincite	Quenselite	Billingsleyite	Klaprothite
Jamesonite	Rabbittite	Bismuthinite	Kolbeckite
Kainite	Realgar	Boehmite	Kornerupine
Kasolite	Riebeckite	Boltwoodite	Krennerite

Lepidocrocite	Topaz	Torbernite	Ferrisymplectite
Libethenite	Tridymite (alpha)	Uranospathite	Gummite
Liebigite	Tyrolite	Uranospinite	Ilsemanite
Ludwigite	Tyuyamunite	Wardite	Jefferisite
Marasite	Uvanite	Wulfenite	Jenkinsite
Massicot	Valentinite	Xenotime	Lehiite
Matildite	Vandendriesscheite	Zeunerite	Loughlinitite
Metatyuyamunite	Variscite	Zircon	Phosphorite
Monticellite	Wavellite		Pintadoite
Montroseite	Weeksite	TRICLINIC (32)	Pitticite
Mottramite	Zippeite		Racewinite
Natrolite	Zoisite	Abelsonite	Rauvite
Neighborite		Albite	Serpophite
Niter	TETRAGONAL (46)	Alunogen	Spadaite
Olivenite		Andesine	Steigerite
Olivine	Abernathyite	Anorthite	Thinolite
Overite	Anatase	Anorthoclase	Thucholite
Parabutlerite	Apophyllite	Axinite	Titanoclinohumite
Paramontroseite	Argyrodite	Chalcanthite	Vanoxite
Phosphuranylite	Autunite	Chalcophanite	Vermiculite
Plancheite	Bismoclite	Dopiapite	Wad
Prehnite	Bismutite	Diadochite	Zunyite
Pseudobrookite	Braunite	Gordonite	
Psilomelane	Cassiterite	Hummerite	
Ptilolite	Coffinite	Johannite	
Rhomboclase	Chalcopyrite	Kaolinite	
Rockbridgeite	Coronadite	Kyanite	
Rutherfordine	Cristobalite	Labradorite	
Samarskite	Cryptomelane	Melanovanadite	
Schoepite	Daubreeite	Metarossite	
Schroëckingerite	Famantinite	Microcline	
Scorodite	Freibergite	Okenite	
Seligmannite	Hetaerolite	Oligoclase	
Sepiolite	Idocrase	Pascoite	
Shortite	Luzonite	Polyhalite	
Sicklerite	Meta-autunite	Reedmergnerite	
Sideronatrite	Metatorbernite	Rhodonite	
Soddyite	Meta-uranocircite	Roemerite	
Staurolite	Metaseunerite	Rossite	
Stellerite	Millisite	Siderotil	
Stepanite	Minium	Turquoise	
Sterrettite	Novacekite	Voglite	
Sibnite	Phosgenite	Wollastonite	
Stromeyerite	Powellite		
Strontianite	Pyrolusite	UNDETERMINED (28)	
Sulfur	Rutile		
Sussexite	Sabugalite	Alaskaite	
Szaibelyite	Saleeite	Borickite	
Thenardite	Scapolite	Corvusite	
Thermonatrite	Scheelite	Cuprotungstite	
Thomsonite	Sherwoodite	Eardleyite	
Tinticite	Stolzite	Fernandinite	
Tobermorite	Thorite		

## Utah Minerals Listed by Chemical Class

The minerals of the State have been assigned to 21 chemical classes. Less than 40 percent of Utah's minerals fall into a single chemical class, such as a simple sulfide or oxide. Many fall into 2 chemical classes, such as azurite, which is listed as a carbonate, and also as a hydroxyl-hydrous mineral. Several lie in 3 chemical classes and a few in 4 classes. One of the surprising results in this tabulation is the abundance of hydroxyl-hydrous minerals. A total of 277 minerals, or 55 percent of the minerals of Utah, contain water. An alphabetical listing of the chemical classes follows with the minerals that fall into each class. The total minerals found in each class is indicated by the number in parentheses.

## ANTIMONATES-ANTIMONITES (4)

Bindheimite  
Bismuthian bindheimite  
Dyscarsite  
Nonimolite

## ARSENATES-ARSENITES (30)

Abernathyite	Uranospinite
Adamite	Zeunerite
Annabergite	
Arseniosiderite	ARSENIDES (2)
Arsenobismite	
Austinite	Donkeyite
Balydonite	Niccolite
Beudantite	
Carminite	BORATES (6)
Chalcophyllite	
Chenevixite	Axinite
Clinoclase	Braitschite
Conichalcite	Dumortierite
Cornwallite	Ludwigite
Erinite	Sussexite
Erythrite	Szaibelyite
Ferrisymplesite	
Metazeunerite	CARBONATES (47)
Mimetite	
Mixite	Andersonite
Novacekite	Ankerite
Olivenite	Aragonite
Pharmacosiderite	Aurichalcite
Pitticite	Azurite
Scorodite	Barytocalcite
Smaltite	Bayleyite
Tyrolite	Bismutite
Uranospathite	Brockite

Burbankite	Gearksutite
Calcite	Halite
Calcedonite	Kainite
Carbonate apatite	Mimetite
Cerussite	Neighborite
Cobaltocalcite	Northupite
Collophane	Phosgenite
Dawsonite	Prosopite
Dolomite	Pyromorphite
Eardleyite	Scapolite
Eitelite	Sodalite
Huntite	Spangolite
Hydromagnesite	Sylvite
Hydrozincite	Vanadinite
Leadhillite	
Liebigite	
Magnesite	
Malachite	
Manganocalcite	
Nahcolite	
Natron	
Rabbittite	
Rhodochrosite	
Rosasite	
Rutherfordine	
Scapolite	
Schroëckingerite	
Shortite	
Siderite	
Smithsonite	
Strontianite	
Swartzite	
Thaumasite	
Thermonatrite	
Thinolite	
Trona	
Tyrolite	
Voglite	

## HYDROXYL-HYDROUS (319)

	Abernathyite
	Actinolite
	Adamite
	Allanite
	Allophane
	Aluminite
	Alunite
	Alunogen
	Ammonia alum
	Ammoniojarosite
	Analcite
	Andersonite
	Annabergite
	Anthophyllite
	Antigorite
	Antlerite
	Apjohnite
	Apophyllite
	Ardunite
	Argentojarosite
	Arseniosiderite
	Arsenobismite
	Atacamite
	Aurichalcite
	Austinite
	Autunite
	Axinite
	Azurite
	Balydonite
	Barnesite
	Basaluminite
	Bassanite
	Bassetite
	Bayleyite
	Beaverite

Becquerelite	Cuprogoslarite	Heulandite	Mixite
Beidellite	Cuprosklodowskite	Hewettite	Montgomeryite
Bertrandite	Cuprotungstite	Hisingerite	Montmorillonite
Beta-Uranotile	Cyanotrichite	Hornblende	Montroseite
Beudantite	Damourite	Humite	Mordenite
Bieberite	Davisonite	Hydromagnesite	Mottramite
Bilinite	Dawsonite	Hydromica	Muscovite
Bindheimite	Dehrnite	Hydrozincite	Natroalunite
Biotite	Delessite	Iddingsite	Natrojarosite
Birnessite	Deltaite	Idocrase	Natrolite
Bischofite	Descloizite	Ilsemanite	Natron
Bismuthian bindheimite	Diadochite	Jarosite	Navajoite
Bloedite	Diaspore	Jefferisite	Nontronite
Boehmite	Dickite	Jenkinsite	Norstrandite
Boltwoodite	Doloresite	Johannite	Novacekite
Boothite	Elpidite	Kainite	Okenite
Borickite	Endellite	Kaolinite	Olivenite
Brachantite	Englishite	Kasolite	Opal
Braitschite	Ephesite	Kieserite	Osarizawaite
Brockite	Epidesmine	Kinoite	Overite
Brucite	Epidote	Kornelite	Paligorskite
Butlerite	Epsomite	Kornerupine	Parabutlerite
Calciovolborthite	Erinite	Kolbeckite	Paragasite
Calcedonite	Erythrite	Laumontite	Pascoite
Carbonate apatite	Ettringite	Leadhillite	Pharmacosiderite
Carminite	Faratsihite	Lehiite	Phillipsite
Carnallite	Fernandinite	Lepidocrocite	Phlogopite
Carnotite	Ferrimolybdite	Leuchtenbergite	Phosphryanylite
Carphosiderite	Ferrisymplesite	Leverrierite	Pickeringite
Chabazite	Ferrogoslarite	Lewistonite	Pinninite
Chalcophanite	Fervanite	Libethenite	Pintadoite
Chalcophyllite	Fibroferrite	Liebigite	Pisanite
Chenevixite	Fluellite	Limonite	Pitticite
Chlorite	Foshagite	Linarite	Plancheite
Chrome mica-clay	Fourmarierite	Loughlinite	Plumbojarosite
Chrysocolla	Garrelsite	Magnesioriebeckite	Polyhalite
Cimolite	Gearsutite	Malachite	Potash Alum
Clinochlore	Gibbsite	Mallardite	Prehnite
Clinoclase	Glaucosite	Manganite	Prochlorite
Clinohumite	Goethite	Melanterite	Prosopite
Clinoptilolite	Goldichite	Mesolite	Psilomelane
Clinzoisite	Gordonite	Meta-aluminite	Ptilolite
Coconinoite	Goslarite	Meta-autunite	Pyrophyllite
Coffinite	Goyazite	Metahebettite	Quenselite
Collophane	Grantsite	Metarossite	Rabgittite
Conichalcite	Gummite	Metastrengite	Racewinite
Connellite	Gunningite	Metatorbernite	Rauvite
Copiapite	Gypsum	Metatyuyamunite	Rectorite
Coquimbite	Gyrolite	Meta-Uranocircite	Rhomboclase
Corkite	Halloysite	Metavariscite	Ripidolite
Cornwallite	Halotrichite	Metazeunerite	Rockbridgeite
Corvusite	Hectorite	Millisite	Roemerite
Crandallite	Hemimorphite	Mirabilite	Rosasite

Roscoelite	Vanoxite	Anatase	Tenorite
Rossite	Variscite	Becquerelite	Titanclinohumite
Sabugalite	Vermiculite	Birnessite	Uraninite
Saleeite	Vivianite	Bismite	Valentinite
Saponite	Voglite	Bismoclite	Vandendriesscheite
Schroëckingerite	Volborthite	Bismutite	Vanoxite
Scorodite	Volchonskoite	Bixbyite	Wad
Searlesite	Voltaite	Boehmite	
Sepiolite	Wad	Braunite	PHOSPHATES (49)
Serpentine	Wardite	Brookite	
Serpophite	Wavellite	Cassiterite	Apatite
Sherwoodite	Weeksite	Cervantite	Autunite
Sideronatrite	Whewellite	Chalcophanite	Bassetite
Siderotil	Xantophyllite	Chromite	Borickite
Simplotite	Zeunerite	Claudeteite	Brockite
Skłodowskite	Zippeite	Corundum	Carbonate apatite
Smectite	Zoisite	Corvusite	Coconinoite
Soddyite	Zunyite	Crednerite	Collophane
Spadaite		Cryptomelane	Corkite
Spangolite	MANGANATES (1)	Cuprite	Crandallite
Staurolite		Diaspore	Davisonite
Steigerite	Hollandite	Doloresite	Dehrnite
Stellerite		Gibbsite	Deltaite
Sterrettite	MOLYBDATES (4)	Goethite	Diadochite
Stibiconite		Gummite	Englishite
Stilbite	Ferrimolybdite	Hematite	Fluorapatite
Stringhamite	Powellite	Hercynite	Gordonite
Sussexite	Umohoite	Hetaerolite	Goyazite
Swartzite	Wulfenite	Ilmenite	Kolbeckite
Szomolnokite		Ilsemannite	Lehiite
Szzibelyite	NATIVE ELEMENTS (11)	Lepidocrocite	Lewistonite
Talc		Limonite	Libethenite
Thaumasite	Arsenic	Lithiophorite	Meta-Autunite
Thermonatrite	Bismuth	Magnesioferrite	Metastrengite
Thomsonite	Copper	Magnetite	Metatorbernite
Tinticite	Gold	Manganite	Meta-Uranocircite
Titanclinohumite	Graphite	Massicot	Metavariscite
Tobermorite	Mercury	Minium	Millisite
Topaz	Palladium	Montroseite	Mimetite
Torbernite	Platinum	Navajoite	Monazite
Tourmaline	Selenium	Nsutite	Montgomeryite
Tremolite	Silver	Paramontroseite	Overite
Trona	Sulfur	Periclase	Phosphorite
Turquoise		Pseudobrookite	Phosphyranylite
Tyrolite	NITRATES (1)	Psilomelane	Pyromorphite
Tyuyamunite		Pyrolusite	Rockbridgeite
Umohoite	Niter	Quenselite	Sabugalite
Uranophane		Rutile	Saleeite
Uranopilite	OXALATES (1)	Samarskite	Sicklerite
Uranospathite		Schoepite	Sterrettite
Uranospinite	Whewellite	Senarmontite	Tinticite
Uvanite		Spinel	Torbernite
Vandendriesscheite	OXIDES (60)	Stibiconite	Turquoise



Uranospathite	Clinoptilolite	Magnesianarvedsonite	Thaumasite
Variscite	Clinozoisite	Magnesianriebeckite	Thomsonite
Vivianite	Coffinite	Mesolite	Thorite
Wardite	Cordierite	Microcline	Titanoclinohumite
Wavellite	Cristobalite	Monticellite	Torbermorite
Xenotime	Crypto. Quartz	Montmorillonite	Topaz
	Cuprosklodowskite	Mordenite	Tourmaline
SELENATES-SELENITES (4)	Damourite	Muscovite	Tremolite
	Danburite	Natrolite	Tridymite
Clausthalite	Delessite	Nepheline	Uranophane
Cobaltomenite	Dickite	Nontronite	Vermiculite
Onofrite	Diopside	Noselite	Volchonskoite
Tiemannite	Dumortierite	Okenite	Weeksite
	Elpidite	Oligoclase	Willemite
SELENIDES (2)	Endellite	Olivine	Wollastonite
	Enstatite	Opal	Xantophyllite
Eucarite	Ephesite	Orthoclase	Zircon
Ferroselite	Epidesmine	Paligorskite	Zoisite
	Epidote	Pargasite	Zunyite
SILICATES (157)	Faratsihite	Pinnite	
	Ferrogoslarite	Phillipsite	SULFATES (81)
Acmite	Forsterite	Phlogopite	Alumian
Actinolite	Foshagite	Planchete	Aluminite
Aegirite	Garnet	Prehnite	Alunite
Albite	Garrelsite	Prochlorite	Alunogen
Allanite	Glaucosite	Ptilolite	Ammonia Alum
Allophane	Gyrolite	Pyrophyllite	Ammoniojarosite
Analcite	Halloysite	Quartz	Anglesite
Andalusite	Hectorite	Racewinite	Anhydrite
Andesine	Hedenbergite	Rectorite	Antlerite
Anorthite	Helvite	Reedmergnerite	Apjohnite
Anorthoclase	Hemimorphite	Rhodonite	Argentojarosite
Anthophyllite	Heulandite	Riebeckite	Barite
Antigorite	Hisingerite	Ripidolite	Basaluminite
Aopohyllite	Hornblende	Roscoelite	Bassanite
Ardunite	Humite	Saponite	Beaverite
Augite	Hydromica	Scapolite	Beudantite
Axinite	Hypersthene	Searlesite	Bieberite
Beidellite	Iddingsite	Sepiolite	Bilinite
Bertrandite	Idocrase	Serpentine	Bloedite
Beryl	Jefferisite	Serpophite	Boothite
Beta-uranotile	Jenkinsite	Sklodowskite	Brochantite
Biotite	Kaolinite	Smectite	Butlerite
Boltwoodite	Kasolite	Sodalite	Calcedonite
Celadonite	Kinoite	Soddyite	Carphosiderite
Chabazite	Kornerupine	Spadaite	Celestite
Chevkinite	Kyanite	Sphene	Chalcanthite
Chlorite	Labradorite	Spodumene	Chalcophyllite
Chrome mica-clay	Laumontite	Staurolite	Coconinoite
Chrysocolla	Leuchtenbergite	Stellerite	Connellite
Cimolite	Leucosphenite	Stilbite	Copiapite
Clinochlore	Leverrierite	Stringhamite	Coquimbite
Clinohumite	Loughlinitite	Talc	

Corkite	Aguilarite	Geocronite	Metazeunerite
Cuprogoslarite	Aikinite	Jamesonite	Novacekite
Cyanotrichite	Alaskaite	Lorandite	Phosphuranylite
Diadochite	Argentite	Luzonite	Rauvite
Epsomite	Argyrodite	Miargyrite	Rutherfordine
Ettringite	Arsenopyrite	Pearceite	Sabugalite
Fibroferrite	Bismuthinite	Polybasite	Saleeite
Glauberite	Bornite	Proustite	Schroeckingerite
Goldichite	Bravoite	Pyrargyrite	Sklodowskite
Goslarite	Chalcocite	Seligmannite	Soddyite
Gunningite	Chalcopyrite	Stephanite	Sqartzite
Gypsum	Cinnabar	Tennantite	Torbernite
Halotrichite	Cobaltite	Tetrahedrite	Tyuyamunite
Jarosite	Cosalite	Zinkenite	Umohoite
Johannite	Covellite		Uranophane
Kainite	Cubanite	TELLURIDES (6)	Uranopilite
Mieserite	Cuprobismutite	Altaite	Uranospinite
Kornelite	Digenite	Calaverite	Uranospathie
Lanarkite	Dufrenoyseite	Hessite	Uvanite
Leadhillite	Emplectite	Krennerite	Voglite
Linarite	Galena	Petzite	Weeksite
Mallardite	Gersdorffite	Sylvanite	Zeunerite
Meta-aluminite	Greenockite		Zippeite
Melanterite	Jalpaite	TUNGSTATES (7)	
Mirabilite	Jordisite		VANADATES (27)
Natroalunite	Kermesite	Cuprotungstite	Barnesite
Natrojarosite	Klaprothite	Ferberite	Calciovolborthite
Noselite	Marcasite	Heubnerite	Carnotite
Osarizawaite	Matildite	Powellite	Descloizite
Parabutlerite	Metacinnabar	Scheelite	Fernandinite
Pickeringite	Metastibnite	Stolzite	Fervanite
Pisanite	Molybdenite	Wolframite	Grantsite
Pitticite	Onofrite		Hewettite
Plumbojarosite	Orpiment	URANINATES (40)	Hummerite
Polyhalite	Pyrite		Melanovanadite
Potash Alum	Pyrrhotite	Abernathyite	Metahewettite
Rhombochase	Realgar	Andersonite	Metarossite
Rosemerite	Sphalerite	Autunite	Metatyuyamunite
Scapolite	Stibnite	Bassetite	Mottramite
Schroeckingerite	Stromeyerite	Bayleyite	Nolanite
Sideronatrite	Sulvanite	Beta-uranotile	Pascoite
Siderotil	Tetradymite	Boltwoodite	Pintadoite
Spangolite	Tungstenite	Carnotite	Rauvite
Szomolnokite	Wurtzite	Cuprosklodowskite	Roscoelite
Thaumasite		Fourmarierite	Rossite
Thenardite	SULFOSALTS (20)	Johannite	Sherwoodite
Uranopilite	Billingsleyite	Kasolite	Simplotite
Voltaite	Boulangerite	Liebigite	Steigerite
Zippeite	Bourmonite	Meta-autunite	Tyuyamunite
	Enargite	Metatorbernite	Uvanite
SULFIDES (45)	Famatinite	Metatyuyamunite	Vanadinite
	Freibergite	Meta-Uranocircite	Volborthite
Acanthite			

## Utah Minerals Listed Under Selected Metallic Elements

Thirty metallic elements were selected by the author for consideration in this compilation. Most of these elements have formed ore deposits of actual or potential economic value in Utah; few metallic elements such as chromium, cobalt, nickel, and tin occur in minerals that may have only mineralogical significance. An alphabetical listing of the thirty selected metallic elements is given below. After each element is a list of Utah minerals containing it. The numbers in parentheses indicate the number of minerals in each list.

<b>ANTIMONY MINERALS (23)</b>	Chalcopyllite
	Chenevixite
Billingsleyite	Claudetite
Bindheimite	Clinoclase
Bismuthian bindheimite	Cobaltite
Boulangerite	Conichalcite
Bourmonite	Cornwallite
Cervantite	Donkeyite
Dyscarsite	Dufrenoyite
Famatinite	Enargite
Geocronite	Erinite
Jamesonite	Erythrite
Kermesite	Ferrisymplesite
Metastibnite	Geocronite
Miargyrite	Gersdorffite
Monimolite	Lorandite
Polybasite	Luzonite
Pyrargyrite	Metazeunerite
Senarmontite	Mimetite
Stephanite	Mixite
Stibiconite	Niccolite
Stibnite	Novacekite
Tetrahedrite	Olivenite
Valentinite	Orpiment
Zinkenite	Pearceite
	Pharmacosiderite
<b>ARSENIC MINERALS (49)</b>	Pitticite
	Proustite
Abernathyite	Realgar
Adamite	Scorodite
Annabergite	Seligmannite
Arsenic	Smaltite
Arseniosiderite	Tennantite
Arsenobismite	Tyrolite
Arsenopyrite	Uranospathite
Austinite	Uranospinite
Balydonite	Zeunerite
Beudantite	
Billingsleyite	<b>BARIUM MINERALS (9)</b>
Carminite	Barite

Barytocalcite	<b>COBALT MINERALS (9)</b>
Burbankite	
Danburite	Annabergite
Garrelsite	Bieberite
Hollandite	Cobaltite
Leucosphenite	Cobaltocalcite
Meta-Uranocircite	Cobaltomenite
Psilomelane	Cryptomelane
	Erythrite
<b>BERYLLIUM MINERALS (4)</b>	Gersdorffite
	Smaltite
Allanite	
Bertrandite	<b>COPPER MINERALS (76)</b>
Beryl	
Helvite	Aikinite
	Alaskaite
<b>BISMUTH MINERALS (17)</b>	Antlerite
	Atacamite
Aikinite	Aurichalcite
Alaskaite	Azurite
Arsenobismite	Balydonite
Bismite	Beaverite
Bismoclite	Boothite
Bismuth	Bornite
Bismuthian bindheimite	Bournonite
Bismuthinite	Brochantite
Bismutite	Calcedonite
Cosalite	Calciovolborthite
Cuprobismutite	Chalcanthite
Daubreeite	Chalcocite
Emplectite	Chalcopyllite
Klaprothite	Chalcopyrite
Matildite	Chenevixite
Mixite	Chrysocola
Tetradymite	Clinoclase
	Conichalcite
<b>CADMIUM MINERALS (1)</b>	Connellite
	Copper
Greenockite	Cornwallite
	Covellite
<b>CERIUM MINERALS (5)</b>	Crednerite
	Cubanite
Allanite	Cuprite
Burbankite	Cuprobismutite
Chevkinite	Cuprogoslarite
Monazite	Cuprosklodowskite
Samarskite	Cuprotungstite
	Cyanotrichite
<b>CHROMIUM MINERALS (2)</b>	Descloizite
	Digenite
Chrome mica-clay	Donkeyite
Chromite	Emplectite
	Eucarite



Allanite	Erythrite	Wavellite	TELLURIUM MINERALS (7)
Apjohnite	Gersdorffite	Xenotime	
Axinite	Nicolite		Altaite
Birnessite	Smaltite	PLATINUM MINERALS (1)	Calaverite
Bixbyite			Hessite
Braunite	PHOSPHORUS	Platinum	Krennerite
Chalcophanite	MINERALS (48)		Petzite
Coronadite	Apatite	SCANDIUM MINERALS (1)	Sylvanite
Crednerite	Autunite		Tetradymite
Cryptomelane	Bassetite	Kolbeckite	
Hetaerolite	Borickite		THORIUM MINERALS (1)
Hollandite	Carbonate apatite	SELENIUM MINERALS (2)	
Huebnerite	Coconinoite	Eucarite	Thorite
Jenkinsite	Collophane	Ferrosilite	
Lithiophorite	Corkite		TIN MINERALS (2)
Mallardite	Crandallite	SILVER MINERALS (26)	
Manganite	Davisonite		Cassiterite
Manganocalcite	Dehrite	Acanthite	Samarskite
Nsutite	Deltaite	Agularite	
Psilomelane	Diadochite	Alaskaite	TITANIUM MINERALS (10)
Pyrolusite	Englishite	Argentite	
Quenselite	Fluorapatite	Argentojarosite	Anatase
Rhodochromite	Gordonite	Argyrodite	Brookite
Rhodonite	Goyazite	Billingsleyite	Chevkinite
Rockbridgeite	Kolbeckite	Cerargyrite	Ilmenite
Sicklerite	Lehiite	Dyscarsite	Leucosphenite
Sussexite	Lewistonite	Embolit	Pseudobrookite
Szaibelyite	Libethenite	Eucarite	Rutile
Wad	Meta-autunite	Freibergite	Samarskite
Wolframite	Metastrengite	Hesite	Sphene
	Metatorbernite	Jalpaite	Titanoclinohumite
MERCURY MINERALS (5)	Meta-uranocircite	Matildite	
	Metavariscite	Miargyrite	TUNGSTEN MINERALS (8)
Cinnabar	Millisite	Pearceite	
Mercury	Mimetite	Petzite	Cuprotungstite
Metacinnabar	Monazite	Polybasite	Ferberite
Onofrite	Montgomeryite	Proustite	Huebnerite
Tiemannite	Overite	Pyrrargyrite	Powellite
	Phosphorite	Silver	Scheelite
MOLYBDENUM MINERALS (7)	Phosphuranylite	Stephanite	Stolzite
	Pyromorphite	Stromeyerite	Tungstenite
Ferrimolybdate	Rockbridgeite	Sylvanite	Wolframite
Ilsemanite	Sabugalite	Tetrahedrite	
Jordisite	Saleeite		VANADIUM MINERALS (35)
Molybdenite	Sicklerite		
Powellite	Sterrettite	STRONTIUM	Barnesite
Umohoite	Tinticite	MINERALS (4)	Calciovolborthite
Wulfenite	Torbernite		Carnotite
	Turquoise	Burbankite	Coconinoite
NICKEL MINERALS (6)	Uranospathite	Celestite	Corvusite
	Variscite	Goyazite	Descloizite
Annabergite	Vivianite	Strontianite	Doloresite
Eardleyite	Wardite		Fernandinite

Fervanite	Phosphuranylite
Grantsite	Rabbittite
Hewettite	Rauvite
Hummerite	Rutherfordine
Melanovanadite	Sabugalite
Metaahewet	Saleeite
Metaahewettite	Samarskite
Metarossite	Schoepite
Metatyuyamunite	Schroekingierite
Montroseite	Sklodowskite
Mottramite	Soddyite
Navajoite	Swartzite
Nolanite	Torbernite
Paramontroseite	Tyuyamunite
Pascoite	Umohoite
Pintadoite	Uranophane
Rauvite	Uranopilite
Roscoelite	Uranospathite
Rossite	Uranospinite
Sherwoodite	Uvanite
Simplotite	Vandendriesscheite
Steigerite	Voglite
Sulvanite	Weeksite
Tyuyamunite	Zeunerite
Uvanite	Zippeite
Vanadinite	<b>ZINC MINERALS (22)</b>
Vanoxite	Adamite
Volborthite	Aurichalcite
<b>URANIUM MINERALS (47)</b>	Austinite
Abernathyite	Chalcophanite
Andersonite	Cryptomelane
Autunite	Cuprogoslarite
Bassetite	Descloizite
Bayleyite	Eardleyite
Becquerelite	Ferrogoslarite
Beta-Uranotile	Freibergite
Boltwoodite	Goslarite
Carnotite	Gunningite
Coffinite	Hemimorphite
Cuprosklodowskite	Hetaerolite
Fourmarierite	Hydrozincite
Gummite	Mottramite
Johannite	Rosasite
Kasolite	Smithsonite
Liebigite	Sphalerite
Meta-autunite	Tetrahedrite
Metatorbernite	Willemite
Metatyuyamunite	Wurtzite
Meta-uranocircite	<b>ZIRCONIUM MINERALS (2)</b>
Metazeunerite	Elpidite
Novacekite	Zircon

### Utah Minerals Listed Under Counties by Selected Metallic Elements

The 30 metallic elements listed with the minerals they form in Utah (section above) were programmed for a computer analysis to determine their occurrence and distribution in the 29 counties of Utah. Specific mineral occurrences can be found by referring to Chapter III. The counties, metallic elements, and minerals are alphabetically arranged. Figures in parentheses indicate the number of minerals in each list.

#### BEAVER COUNTY

##### ANTIMONY (4)

Bindheimite  
Jamesonite  
Pyrargyrite  
Tetrahedrite

##### ARSENIC (3)

Dufrenoyite  
Proustite  
Scorodite

##### BARIUM (1)

Barite

##### BERYLLIUM (2)

Beryl  
Helvite

##### BISMUTH (3)

Bismuthinite  
Bismutite  
Cosalite

##### CADMIUM (1)

Greenockite

##### COPPER (20)

Aurichalcite  
Azurite  
Beaverite  
Bornite  
Brochantite  
Chalcanthite  
Chalcocite  
Chalcocopyrite  
Chrysocolla  
Copper  
Covellite  
Cuprite

Kinoite  
Linarite  
Malachite  
Plancheite  
Stringhamite  
Tenorite  
Tetrahedrite  
Torbernite

**GOLD (1)**  
Gold

##### IRON (30)

Actinolite  
Argentojarosite  
Augite  
Beaverite  
Biotite  
Bornite  
Chalcocopyrite  
Corkite  
Epidote  
Garnet  
Goethite  
Hedenbergite  
Hematite  
Hornblende  
Hypersthene  
Idocrase  
Ilmenite  
Jamesonite  
Jarosite  
Limonite  
Ludwigite  
Magnetite  
Marcasite  
Olivine  
Plumbojarosite  
Pyrite  
Scorodite  
Siderite

Tourmaline	Rutile	COPPER (12)	Argentite
Wolframite	Sphene	Azurite	Argyrodite
LEAD (13)	TUNGSTEN (4)	Bornite	Cerargyrite
Anglesite	Huebnerite	Chalcocite	Pearceite
Beaverite	Powellite	Chalcopyrite	Proustite
Bindheimite	Scheelite	Chrysocolla	Pyrrargyrite
Cerussite	Wolframite	Copper	Silver
Corkite	URANIUM (3)	Covellite	Tetrahedrite
Cosalite	Autunite	Cuprite	TUNGSTEN (2)
Dufrenoyite	Torbernite	Malachite	Scheelite
Galena	Uranophane	Tennantite	Stolzite
Jamesonite	VANADIUM (1)	Tenorite	VANADIUM (1)
Linarite	Vanadinite	Tetrahedrite	Vanadinite
Plumbojarosite	ZINC (8)	GOLD (1)	ZINC (4)
Vanadinite	Aurichalcite	Gold	Hemimorphite
Wulfenite	Goslarite	IRON (12)	Smithsonite
MANGANESE (6)	Hemimorphite	Arsenopyrite	Sphalerite
Huebnerite	Smithsonite	Bornite	Tetrahedrite
Manganite	Sphalerite	Chalcopyrite	ZIRCONIUM (1)
Pyrolusite	Tetrahedrite	Epidote	Zircon
Rhodochrosite	Willemite	Garnet	CACHE COUNTY
Szaibelyite	Wurtzite	Goethite	COPPER (3)
Wolframite	ZIRCONIUM (1)	Hematite	Azurite
MOLYBDENUM (3)	Zircon	Limonite	Cuprite
Molybdenite	BOX ELDER COUNTY	Magnetite	Mal
Powellite	ANTIMONY (4)	Plumbojarosite	CACHE COUNTY
Wulfenite	Bindheimite	Pyrite	COPPER (3)
PHOSPHORUS (4)	Pyrrargyrite	Tennantite	Azurite
Molybdenite	Stibnite	LEAD (8)	Cuprite
Powellite	Tetrahedrite	Anglesite	Mal
Wulfenite	ARSENIC (6)	Bindheimite	CACHE COUNTY
PHOSPHORUS (4)	Arsenopyrite	Cerussite	COPPER (3)
Apatite	Orpiment	Galena	Azurite
Autunite	Pearceite	Plumbojarosite	Cuprite
Corkite	Proustite	Stolzite	Malachite
Torbernite	Realgar	Vanadinite	GOLD (1)
SILVER (7)	Tennantite	Wulfenite	Gold
Argentite	BARIUM (1)	MANGANESE (1)	IRON (2)
Argentojarosite	Barite	Rhodochrosite	Hematite
Cerargyrite	BISMUTH (2)	MOLYBDENUM (1)	Siderite
Proustite	Bismuthinite	Wulfenite	LEAD (3)
Pyrrargyrite	Bismutite	PHOSPHORUS (3)	Anglesite
Silver	PHOSPHORUS (3)	Metavariscite	Cerussite
Tetrahedrite	Variscite	Monazite	Galena
TITANIUM (3)	SILVER (8)	Variscite	MANGANESE (1)
Ilmenite	Pyrolusite		Pyrolusite

SILVER (1) Silver	Carnotite Tyuyamunite	Carbonate Apatite Collophane Fluorapatite Phosphorite	Ankerite Bassetite Bornite Butlerite Chalcopyrite Copiapite Coquimbite Diadochite Dumortierite Fibroferrite Goldichite Halotrichite Ilmenite Jarosite Melanterite Montroseite Parabutlerite Pitticite Pyrite Roemerite Scorodite Voltaite
ZINC (1) Smithsonite	<b>DAVIS COUNTY</b>	STRONTIUM (1) Burbankite	
<b>CARBON COUNTY</b>	COPPER (7) Azurite Bornite Chalcocite Chalcopyrite Chrysocolla Cuprite Malachite	TITANIUM (1) Leucosphenite	
URANIUM (1) Carnotite		<b>EMERY COUNTY</b>	
VANADIUM (1) Carnotite		ARSENIC (9) Abernathyite Arsenic Metazeunerite Niccolite Orpiment Pitticite Realgar Scorodite Zeunerite	
<b>DAGGETT COUNTY</b>	IRON (10) Biotite Bornite Chalcopyrite Epidote Garnet Hematite Hornblende Limonite Magnetite Pyrite	BARIUM (1) Psilomelane	LEAD (6)  Anglesite Cerussite Fourmarierite Galena Gummite Vandendriesscheite
COPPER (7) Azurite Bornite Brochantite Chalcocite Chalcopyrite Malachite Volborthite		CERIUM (1) Monazite	
GOLD (1) Gold	LEAD (2) Anglesite Galena	CHROMIUM (1) Chrome mica-clay	
IRON (8) Anthophyllite Bornite Chalcopyrite Glauconite Hematite Hornblende Limonite Staurolite	TUNGSTEN (1) Scheelite	COBALT (2) Bieberite Cobaltocalcite	MANGANESE (4) Manganite Psilomelane Pyrolusite Wad
<b>MANGANESE (1)</b> Pyrolusite	<b>DUCHESNE COUNTY</b>	COPPER (10) Azurite Bornite Brochantite Chalcanthite Chalcopyrite Malachite Metatorbernite Metazeunerite Torbernite Zeunerite	NICKEL (1) Niccolite
<b>PHOSPHORUS (4)</b> Carbonate Apatite Collophane Fluorapatite Phosphorite	BARIUM (2) Burbankite Leucosphenite	GOLD (1) Gold	<b>PHOSPHORUS (7)</b> Autunite Bassetite Biodochite Metatorbernite Monazite Phosphuranylite Torbernite
VANADIUM (3) Carnotite Tyuyamunite Volborthite	CERIUM (1) Burbankite	IRON (22)	SILVER (1) Silver
URANIUM (2)	COPPER (1) Malachite		
	IRON (5) Acmite Hematite Magnesioriebeckite Pyrite Riebeckite		
	PHOSPHORUS (4)		



<b>STRONTIUM (1)</b> Celestite	<b>ZIRCONIUM (1)</b> Zircon	<b>TITANIUM (1)</b> Ilmenite	Bornite Chalcopyrite Chromite Fervanite Goethite Hedenbergite Hematite Limonite Montroseite Pyrite
<b>TIN (1)</b> Cassiterite	<b>GARFIELD COUNTY</b>	<b>URANIUM (9)</b> Autunite Beta-uranotile Carnotite Johannite Torbernite Tyuyamunite Uraninite Uranophane Zippeite	<b>LEAD (2)</b> Descloizite Galena
<b>TITANIUM (2)</b> Brookite Ilmenite	<b>ANTIMONY (4)</b> Senarmontite Stibiconite Stibnite Valentinite	<b>VANADIUM (6)</b> Carnotite Metahewettite Montroseite Pascoite Tyuyamunite Vanoxite	<b>LITHIUM (1)</b> Lithiophorite
<b>URANIUM (25)</b> Abernathyite Autunite Bassetite Bayleyite Becquerelite Boltwoodite Carnotite Coffinite Fourmarierite Gummite Metatorbernite Metazeunerite Phosphuranylite Rabbittite Rauvite Rutherfordine Schoepite Schroeckingerite Torbernite Tyuyamunite Uraninite Uvanite Vandendriesscheite Zeunerite Zippeite	<b>ARSENIC (3)</b> Arsenopyrite Orpiment Realgar	<b>ZIRCONIUM (1)</b> Zircon	<b>MANGANESE (5)</b> Lithiophorite Manganite Psilomelane Pyrolusite Rhodochrosite
<b>IRON (8)</b> Arsenopyrite Bornite Chalcopyrite Epidote Hematite Ilmenite Magnetite Pyrite	<b>CERIUM (1)</b> Monazite	<b>GRAND COUNTY</b>	<b>MOLYBDENUM (1)</b> Ilsemannite
<b>PHOSPHORUS (3)</b> Autunite Monazite Torbernite	<b>GOLD (1)</b> Gold	<b>BARIUM (2)</b> Barite Psilomelane	<b>PHOSPHORUS (3)</b> Autunite Meta-autunite Phosphuranylite
<b>STRONTIUM (1)</b> Celestite	<b>IRON (8)</b> Arsenopyrite Bornite Chalcopyrite Epidote Hematite Ilmenite Magnetite Pyrite	<b>CERIUM (1)</b> Chevkinite	<b>STRONTIUM (1)</b> Celestite
<b>TITANIUM (1)</b> Chevkinite	<b>MANGANESE (2)</b> Pyrolusite Wad	<b>CHROMIUM (1)</b> Chromite	<b>TITANIUM (1)</b> Chevkinite
<b>TUNGSTEN (1)</b> Scheelite	<b>PHOSPHORUS (3)</b> Autunite Monazite Torbernite	<b>COPPER (9)</b> Azurite Bornite Calciovolborthite Chalcocite Chalcopyrite Chrysocolla Descloizite Malachite Volborthite	<b>TUNGSTEN (1)</b> Scheelite
<b>URANIUM (15)</b> Andersonite Autunite Becquerelite Boltwoodite Carnotite Coffinite Liebigite Meta-autunite Metatyuyamunite Phosphuranylite	<b>PLATINUM (1)</b> Platinum	<b>IRON (14)</b> Actinolite Aegirite Augite Biotite	<b>URANIUM (15)</b> Andersonite Autunite Becquerelite Boltwoodite Carnotite Coffinite Liebigite Meta-autunite Metatyuyamunite Phosphuranylite
<b>ZINC (1)</b> Sphalerite			

Rauvite	GOLD (2)	TELLURIUM (1)	Zeunerite
Schroëckingerite	Gold	Sylvanite	
Tyuyamunite	Sylvanite		BARIUM (3)
Uraninite		URANIUM (2)	Barite
Zippeite	IRON (13)	Autunite	Meta-Uranocircite
	Actinolite	Carnotite	Psilomelane
VANADIUM (23)	Augite		
Barnesite	Biotite	VANADIUM (3)	BERYLLIUM (2)
Calciovolborthite	Ferrimolybdite	Carnotite	Bertrandite
Carnotite	Garnet	Descloizite	Beryl
Corvusite	Goethite	Mottramite	
Descloizite	Hematite		BISMUTH (8)
Fervanite	Limonite	ZINC (2)	Arsenobismite
Grantsite	Magnetite	Descloizite	Bismite
Hewettite	Metastrengite	Mottramite	Bismoclite
Melanovanadite	Pyrite		Bismuth
Methaheettite	Rockbridgeite	JUAB COUNTY	Bismuthinite
Metarossite	Siderite		Bismutite
Metatyuyamunite		ANTIMONY (8)	Daubreeite
Montroseite	LEAD (5)	Bindheimite	Mixite
Paramontroseite	Descloizite	Famatinite	
Pascoite	Galena	Geocronite	COPPER (31)
Rauvite	Mimetite	Jamesonite	Atacamite
Roscoelite	Mottramite	Pyrrargyrite	Aurichalcite
Rossite	Pyromorphite	Stephanite	Azurite
Sherwoodite		Stibnite	Brochantite
Steigerite	MANGANESE (3)	Tetrahedrite	Chalcocite
Tyuyamunite	Pyrolusite		Chalcophyllite
Vanoxite	Rhodochrosite	ARSENIC (25)	Chalcopyrite
Volborthite	Rockbridgeite	Adamite	Chenevixite
		Arsenosiderite	Chrysocolla
ZINC (2)	MERCURY (2)	Arsenobismite	Clinoclase
Descloizite	Cinnabar	Arsenopyrite	Conichalcite
Sphalerite	Mercury	Chalcophyllite	Connellite
		Chenevixite	Copper
IRON COUNTY	MOLYBDENUM (1)	Clinoclase	Cornwallite
	Ferrimolybdite	Conichalcite	Covellite
		Cornwallite	Cuprite
ARSENIC (2)	NICKEL (1)	Enargite	Cyanotrichite
Annabergite	Annabergite	Erinite	Enargite
Mimetite		Geocronite	Erinite
	PHOSPHORUS (6)	Metazeunerite	Famatinite
BARIUM (1)	Apatite	Mimetite	Linarite
Barite	Autunite	Mixite	Malachite
	Metastrengite	Olivenite	Metazeunerite
COBALT (1)	Mimetite	Pearceite	Mixite
Annabergite	Pyromorphite	Pharmacosiderite	Olivenite
	Rockbridgeite	Pitticite	Spangolite
COPPER (4)		Proustite	Tennantite
Azurite	SILVER (3)	Scorodite	Tenorite
Descloizite	Argentite	Tennantite	Tetrahedrite
Malachite	Cerargyrite	Tyrolite	Tyrolite
Mottramite	Sylvanite	Uranospinite	Zeunerite

GOLD (1) Gold	Spodumene	Weeksite Zeunerite	Autunite Carnotite Torbernite Tyuyamunite Uranospinite
IRON (30) Actinolite Ankerite Arseniosiderite Arsenopyrite Biotite Bixbyite Borickite Carphosiderite Chalcopyrite Chenevixite Epidote Garnet Hematite Idocrase Jamesonite Jarosite Limonite Magnetite Marcasite Melanterite Pharmacosiderite Pitticite Plumbojarosite Pseudobrookite Pyrite Pyrrhotite Scorodite Sicklerite Tennantite Tourmaline	MANGANESE (8) Bixbyite Braunite Manganite Psilomelane Pyrolusite Rhodochrosite Sicklerite Wad	VANADIUM (1) Carnotite	VANADIUM (2) Carnotite Tyuyamunite
LEAD (14) Anglesite Bindheimite Cerussite Cotunnite Galena Geocronite Jamesonite Leadhillite Linarite Mimetite Minium Phosgenite Plumbojarosite Pyromorphite	MOLYBDENUM (1) Molybdenite	ZINC (7) Adamite Aurichalcite Hemimorphite Hydrozincite Smithsonite Sphalerite Tetrahedrite	ZIRCONIUM (1) Zircon
LITHIUM (2) Sicklerite	PHOSPHORUS (7) Autunite Borickite Crandallite Meta-uranocircite Mimetite Pyromorphite Sicklerite	<b>KANE COUNTY</b>	<b>MILLARD COUNTY</b>
	SILVER (8) Argentite Cerargyrite Pearceite Proustite Pyrargyrite Silver Stephanite Tetrahedrite	ARSENIC (1) Uranospinite	BISMUTH (1) Bismutite
	TITANIUM (2) Pseudobrookite Sphene	BARIUM (1) Barite	COPPER (5) Azurite Chalcopyrite Cuprite Malachite Osarizawaite
	TUNGSTEN (1) Scheelite	CERIUM (1) Monazite	GOLD (1) Gold
	URANIUM (13) Autunite Beta-uranotile Carnotite Meta-uranocircite Metazeunerite Schroekingierite Sklodowskite Soddyite Uraninite Uranophane Uranospinite	COPPER (4) Azurite Cuprite Malachite Torbernite	IRON (11) Augite Biotite Chalcopyrite Garnet Hematite Idocrase Limonite Magnetite Marcasite Pyrite Tourmaline
		GOLD (1) Gold	LEAD (4) Anglesite Cerussite Galena Osarizawaite
		IRON (4) Ammoniojarosite Ilmenite Limonite Magnetite	MANGANESE (4) Manganite Pyrolusite Rhodochrosite Wad
		MANGANESE (1) Pyrolusite	
		PHOSPHORUS (3) Autunite Monazite Torbernite	
		TITANIUM (1) Ilmenite	
		URANIUM (5)	

MOLYBDENUM (1) Molybdenite	SILVER (1) Silver	LEAD (6) Anglesite Cerussite Galena Kasolite Plumbojarosite Wulfenite	Johannite Kasolite Meta-Autunite Metatorbernite Phosphuranylite Rauvite Sabugalite Schroekingerite Sklodowskite Torbernite Tyuyamunite Umohoite Uraninite Uranophane Uranopilite Zeunerite Zippeite
PHOSPHORUS (1) Apatite	ZINC (1) Smithsonite	LITHIUM (1) Lithiophorite	VANADIUM (2) Rauvite Tyuyamunite
TUNGSTEN (1) Scheelite	<b>PIUTE COUNTY</b>	MANGANESE (4) Lithiophorite Manganocalcite Pyrolusite Rhodochrosite	ZINC (4) Hydrozincite Sphalerite Tetrahedrite Wurtzite
ZINC (1) Sphalerite	ANTIMONY (1) Tetrahedrite	MERCURY (4) Cinnabar Metacinnabar Onofrite Tiemannite	ZIRCONIUM (1) Zircon
<b>MORGAN COUNTY</b>	ARSENIC (1) Zeunerite	MOLYBDENUM (5) Ilsemanite Jordisite Molybdenite Umohoite Wulfenite	<b>RICH COUNTY</b>
BARIUM (1) Barite	BARIUM (1) Barite	PHOSPHORUS (6) Autunite Meta-autunite Metatorbernite Phosphuranylite Sabugalite Torbernite	ARSENIC (1) Tennantite
CERIUM (1) Monazite	BISMUTH (2) Cuprobismutite Emplectite	SILVER (4) Argentite Cerargyrite Sylvanite Tetrahedrite	BARIUM (1) Barite
COPPER (7) Azurite Chalcopyrite Chrysocolla Copper Cuprite Malachite Tenorite	COBALT (1) Cobaltomenite	TELLURIUM (1) Sylvanite	COPPER (2) Azurite Tennantite
GOLD (1) Gold	COPPER (10) Azurite Chalcopyrite Cuprobismutite Emplectite Johannite Malachite Metatorbernite Tetrahedrite Torbernite Zeunerite	TITANIUM (1) Anatase	IRON (1) Tennantite
IRON (7) Biotite Chalcopyrite Hematite Jarosite Limonite Marcasite Pyrite	GOLD (2) Gold Sylvanite	URANIUM (19) Autunite Beta-Uranotile	LEAD (3) Cerussite Galena Wulfenite
LEAD (3) Anglesite Cerussite Galena	IRON (11) Biotite Chalcopyrite Garnet Goethite Hematite Jarosite Limonite Nontronite Penninite Plumbojarosite Pyrite		MANGANESE (2) Pyrolusite Rhodochrosite
MOLYBDENUM (1) Molybdenite			
PHOSPHORUS (2) Monazite Xenotime			

MOLYBDENUM (1)	Azurite	Siderite	Pyrrargyrite
Wulfenite	Beaverite	Siderotil	Silver
	Bornite	Tennantite	Tetrahedrite
PHOSPHORUS (1)	Bournonite	Vivianite	
Phosphorite	Calcedonite		TELLURIUM (1)
	Chalcanthite	LEAD (15)	Calaverite
URANIUM (1)	Chalcocite	Aikinite	
Tyuyamunite	Chalcopyrite	Alaskaite	TITANIUM (2)
	Chrysocolla	Anglesite	Rutile
VANADIUM (1)	Copper	Beaverite	Sphene
Tyuyamunite	Covellite	Bournonite	
	Cubanite	Calcedonite	TUNGSTEN (3)
<b>SALT LAKE COUNTY</b>	Cuprite	Cerussite	Scheelite
	Digenite	Dufrenoyite	Stolzite
ANTIMONY (6)	Enargite	Galena	Tungstenite
Bournonite	Linarite	Linarite	
Cervantite	Malachite	Massicot	ZINC (6)
Dyscarsite	Pisanite	Plumbojarosite	Aurichalcite
Pyrrargyrite	Seligmannite	Seligmannite	Goslarite
Stibnite	Tennantite	Stolzite	Hemimorphite
Tetrahedrite	Tenorite	Wulfenite	Smithsonite
	Tetrahedrite		Sphalerite
ARSENIC (8)	Tyrolite	MANGANESE (7)	Tetrahedrite
Enargite		Allanite	
Arsenopyrite	GOLD (2)	Apjohnite	ZIRCONIUM (1)
Dufrenoyite	Calaverite	Mallardite	Zircon
Orpiment	Gold	Pyrolusite	
Realgar		Rhodochrosite	<b>SAN JUAN COUNTY</b>
Seligmannite	IRON (28)	Sussexite	ARSENIC (7)
Tennantite	Actinolite	Szaibelyite	Donkeyite
Tyrolite	Allanite		Erythrite
	Arsenopyrite	MERCURY (1)	Gersdorffite
BARIUM (1)	Beaverite	Mercury	Metazeunerite
Barite	Biotite		Novacekite
	Bornite	MOLYBDENUM (2)	Smaltite
BERYLLIUM (1)	Chalcopyrite	Molybdenite	Uranospathite
Allanite	Cubanite	Wulfenite	
	Epidote		BARIUM (2)
BISMUTH (6)	Garnet	PHOSPHORUS (5)	Barite
Aikinite	Hematite	Apatite	Psilomelane
Alaskaite	Hornblende	Phosphorite	
Bismite	Hypersthene	Turquoise	CADMIUM (1)
Bismuth	Idocrase	Vivianite	Greenockite
Bismuthinite	Limelite	Wavellite	
Bismutite	Ludwigite		CHROMIUM (1)
	Magnetite	PLATINUM (1)	Chromite
CERIUM (1)	Marcasite	Platinum	
Allanite	Melanterite		COBALT (4)
	Nontronite	SILVER (7)	Bieberite
COPPER (26)	Pisanite	Alaskaite	Erythrite
Aikinite	Plumbojarosite	Argentite	Gersdorffite
Alaskaite	Pyrite	Cerargyrite	Smaltite
Aurichalcite	Pyrrhotite	Dyscarsite	

**COPPER (24)**

Antlerite  
Azurite  
Boothite  
Bornite  
Brochantite  
Calciovolborthite  
Chalcanthite  
Chalcocite  
Chalcopyrite  
Chrysocolla  
Copper  
Covellite  
Cuprite  
Cuprosklodowskite  
Donkeyite  
Eucarite  
Johannite  
Libethenite  
Malachite  
Metatorbernite  
Metazeunerite  
Torbernite  
Uranospathite  
Voglite

**GOLD (1)**

Gold

**IRON (17)**

Aegirite  
Augite  
Bornite  
Chalcopyrite  
Chromite  
Garnet  
Gersdorffite  
Goethite  
Hematite  
Jarosite  
Limonite  
Magnetite  
Marcasite  
Montroseite  
Nolanite  
Pyrite  
Tourmaline

**LEAD (3)**

Clausthalite  
Galena  
Gummite

**MANGANESE (2)**

Manganite  
Psilomelane

**MOLYBDENUM (3)**

Ilseemannite  
Jordisite  
Molybdenite

**NICKEL (3)**

Erythrite  
Gersdorffite  
Smaltite

**PHOSPHORUS (9)**

Apatite  
Autunite  
Libethenite  
Metatorbernite  
Phosphuranylite  
Sabugalite  
Saleeite  
Torbernite  
Uranospathite

**SILVER (1)**

Eucarite

**TITANIUM (2)**

Sphene  
Titanoclinohumite

**URANIUM (30)**

Andersonite  
Autunite  
Bayleyite  
Becquerelite  
Beta-Uranotile  
Boltwoodite  
Carnotite  
Coffinite  
Cuprosklodowskite  
Gummite  
Johannite  
Liebigite  
Metatorbernite  
Metatyuyamunite  
Metazeunerite  
Novacekite  
Phosphuranylite  
Rutherfordine  
Sabugalite  
Saleeite

Schoepite  
Schroëckingerite  
Swartzite  
Torbernite  
Uraninite  
Uranophane  
Uranopilite  
Uranospathite  
Voglite  
Zippeite

**VANADIUM (19)**

Calciovolborthite  
Carnotite  
Coconinoite  
Corvusite  
Doloresite  
Hewettite  
Melanovanadite  
Metarossite  
Metatyuyamunite  
Montroseite  
Navajoite  
Nolanite  
Paramontroseite  
Pascoite  
Pintadoite  
Roscoelite  
Simplotite  
Tyuyamunite  
Vanoxite

**ZINC (1)**

Sphalerite

**SANPETE COUNTY****COPPER (1)**

Torbernite

**IRON (4)**

Beidellite  
Limonite  
Marcasite  
Pyrite

**LEAD (1)**

Galena

**MANGANESE (1)**

Pyrolusite

**PHOSPHORUS (2)**

Autunite  
Torbernite

**STRONTIUM (1)**

Strontianite

**URANIUM (2)**

Autunite  
Torbernite

**ZINC (1)**

Sphalerite

**SEVIER COUNTY****COPPER (5)**

Azurite  
Chalcanthite  
Chalcocite  
Chalcopyrite  
Malachite

**IRON (10)**

Chalcopyrite  
Epidote  
Garnet  
Hematite  
Hercynite  
Jarosite  
Limonite  
Magnetite  
Pinninite  
Pyrite

**LEAD (2)**

Cerussite  
Galena

**MANGANESE (2)**

Pyrolusite  
Wad

**PHOSPHORUS (1)**

Apatite

**STRONTIUM (1)**

Celestite

**TITANIUM (1)**

Rutile

**THORIUM (1)**

Thorite

ZINC (1)  
Sphalerite

### SUMMIT COUNTY

ANTIMONY (8)  
Boulangerite  
Bournonite  
Jamesonite  
Metastibnite  
Pyrargyrite  
Stibnite  
Tetrahedrite  
Zinkenite

ARSENIC (3)  
Balydonite  
Mimetite  
Olivenite

BARIUM (2)  
Barite  
Psilomelane

COPPER (15)  
Azurite  
Balydonite  
Bornite  
Bournonite  
Brochantite  
Chalcanthite  
Chalcocite  
Chalcopyrite  
Chrysocolla  
Covellite  
Cuprite  
Linarite  
Malachite  
Olivenite  
Tetrahedrite

GOLD (2)  
Calaverite  
Gold

IRON (10)  
Bornite  
Chalcopyrite  
Epidote  
Garnet  
Hematite  
Jamesonite  
Limonite

Magnesioferrite  
Magnetite  
Pyrite

LEAD (12)  
Anglesite  
Balydonite  
Boulangerite  
Bournonite  
Cerussite  
Galena  
Jamesonite  
Linarite  
Massicot  
Mimetite  
Pyromorphite  
Zinkenite

MANGANESE (5)  
Manganite  
Psilomelane  
Pyrolusite  
Rhodochrosite  
Rhodonite

PHOSPHORUS (3)  
Mimetite  
Phosphorite  
Pyromorphite

SILVER (5)  
Argentite  
Cerargyrite  
Pyrargyrite  
Silver  
Tetrahedrite

TELLURIUM (1)  
Calaverite

ZINC (4)  
Goslarite  
Hemimorphite  
Sphalerite  
Tetrahedrite

### TOOELE COUNTY

ANTIMONY (8)  
Boulangerite  
Jamesonite  
Monimolite  
Pyrargyrite

Stephanite  
Stibiconite  
Stibnite  
Tetrahedrite

ARSENIC (22)  
Adamite  
Arseniosiderite  
Arsenopyrite  
Austinite  
Beudantite  
Carminite  
Chenevixite  
Clinoclase  
Cobaltite  
Conichalcite  
Cornwallite  
Ferrisymplesite  
Lorandite  
Mimetite  
Olivenite  
Orpiment  
Pharmacosiderite  
Proustite  
Realgar  
Scorodite  
Tennantite  
Tyrolite

BARIUM (3)  
Barite  
Danburite  
Psilomelane

BERYLLIUM (3)  
Allanite  
Bertrandite  
Beryl

BISMUTH (5)  
Aikinite  
Bismite  
Bismuth  
Bismuthinite  
Bismutite

CERIUM (3)  
Allanite  
Monazite  
Samarskite

COPPER (27)  
Aikinite

Aurichalcite  
Azurite  
Beaverite  
Bornite  
Brochantite  
Chalcanthite  
Chalcocite  
Chalcopyrite  
Chenevixite  
Chrysocolla  
Clinoclase  
Conichalcite  
Copper  
Cornwallite  
Covellite  
Cuprite  
Cuprotungstite  
Descloizite  
Malachite  
Olivenite  
Rosasite  
Sulvanite  
Tennantite  
Tenorite  
Tetrahedrite  
Tyrolite

GOLD (2)  
Calaverite  
Gold

IRON (48)  
Actinolite  
Allanite  
Argentojarosite  
Arseniosiderite  
Arsenopyrite  
Augite  
Axinite  
Beaverite  
Beidellite  
Beudantite  
Biotite  
Bornite  
Carminite  
Carphosiderite  
Chalcopyrite  
Chenevixite  
Cobaltite  
Epidote  
Ferberite  
Ferrimolybdate  
Ferrisymplesite

Garnet	Rhodochrosite	Scheelite	IRON (6)
Hedenbergite	Rhodonite	Stolzite	Bornite
Hematite	Wad	Wolframite	Chromite
Hornblende	Wolframite		Glaucosite
Hypersthene		URANIUM (2)	Halotrichite
Iddingsite	MERCURY (2)	Samarskite	Hematite
Idocrase	Cinnabar	Uraninite	Pyrite
Ilmenite	Metacinnabar		
Jamesonite		VANADIUM (2)	LEAD (2)
Jarosite	MOLYBDENUM (4)	Descloizite	Cerussite
Jefferisite	Ferrimolybdite	Sulvanite	Galena
Limonite	Molybdenite		
Magnetite	Powellite	ZINC (11)	MOLYBDENUM (2)
Melanterite	Wulfenite	Adamite	Ilsemanite
Natrojarosite		Aurichalcite	Molybdenite
Nontronite	PHOSPHORUS (6)	Austinite	
Olivine	Apatite	Descloizite	PHOSPHORUS (7)
Pharmacosiderite	Mimetite	Hemimorphite	Autunite
Plumbojarosite	Monazite	Hydrozincite	Carbonate apatite
Pyrite	Pyromorphite	Rosasite	Collophane
Pyrrhotite	Turquoise	Smithsonite	Fluorapatite
Scorodite	Variscite	Sphalerite	Monazite
Siderite		Tetrahedrite	Phosphorite
Siderotil	SILVER (9)	Wurtzite	Torbernite
Tennantite	Argentite		
Tourmaline	Argentojarosite	ZIRCONIUM (1)	SILVER (1)
Wolframite	Cerargyrite	Zircon	Cerargyrite
	Hessite		
LEAD (16)	Proustite		STRONTIUM (1)
Aikinite	Pyrargyrite	UINTAH COUNTY	Burbankite
Anglesite	Silver		
Beaverite	Stephanite	BARIUM (4)	TITANIUM (1)
Beudantite	Tetrahedrite	Barytocalcite	Leucospheinite
Boulangerite		Burbankite	
Carminite	TELLURIUM (2)	Garrelsite	URANIUM (4)
Cerussite	Calaverite	Leucospheinite	Autunite
Descloizite	Hessite		Carnotite
Galena		CERIUM (2)	Torbernite
Jamesonite	TIN (1)	Burbankite	Tyuyamunite
Mimetite	Samarskite	Monazite	
Monimolite			VANADIUM (2)
Plumbojarosite	TITANIUM (5)	CHROMIUM (1)	Carnotite
Pyromorphite	Anatase	Chromite	Tyuyamunite
Stolzite	Ilmenite		
Wulfenite	Rutile	COPPER (5)	ZINC (2)
	Samarskite	Azurite	Smithsonite
MANGANESE (10)	Sphene	Bornite	Wurtzite
Allanite		Chalcocite	
Axinite	TUNGSTEN (7)	Malachite	
Huebnerite	Cuprotungstite	Torbernite	
Manganite	Ferberite		
Psilomelane	Huebnerite	GOLD (1)	ZIRCONIUM (1)
Pyrolusite	Powellite	Gold	Elpidite



**UTAH COUNTY**

	Cuprogoslarite	<b>LEAD (15)</b>	Mimetite
	Enargite	Altaite	Montgomeryite
<b>ANTIMONY (7)</b>	Freibergite	Anglesite	Overite
Billingsleyite	Jalpaite	Bismuthian bindheimite	Phosphorite
Bismuthian bindheimite	Klaprothite	Cerussite	Sterrettite
Jamesonite	Luzonite	Coronadite	Tinticite
Kermesite	Malachite	Galena	Variscite
Miargyrite	Polybasite	Jamesonite	Wardite
Polybasite	Stromeyerite	Lanarkite	
Tetrahedrite	Tetrahedrite	Massicot	<b>SCANDIUM (1)</b>
		Mimetite	Kolbeckite
		Minium	
<b>ARSENIC (6)</b>	<b>GOLD (4)</b>	Plumbojarosite	<b>SILVER (16)</b>
Billingsleyite	Gold	Quenselite	Argentite
Claudetite	Krennerite	Vanadinite	Argentojarosite
Enargite	Petzite	Wulfenite	Billingsleyite
Luzonite	Sylvanite		Cerargyrite
Mimetite		<b>MANGANESE (14)</b>	Freibergite
Pearceite		Allanite	Hessite
	<b>IRON (35)</b>	Chalcophanite	Jalpaite
<b>BARIUM (3)</b>	Actinolite	Coronadite	Matildite
Barite	Allanite	Crednerite	Miargyrite
Hollandite	Argentojarosite	Cryptomelane	Pearceite
Psilomelane	Beidellite	Hetaerolite	Petzite
	Biotite	Hollanite	Polybasite
	Bornite	Jenkinsite	Silver
<b>BERYLLIUM (1)</b>	Chalcophanite	Nsutite	Stromeyerite
Allanite	Chalcopyrite	Psilomelane	Sylvanite
	Cubanite	Pyrolusite	Tetrahedrite
	Delessite	Quenselite	
<b>BISMUTH (5)</b>	Epidote	Rhodochrosite	<b>TELLURIUM (6)</b>
Bismuthian bindheimite	Freibergite	Wad	Altaite
Bismuthinite	Garnet		Hessite
Klaprothite	Gunningite	<b>MOLYBDENUM (2)</b>	Krennerite
Matildite	Halotrichite	Molybdenite	Petzite
Tetradymite	Hematite	Wulfenite	Sylvanite
	Hisingerite		Tetradymite
<b>CADMIUM (1)</b>	Hornblende	<b>NICKEL (1)</b>	<b>TITANIUM (3)</b>
Greenockite	Jamesonite	Eardleyite	Anatase
	Jarosite		Rutile
<b>CERIUM (1)</b>	Jenkinsite	<b>PHOSPHORUS (20)</b>	Sphene
Allanite	Kornelite	Apatite	
	Limonite	Crandallite	<b>TUNGSTEN (1)</b>
<b>COBALT (1)</b>	Magnetite	Davisonite	Scheelite
Cryptomelane	Marcasite	Dehrite	
	Melanterite	Deltaite	<b>VANADIUM (1)</b>
<b>COPPER (19)</b>	Nontronite	Englishite	Vanadinite
Antlerite	Olivine	Gordonite	
Azurite	Pargasite	Goyazite	<b>ZINC (12)</b>
Bornite	Plumbojarosite	Kolbeckite	Chalcophanite
Brochantite	Pyrite	Lehiite	Cryptomelane
Chalcocite	Siderite	Lewistonite	Cuprogoslarite
Chalcopyrite	Siderotil	Millisite	
Crednerite	Szomolnokite		
Cubanite	Tinticite		
Cuprite			

Eardleyite  
 Ferrogoslarite  
 Freibergite  
 Gunningite  
 Hetaerolite  
 Smithsonite  
 Sphalerite  
 Tetrahedrite  
 Wurtzite

SILVER (3)  
 Acanthite  
 Silver  
 Tetrahedrite

ZINC (2)  
 Sphalerite  
 Tetrahedrite

#### WASHINGTON COUNTY

ZIRCONIUM (1)  
 Zircon

ANTIMONY (1)  
 Stibnite

#### WASATCH COUNTY ARSENIC (3)

ANTIMONY (1)  
 Tetrahedrite

Adamite  
 Orpiment  
 Realgar

BARIUM (1)  
 Barite

COPPER (12)  
 Aurichalcite

COPPER (3)  
 Bornite  
 Chalcopyrite  
 Tetrahedrite

Azurite  
 Bornite  
 Chalcocite  
 Chalcopyrite  
 Chrysocolla  
 Copper  
 Cuprite  
 Malachite  
 Rosasite  
 Tenorite  
 Volborthite

IRON (10)  
 Bornite  
 Chalcopyrite  
 Garnet  
 Hematite  
 Idocrase  
 Magnesioferrite  
 Magnetite  
 Penninite  
 Pyrite  
 Siderite

GOLD (1)  
 Gold

LEAD (3)  
 Cerussite  
 Galena  
 Pyromorphite

IRON (8)  
 Bornite  
 Chalcopyrite  
 Hematite  
 Jarosite  
 Limonite  
 Magnetite  
 Plumbojarosite  
 Pyrite

MANGANESE (2)  
 Pyrolusite  
 Rhodochrosite

LEAD (2)  
 Cerussite  
 Plumbojarosite

PHOSPHORUS (4)  
 Carbonate Apatite  
 Fluorapatite  
 Phosphorite  
 Pyromophite

MANGANESE (2)  
 Birnessite  
 Pyrolusite

PHOSPHORUS (1)  
 Autunite

SILVER (5)  
 Aguilarite  
 Argentite  
 Cerargyrite  
 Embolite  
 Silver

STRONTIUM (1)  
 Celestite

TUNGSTEN (1)  
 Scheelite

URANIUM (2)  
 Autunite  
 Carnotite

VANADIUM (2)  
 Carnotite  
 Volborthite

ZINC (5)  
 Adamite  
 Aurichalcite  
 Hydrozincite  
 Rosasite  
 Smithsonite

#### WAYNE COUNTY

ARSENIC (1)  
 Metazeunerite

CERIUM (1)  
 Monazite

COPPER (9)  
 Azurite  
 Brochantite  
 Chalcantite  
 Chalcopyrite  
 Johannite  
 Malachite  
 Metatorbernite  
 Metazeunerite  
 Torbernite

IRON (7)  
 Chalcopyrite  
 Jarosite

Lepidocrocite  
 Limonite  
 Pyrite  
 Sideronatrite  
 Staurolite

LEAD (1)  
 Galena

MANGANESE (1)  
 Pyrolusite

PHOSPHORUS (3)  
 Metatorbernite  
 Monazite  
 Torbernite

TITANIUM (2)  
 Anatase  
 Rutile

URANIUM (11)  
 Carnotite  
 Johannite  
 Metatorbernite  
 Metazeunerite  
 Schoepite  
 Schroeckingerite  
 Sklodowskite  
 Torbernite  
 Uraninite  
 Uranopilite  
 Zippeite

VANADIUM (2)  
 Carnotite  
 Metarossite

ZIRCONIUM (1)  
 Zircon

#### WEBER COUNTY

BARIUM (2)  
 Barite  
 Psilomelane

COPPER (4)  
 Azurite  
 Bornite  
 Chalcopyrite  
 Malachite

IRON (10)  
Biotite  
Bornite  
Chalcopyrite  
Epidote  
Garnet  
Hematite  
Hornblende

Limonite  
Magnetite  
Pyrite

LEAD (3)  
Anglesite  
Cerussite  
Galena

MANGANESE (2)  
Psilomelane  
Pyrolusite  
  
MOLYBDENUM (1)  
Molybdenite  
  
PHOSPHORUS (1)

Phosphorite  
  
SILVER (1)  
Silver

URANIUM (1)  
Uraninite



# UTAH GEOLOGICAL AND MINERAL SURVEY

606 Black Hawk Way  
Salt Lake City, Utah 84108

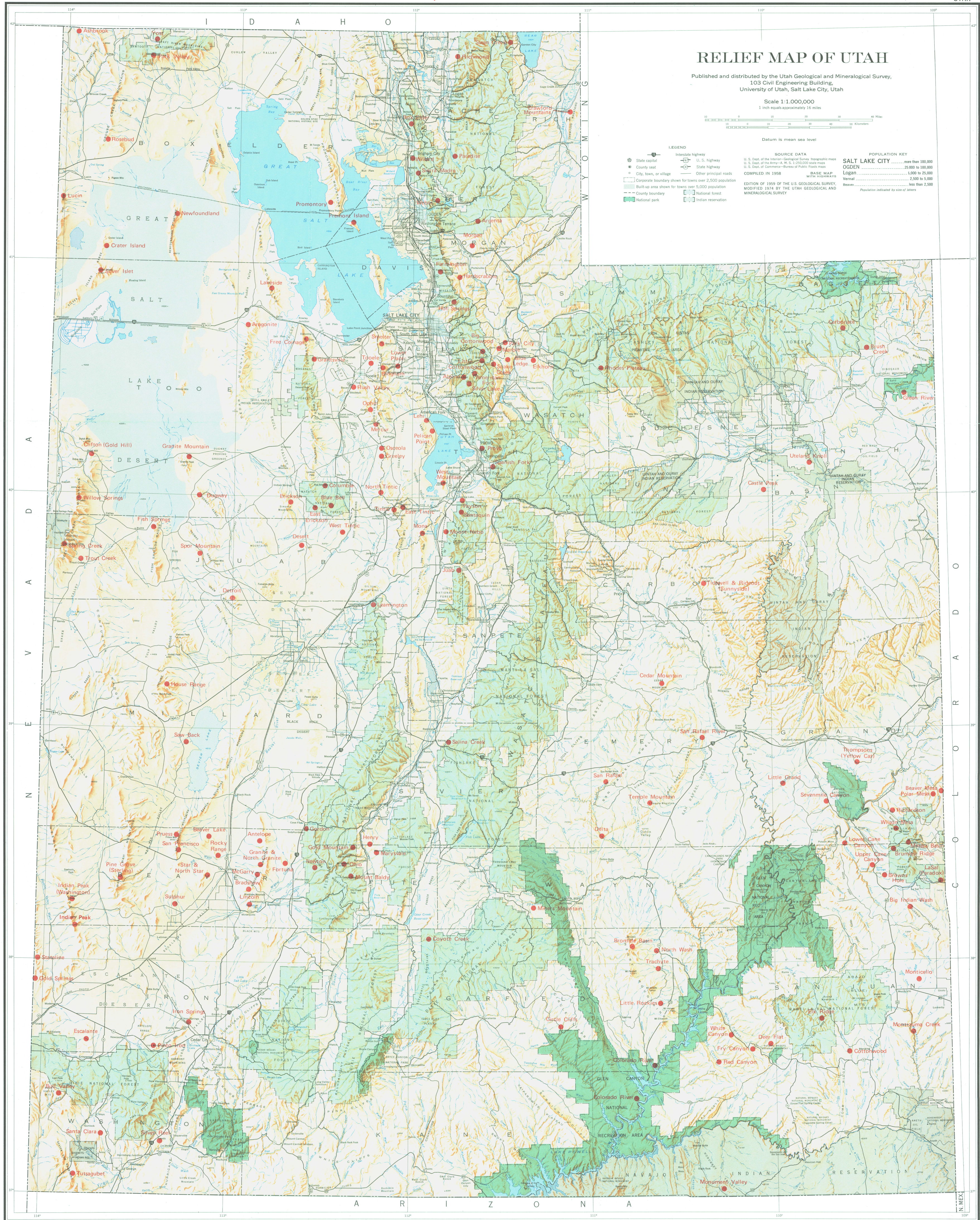
THE UTAH GEOLOGICAL AND MINERAL SURVEY is a Division of the Utah Department of Natural Resources and operates under the guidance of a 7-member Board appointed by the Governor from industry and the public-at-large. The Survey is instructed by law to collect and distribute reliable information concerning the mineral resources, topography, and geology of the state, to investigate areas of geologic and topographic hazards that could affect the citizens of Utah, and to support the development of natural resources within the state. The *Utah Code Annotated, 1953 Replacement Volume 5, Chapter 36, 53-36-1 through 12*, describes the Survey and its functions.

The Survey publishes bulletins, maps, a quarterly newsletter, and other publications that describe the geology of the state. Write for the latest list of publications available.

THE SAMPLE LIBRARY is maintained to preserve well cuttings, drill cores, stratigraphic sections, and other geological samples. Files of lithologic, electrical, and mechanical logs of oil and gas wells drilled in the state are also maintained. The library's collections have been obtained by voluntary donation and are open to public use, free of charge.

THE UTAH GEOLOGICAL AND MINERAL SURVEY adopts as its official policy the standard proclaimed in the Governor's Code of Fair Practices that it shall not, in recruitment, appointment, assignment, promotion, and discharge of personnel, discriminate against any individual on account of race, color, religious creed, ancestry, national origin, or sex. It expects its employees to have no interest, financial or otherwise that is in conflict with the goals and objectives of the Survey and to obtain no personal benefit from information gained through their work as employees of the Survey. For permanent employees this restriction is lifted after a two-year absence and for consultants the same restriction applies until publication of the data they have acquired.

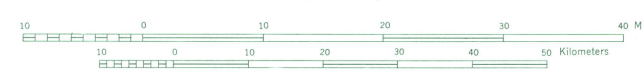




### RELIEF MAP OF UTAH

Published and distributed by the Utah Geological and Mineralogical Survey,  
103 Civil Engineering Building,  
University of Utah, Salt Lake City, Utah

Scale 1:1,000,000  
1 inch equals approximately 16 miles



Datum is mean sea level

**LEGEND**

- State capital
- County seat
- City, town, or village
- Corporate boundary shown for towns over 2,500 population
- Built-up area shown for towns over 5,000 population
- National park
- Indian reservation
- Interstate highway
- U. S. highway
- State highway
- Other principal roads
- National forest
- Indian reservation

**SOURCE DATA**

U. S. Dept. of the Interior—Geological Survey, Topographic maps  
U. S. Dept. of the Army—U. S. 1:250,000 scale maps  
U. S. Dept. of Commerce—Bureau of Public Roads maps  
COMPILED IN 1958

**BASE MAP WITH HIGHWAYS**

EDITION OF 1959 OF THE U. S. GEOLOGICAL SURVEY,  
MODIFIED 1974 BY THE UTAH GEOLOGICAL AND  
MINERALOGICAL SURVEY

**POPULATION KEY**

**SALT LAKE CITY** ..... more than 100,000  
**OGDEN** ..... 25,000 to 100,000  
**Logan** ..... 1,500 to 25,000  
**Vernal** ..... 2,500 to 5,000  
**Beaver** ..... less than 2,500  
Population indicated by size of letters