

OHIO

Only Paleozoic rock formations underlie Ohio's Pleistocene surface debris and Quaternary soils. For long ages Ohio lay beneath a shallow sea which received successively enormous quantities of Ordovician, Silurian, Devonian, Mississippian and Pennsylvanian sediments; the erosional products of some 200 million years. Few, if any Mesozoic rocks appear within the state, but every one of Ohio's 88 counties is surfaced with Pleistocene debris. The state was buried completely four times by Ice Age glaciers, leaving the land surface nearly level but with some fairly rugged low hills in the southeastern corner. There are few localities containing worthwhile gems or minerals, although excavations in the underlying black, Upper Devonian (New Albany) shales occasionally produces pieces of silicified wood.

Ohio ranks first in the nation in the production of limestone and dolomite, and second in the production of clays. Lesser production of iron, petroleum, natural gas and coal from thick beds contributes to the mineral economy. But as far as the collector is concerned, Ohio is unique in but a single gemstone, an exceptionally high quality, colorful **flint** that is mostly a mixture of chert, translucent chalcedony, jasp-agate and common opal, rivaling in beauty the Arizona agatized wood. This gem flint occurs in the 8 mile long Flint Ridge, between Newark (Licking Co.) and Zanesville (Muskingum Co.), a region of rolling, wooded hills. Here, prehistoric Indians quarried the toolmaking material for arrowheads and other implements.

While occurrences are widespread throughout Ohio, the chief deposits of true flint (characterized by ease of working) include the highly colored *Vanport flint* of the Flint Ridge and the *Upper Mercer flint* exposed in Hocking, Perry, and Coshocton counties. Early American settlers also quarried a rough, porous flintstone from outcrops, especially around McArthur, Vinton Co., for making the burstones they needed for grinding grain in their water mills.

Other collectable minerals are rare, although quarries in the western counties, especially the Clay Center Quarry 12 miles southeast of Toledo but in Ottawa Co. between Rtes. 51 and 579 yield good specimens of **Celestite**, **Dolomite** crystals, **Fluorite** (fluorescent), , **Galena**, **Marcasite**, **Pyrite**, **Selenite** and **Sphalerite**. A few alluvial **Diamonds** have been found.

ASHTABULA COUNTY

CONNEAUT, area pits, quarries, rd. cuts, etc.—cone-in-cone **Calcite**.

CLERMONT COUNTY

MILFORD, area creek gravels and alluvial deposits, rare—**Diamond**.

CLINTON COUNTY

WILMINGTON, area of Todd's Ford, a mineral deposit—**Hematite**.

COSHOCOTON COUNTY

AREA, townships of Washington, Virginia, Bedford, Jackson, Jefferson, Bethlehem, Monroe and Clark; on regional knobs and ridges and just above areas of drainage in

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townships of Franklin, Keene, Mill Creek and Tuscarawas, as hard dark gray to black nodules—**flint**.

CUYAHOGA COUNTY

CHAGRIN FALLS (on Geauga Co. line), area quarries—**oilstone**.

DELAWARE COUNTY

DELAWARE, area Co. exposures of blue clay, as clusters and nodules—**Pyrite** (crystals sharply cubic).

FRANKLIN COUNTY

COLUMBUS, area countywide exposures of blue clay in rd. cuts, pits, quarries, excavations—**Pyrite** (clustered crystals sharply cubic).

HIGHLAND COUNTY

SINKING SPRING, area ore deposit (most important in Ohio)—**Hematite**.

HOCKING COUNTY

AREA exposures throughout Co. of the Upper Mercer horizon, commonly represented by black flint of excellent quality: ① Benton Twp. Map, Sec. 24, along high ridges and knobs, as nodules—**flint**; ② Green Twp., 2½ mi. SW of Kachelmacher and 1 mi. W of Freeland School—**flint**; (high quality); ③ Sec. 23, E center, in a hollow as scattered nodules—**flint**; ④ Washington Twp., SW part of Sec. 31 in a gully on the knob—**flint**.

HOLMES COUNTY

AREA, townships of Berlin, Hardy, Killbuck, Mechanic, Paint and Salt Creek (with occurrences in shale or sandstone); and conspicuous deposits in townships of Clark (limestone occurrences), Prairie and Walnut Creek—**flint**.

JACKSON COUNTY

AREA, townships of Bloomfield, Coal, Hamilton, Jefferson, Franklin, Lick, Madison and Milton, as nodules in the Vanport member—**flint**.

LAWRENCE COUNTY

AREA, townships of Decatur, Elizabeth, Perry, Symmes, Upper and Washington, as nodules in limestone exposures—**flint**.

LICKING & MUSKINGUM COUNTIES

AREA, from 3 mi. SE of Newark, Licking Co., to 12 mi. NW of Zanesville, Muskingum Co., 8 mi. long by ¼ mi. wide: ① Flint Ridge—**agate**, **Amethyst**, **carnelian**, **chalcedony**, **chert** (various colors), jasper-like **flint**, **jasp-agate**, **jasper**, **Smoky Quartz**

Ohio

crystals, clear **Quartz**. From Brownsville, Licking Co., take US 40 E 3 mi., turn N to Flint Ridge State Park, and area of 10 mi. radius of private lands—gem **flint**. ② Regional rd. cuts, banks, stream banks and beds—gem **flint**, translucent **chalcedony**, drusy **quartz**.

LUCAS COUNTY

SYLVANIA, SW, at jct. of Brint St. and Centennial rd., the Medusa Quarry (SW of 4 quarries), very many specimens—**fossils** (some replaced by Marcasite), hollow shells lined with **Calcite** crystals or **Marcasite**.

WHITEHOUSE, area quarries—**Celestite**, **Gypsum**.

MUSKINGUM COUNTY

AREA—**agate**, **Amethyst**, **carnelian**, **chalcedony**, **chert** (various colors), jasper-like **flint**, **jasp-agate**, **jasper**, **Smoky Quartz** crystals, clear **Quartz**..

ZANESVILLE, area mined deposits—**Hematite**.

OTTAWA COUNTY

CLAY CENTER, area limestone quarry, famed—**Calcite**, **Celestite** (fluorescent), **Dolomite** crystals, **Fluorite** (fluorescent), **Pyrite**, **fossils**.

GENOA, SE, in area quarries—**Calcite**, **Celestite**, **Dolomite** crystals, **Fluorite**, **Marcasite**, **Pyrite**, **fossils**.

GREEN (or Strontian) ISLAND, Put-in-Bay, Lake Eire, as fine crystals and large masses filling fissures in the waterline rock—**Celestite**.

PERRY COUNTY

AREA: ① countywide deposits, long worked, as nodules—**flint**; ② townships of Monday Creek, Salt Lick, Pike and Clayton, area—**flint**.

ROSS COUNTY

CHILLICOTHE, W several mi., in a region exposures of blue clay, as large masses—**Pyrite** crystal clusters.

SANDUSKY COUNTY

WOODVILLE, area quarries—**Calcite**, **Celestite**, **Dolomite** crystals, **Fluorite**, **Marcasite**, **Pyrite**, **Witherite** (fluorescent), **fossils**.

SCIOTO COUNTY

PORTSMOUTH, countywide regional quarries—**Catlinite**.

SENECA COUNTY

MAPLE GROVE (N of Tiffin to Ft. Seneca on Rte. 53 and W 2 mi. on secondary line rd., then N ½ mi. to Maple Grove Quarry) —**Calcite**, **Celestite**, **Dolomite** crystals, **Fluorite**, **Marcasite**, **Pyrite**, **fossils**, etc.

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TUSCARAWAS COUNTY

CANAL DOVEL, MIDVALE, NEW PHILADELPHIA, ROSWELL, WAINWRIGHT, regional mines—**Pyrite**.

TUSCARAWAS, STARK, SUMMIT & PORTAGE COUNTIES

AREA, from the NW part of Tuscarawas Co., in numerous townships along the valley of the Tuscarawas R. from Bolivar to Zoar Station, as nodules in limestone outcrops—**flint**.

VINTON COUNTY

AREA: ① Swan Twp., on Upper Mercer horizon exposed along an old rd. in SE part of Sec. 9—**flint**; ② townships of Richland (Sec. 1, central part along an abandoned rd.), Wilkesville, Vinton, Clinton and Elk, in Vanport limestone exposures as nodules—**flint**.

WAYNE COUNTY

AREA, Paint Twp., Sec. 24, near center, as black nodules—**flint**.

WOOD COUNTY

BOWLING GREEN, W and S, at the Pugh Quarry—crystals of **Barite** (fluorescent), **Calcite**, **Celestite**, **Fluorite**, **Pyrite** (all in cavities and veins).

LIME CITY, area quarries—**Celestite** (fluorescent).

OKLAHOMA

The Sooner State occupies approximately 70,000 sq. mi. of nearly level land in the southern part of the Great Plains. The western Oklahoma Panhandle is part of the arid, short grass Great High Plains, broken by the Black Mesa in the northwest corner of Cimarron Co. and the Wichita Mts. in the southwest. Black Mesa, at 4,978' elevation, is the highest point of the state. From the Panhandle the land slopes gently east and south to a minimum elevation of less than 350' in the extreme southeastern corner of the state. There are elevated regions, ranging from 200' to 1,200' higher than the surrounding plains, in the Wichita, Kiamichi, Ouachita and Arbuckle mountains and in the westward extensions of the Missouri Ozarks.

Parts of Oklahoma are mineralogically important. Extensive coal beds occur around McAlester, Pittsburg Co., and the great mines of the extreme northeastern corner, known as the Tri-State Area, are famed for their production of **Lead** and **Zinc** along with similar production from the adjacent mines in Kansas and Missouri. While western Oklahoma produces a good deal of **Gypsum**, it is the immense petroleum deposits which have given the state much of its fame and wealth.

Barite occurs at many localities in maroon sediments of Lower Permian age, with the greatest concentrations south and east of the Wichita Mts. and in the central counties of Comanche, Kiowa, Stephens and Tillman, with locally abundant exposures in McClain and Garvin counties. In the Barite dists, the mineral occur in veins, nodules and Barite-clay carbonate concretions in shale or as sand-barite concretions in sandstone. The *state stone* of Oklahoma, if it can be called that, is the Barite Rose.

Southwestern Oklahoma, especially in Beckham and Tillman counties, produces **alabaster**, **agatized** and **petrified wood**, and other **quartz family gemstones** from regional gravel pits and stream beds. Along the Cimarron and North Canadian rivers, gravel bars carry **agate**, **jasp-agate**, **jasper** and **petrified wood** along with **fossil** bones and teeth of Pleistocene mammals.

ALFALFA COUNTY

JET, W 6 mi. on US 64, then N 3 mi. on dirt rd. to crossrds., then E 1¼ mi. to gate; collecting area on the Salt Plains National Wildlife Refuge are posted—**Selenite** crystals. Collecting on the refuge is permitted from 8 AM to 5 PM only on weekends and holidays between April and mid October; per person limits are 10 lbs. Plus one crystal cluster per day. Natural salt (halite) coating the plains, 7 mi. long by 3 mi. wide.

ATOKA COUNTY

AREA, Impsom Valley, W side, on branch of Tenmile Cr., in fissure veins in Stanley shale—**Grahamite**.

ATOKA, area quarries—**novaculite**.

BECKHAM COUNTY

AREA, Gypsum quarries—**alabaster**, **Selenite**, **petrified wood**.

ELK CITY, area quarries—**alabaster**, **Selenite**.

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BLAINE COUNTY

AREA (extending SW into Custer Co.), regional quarries—**Borate** minerals (**Priceite**, **Probertite**, **Ulexite**).

SOUTHARD, area quarries—**Borate** minerals.

WATONGA, NE 6 mi., quarry—**Borate** minerals.

WINNVIEW, area scattered through clay shale exposures, as raw nuggets—native **Copper**.

CADDO COUNTY

APACHE, SW 4 mi., quarry—**Calcite** rhombs (fluorescent).

CANADIAN COUTNY

EL RENO (W end of the Oklahoma City complex), in gravel bars along the North Canadian R.—**agate**, **jasper**, **petrified wood**.

CIMARRON COUNTY

KENTON: ① E 2 mi. on Rte. 18 to turnoff to Roberts Ranch and 2.3 mi. to ranch house, fee, collecting area—**agatized algae**, agatized **cycad wood**; ② N to Tri-State Marker (OK-CO-NM), on hill—rose **agate**; ③ E ½ mi., turn N across Cimarron R. 11.2 mi. into Colorado, turn E 2.3 mi. to the Layton Ranch (fee), in bed and sides of Carrizozo Cr. S from Colorado into Oklahoma —rose **agate**, **agatized algae**, **agatized cycad wood**.

COAL COUNTY

LEHIGH, HUNTON, area mines—**Manganese** minerals.

COTTON COUNTY

RANDLETT: ① E 3 mi., and ② E 6 mi., as small fissures in red shale—**Malachite**.

DEWEY COUNTY

SEILING, TALOGA, area—**agate**, **Jadeite**, **jasp-agate**, **jasper**, **petrified wood**, etc.

GARFIELD COUNTY

ENID, T. 24 N, R. 8 W (NE¼SE¼ Sec. 24), area—native **Copper**.

GARVIN COUNTY

PAULS VALLEY, area of Sec. 18, T. 4 N, R. 1 E, in red sandstone—**Malachite**.

GREER COUNTY

AREA, the Wichita Mts., regional mines—**Amphiboles**, **Zircons**.

Oklahoma

MANGUM: ① area quarries—**alabaster**; ② N of town, general area—**agatized wood**.

HARPER COUNTY

BUFFALO, area—**agate, chalcedony, chert, jasper**.

ROSSTON, on twin buttes 1 mi. E of Hwy. 283 and 7 mi. N of jct. of Hwy. 283 with Hwy. 64—**Aragonite**.

HUGHES COUNTY

WETUMKA, area of Sec. 30, T. 8 N, R. 9 E, as clear, transparent, coarsely crystalline masses—**Barite**.

JACKSON COUNTY

ALTUS, area draws, washes, cut banks, gravels—**Smoky Quartz** crystals.

JOHNSTON COUNTY

MILL CREEK: ① area mines—**Manganese** minerals; ② NE 6 mi., old Thompson Ranch near W line of NW¼ Sec. 15, T. 1 S, R. 5 E—**Barite, Iron** oxides.

KIOWA COUNTY

HOBART, in quarries near Altus Reservoir—**Quartz** crystals.

OTTAWA COUNTY

MIAMI-PICHER, regional Lead-Zinc dist. Mines as important contributors to the Tri-State Dist. Mineral production—**Anglesite, Aragonite, Barite, Calamine, Calcite, Chalcopyrite, chert, Dolomite, Galena, Greenockite, Gypsum, Marcasite, Melanterite, Quartz** crystals, **Pyrite, Smithsonite, Sphalerite**.

The major producing mines occur within an area of 25 to 30 mi. revolving around the mining towns of Picher, Cardin, Century and Quapaw.

PEORIA, QUAPAW, area mines—**Calamine, Cerussite, Galena**.

SENECA, area mines—**tripoli**.

PUSHMATAHA COUNTY

ANTLERS: ① area draws, washes, gravels—green **Quartz** crystals; ② Impson Valley, McGee Creek and Moulton mines—**Impsonite** (bitumen).

WOODS COUNTY

ALVA: ① countywide regional fields, washes, stream beds, cut banks, etc., especially ② S of Alva—**agate** (banded, mossy), **chalcedony, chert, jasper**.

OREGON

The geologic character of Oregon was formed during Tertiary times when millions of years of volcanic activity during the Oligocene and Miocene epochs raised the Cascade Mts., and layered nearly the whole surface of the state with thick beds of volcanic ash and flows of basalt. The Cascade Range, with its numerous snow-covered volcanic cones, divides the 100 mi. wide strip of rainy western Oregon from the high arid plateau country of the eastern two-thirds of the state. Northeastern Oregon is part of the 225,000 sq. mi. basalt Columbia Plateau, one of the largest raw lava regions of the world.

Central and eastern Oregon embraces many thousand sq. mi. of some of the most prolific gemstone collecting land in America. Here almost every type of **Quartz family gemstone** can be found, along with such oddities of the mineral kingdom as geodes, nodules, fossils, and a great array of silicified woods. The fertile western region is also heavily endowed with gemstones, and nearly every creek and river gravel bar, regional gravel pit or other excavation and rd. cut reveals attractive minerals, gemstones, fossils and petrified wood.

A federal law passed in 1962 limits collecting of rocks from public lands to not more than 25 pounds plus one piece per person per day, not to exceed 250 lbs. per year. Petrified wood may not be sold or bartered to commercial collectors. A particularly informative and colorful *Central Oregon Rockhound Guide* is available free of charge, published by the Forest Service in cooperation with the Bureau of Land management, and the Prineville-Crook county chamber of Commerce.

The state rock of Oregon was officially designated as the **thunderegg**, one of the most distinctive and sought-after mineral oddities in the world. These spherical masses of agate core in a volcanic matrix range in size from less than 1" to several ft. in dia., with most specimens being slightly larger than baseballs. The exterior surface is an uninteresting, drab rind of chocolate brown rhyolite or silicified volcanic tuff, nearly always knobby in appearance. This rind encloses a solid core of a peculiarly geometric, multisided mass of translucent chalcedony which may be banded agate in contrasting colors, deep red carnelian, jasp-agate, or chalcedony containing a small unfilled cavity lined with Quartz crystals. No two thundereggs are alike, and no matter how one is sawed or sliced, the interior presents a star shape in lovely contrasting colors against the dark brown, buff, or tan rind matrix. The most prized specimen contain carnelian or reveal exquisite and colorful designs ranging from five-pointed stars to miniature landscapes. Not a few thundereggs are actual doubles enclosed in an elongated rind. Such nodular gemstones are invariably associated with highly siliceous volcanic rocks and are found abundantly in rhyolite flows and welded tuffs in a broad zone north and west of US 26. The geology exposed in this area is mainly the Clarno formation of Eocene age and includes basic flows and andesite intrusives. The genesis of thundereggs is almost completely unknown.

Some of Oregon's coastal beaches are considered by rock collectors as the finest areas in the world for **agates** (clear, ribbon), **jasper**, **agatized wood**, **coral**, **bloodstone** and **fossils**. Agate Beach near Newport in Lincoln Co. was well named. Other beaches well known to collectors are Otter Rock, Bob Creek, Ten Mile, Hecceta Head, and beaches both north and south of Yaquina Bay. The best hunting is right after winter storms and after extreme high tides have churned up the sands.

Oregon also ranks 10th in the **Gold** producing states of America. The Gold panning hobbyist may still reap small seasonal fortunes in nuggets and colors from the streams of northeastern Oregon's Blue Mts. and those descending the Siskiyou Mts. of far southwestern Oregon.

Oregon

BAKER COUNTY

BAKER: ① area land surfaces, draws, washes, etc., many varieties—**quartz family gemstones**; ② area mining dists., including Baker, Buck Gulch, Virtue, etc., regional mines (lode and placer) —**Gold, Pyrite, Pyrrhotite** (bearing Gold), **Tetrahedrite**; ③ N 2 mi., a quarry—**Gypsum, satin spar**; ④ Shirttail Cr., area—**agate, chalcedony, jasper, Oregon Jade** (green **plasma** agate), **agatized wood**; ⑤ E, in volcanic rocks and in Powder R. gravels along the Richland Valley—**chalcedony geodes** (lined with drusy quartz crystals).

COPPERFIELD (NE part of Co.), the Copper Butte Dist. (including the Lower Snake R.), regional mines, especially the Copper Queen—**Chalcocite, Malachite, Pyrite**.

CORNUCOPIA (ghost town), the Bryan Mine and others—**Gold, Pyrite, Sylvanite**.

DURKEE, area washes, draws, slopes—quartz family **gemstones**.

GEISER, the Bonanza Dist. regional mines—**Gold, Pyrite**.

HOMESTEAD (extreme NE corner of Co.), the Iron Dike Dist. mines, as predominant metal—**Silver** minerals.

PLEASANT VALLEY. Area draws, washes, hillsides—**garnets** (resembling Rhodolite), **opalized wood** (banded black and white).

RICHLAND, area surfaces, draws, etc.—quartz family **gemstones**.

RYE VALLEY, area mines—**Argentite, Arsenopyrite, Cinnabar, Galena, Pyrite, Pyrolusite, Specularite** (in Argillite), **Sphalerite, Tetrahedrite**.

SPARTA (14 mi. NW of Richland), area mines—**Arsenopyrite, Galena**.

SUMPTER: ① area mining dists. Of Cable Cove, Elkhorn and Burnt River Divide (Sumpter), regional mines—**Argentite, Arsenopyrite, Cinnabar, Galena, Pyrite, Pyrolusite, Specularite** (in Argillite), **Sphalerite, Tetrahedrite**; ② Cracker Creek Dist.; and ③ N, in the Bourne Dist., area mines (several deep) —**Gold, Pyrite**.

WHITNEY (11 mi. SW of Sumpter): ① Greenhorn Dist.: (a) area gravels surfaces—**Gold, agate, silicified wood**; (b) Greenhorn Mts., area NW of the Owyhee Reservoir—**agate**.

BENTON, LANE, LINN, CLACKAMAS & MULTNOMAH COUNTIES

AREA, all low-water gravel bars of the Willamette R., and its tributaries—**agate, jasper, bloodstone, petrified wood**, etc.

CLATSOP COUNTY

ASTORIA, Pacific Ocean beaches in gravels as waterworn pebbles—**bloodstone, jasper**, some **agate**.

Pittsburg, MIST, JEWEL, ELSIE, NEHALEM (take E to W along the Nehalem R. from Columbia Co. NE of Vernonia), low-water stream gravels all way to ocean—**agate, carnelian, jasper**.

COLUMBIA COUNTY

GABLE, Columbia R. shores, in gravels—**Thomsonite**.

VERONIA: ① SW, in gravels of Clear Cr.—plume **agate, carnelian, jasper**; ② in gravel bars of Clear Cr. and town—**agate, carnelian, chalcedony, jasper**; ③ area logging RR cuts—**Zeolite** minerals, **fossils**.

COOS COUNTY

AREA, ocean beach gravels, entire length of Co.—**agate**.

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BANDON, just N, at Bullards Beach State park, in beach sands—**Platinum**.

COOS BAY, W to ocean beaches, both N and S of the bay entrance along entire coast of Co.—**agate, petrified wood**.

MYRTLE POINT, including the Eden and Randolph dists., regional stream placers—**Gold**.

CROOK COUNTY

AREA: ① W side of Co., especially in broad triangle between US 26 on N and US 20 on the S, all land surfaces, draws washes, etc.—**agate, chalcedony, chert, jasper, petrified wood, quartzite**; ② Howard area black-sand placers—**Cinnabar, Gold**; ③ McAllister Butte (near Ochoco Cr.), area—gem **moss agate**.

PAULINA, SW 5½ air mi., in T. 17 S, R. 22 E: ② Sec. 8 & 29, the South Fork, area—**agatized limb casts**.

POWELL BUTTE, area draws, washes, breaks, slopes, etc.—plume **agate**.

PRINEVILLE. Most of the following localities have been abstracted from Central Oregon Rockhound Guide, published in 1971 by the US Forest Service. This broad region ranks among the finest gemstone collecting areas in America for **moss agate** (all sizes and colors), **Quartz** crystal geodes, massive botryoidal **agate**, and **thundereggs**. Many of the listed localities comprise free collecting claims owned by the Prineville chamber of Commerce; many others are on private land and require permission.

① Area, Viewpoint, several excellent locations on private lands, fee charged—**thundereggs**; ② E 5 mi. on US 26, Ochoco Lake shores above the dam, area—**Ochoco jasper**; ③ E 6 mi., on US 26, on NW side of the Ochoco Reservoir in Sec. 14, T. 14 S, R. 16 E, area—**Ochoco jasper**; ④ E approx. 19½ air mi., in T. 14 S, R. 18 E, sheep Cr. (NW¼ Sec. 25), area—green **moss agate**; ⑤ E, into the Clarno Basin, all regional land breaks, washes, erosional slopes—**fossil** bones and cones; ⑥ ENE on US 26 to dirt rd. turnoff NE along Ochoco Cr., then NE ≈ 12 mi. (into Wheeler Co.): (a) turn W, back into Crook Co. to Coyle Spring (Sec. 34, T. 12 S, R. 19 E), area—green **jasper**; (b) Sec. 35, Ahalt Cr., area—**Vistaite**; ⑦ NE ≈ 12 air mi. (6.2 air mi. due N of the E end of the Ochoco Reservoir), in T. 13 S, R. 17 E, Dry Cr.: (a) line between Sec. 7 & 8, SW¼ Sec. 8, area—**jasper**; (b) due N ½ mi. or so, area—**thundereggs**; ⑧ NE ≈ 16 air mi. (11 mi. NNE of E end of the Ochoco Reservoir), in T. 12 S, R. 17 E: (a) S part of Sec. 22, Harvey Cr., area—**thundereggs**; (b) NW¼ Sec. 22, Harvey Gap—**thundereggs**; (c) nearby, in Sec. 30, T. 12 S, R. 18 E, at Forked Horn Butte, area—**thundereggs**; ⑨ NE ≈ 16 air mi.: (a) T. 13 S, R. 18 E, White Fir Spring (Sec. 7), area—**thundereggs**; (b) Sec. 5, white Rock (immediately SE of Wildcat Mt.), area—**thundereggs**; ⑩ NE ≈ 19 air mi., at Wildcat Mt., the famed Ochoco Nodule Beds, area—plume **agate, chalcedony, opal, thundereggs** (agate centers); ⑪ NE ≈ 25 air mi., in Sec. 26, T. 11 S, R. 18 E (area reached by USFS rd. 1223), area—green **moss agate**; ⑫ NE ≈ 26 air mi. via US 26 to the Ochoco Divide, turn W on dirt rd. to Whistler Spring in T. 12 S, R. 18 E: (a) Sec. 11, area about the springs—**thundereggs**; (b) Sec. 16, Desolation Canyon, area—**thundereggs**; ⑬ S about 15 mi. on the Crooked R. rd. to the Prineville Reservoir dam, then continue S and E about 6 mi. to rd. fork at Bear Cr.: (a) turn N to mouth of Bear Cr. in Sec. 4, T. 17 S, R. 16 E, area—**agate**; (b) from fork turn S and E about 12 mi. (past Little Bear Cr. turnoff, then up Bear Cr. from its confluence with Sage Hollow Cr.), then fork N on crooked dirt rd. about 3 mi. to Sec. 15, T. 18 S, R. 17 E, Fischer Canyon (on the Crook Co. side of the Deschutes Co. line), area—**petrified wood**; ⑭ S ≈ 19 mi. on Rte. 27 and 2 mi. S of confluence of Bear Cr. with the Prineville Res., on E side of Taylor Butte (Sec. 9, T. 17 S, R. 16 E): (a) area—**moss agate, chalcedony**, drusy **quartz** in agate; (b) gravel bars of the whole length of Bear Cr. —**moss agate, chalcedony**, drusy **quartz** in agate; ⑮ SSE about 12 mi. on the Juniper Canyon rd. to Antelope Cr.: (a) area E toward the Carey Ranch in Sec. 11, T. 16 S, R. 16 E, the famed Carey Agate Beds—Carey plume **agate, chalcedony**,

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jasper; (b) SW about 3 mi. to end of rd. in Sec. 21 (a short distance E of the Prineville Res.), area of Reservoir Heights—black **moss agate**; ⑩ SE ≈ 12½ air mi. to Eagle Rock in Sec. 29, T. 15 S, R. 17 E, area N of the Prineville Res. And Crooked R.—dendritic **agate**; ⑩ SE ≈ 30 air mi. into Ochoco Natl. Forest, in Sec. 1 & 2, T. 17 S, R. 19 E, at Shotgun Cr., area—varied **moss agate**; ⑩ SE ≈ 40 air mi.: (a) 4½ mi. S of Logan Butte, in SE¼, SE¼ Sec. 12, T. 19 S, R. 19 E, Smoky Mt., area—**agatized limb casts**; (b) ≈ 4 mi. SE of Logan Butte at Owens Water-South Pole Cr. in Sec. 3 & 9, T. 19 S, R. 20 E, area—green **agatized wood**.

CURRY COUNTY

AREA: ① ocean beaches along entire Co., but especially N and S of the mouths of the Chetco and Rogue rivers—**agate**, **Californite** (Idocrase), **Jasper**; ② Rogue R. gravel bars from Marial in the NE corner of Co. to its mouth at Wedderburn—**agate**, **Garnets**, **Gold**, **jasper**, **petrified wood**.

AGNESS: ① area Rogue R. gravels—**agate**, **carnelian**, **chalcedony**, **Grossularite** garnets, **Gold**, **jasper**, **Quartz** crystals; ② old mines and prospects along the lower Illinois R.—**Copper** minerals, native **Copper**.

BROOKINGS, area ocean beach gravels—**agate**, **jasper**, **Nephrite** jade.

CHETCO, CORBIN, ECKLEY, MARIAL, OPHIR, PORT ORFORD, SELMA, many regional streams with placer sands, formally mined and yielding colors and nuggets to the casual seasonal panner—**Gold**.

PORT ORFORD, area ocean beach sands—**Platinum**.

SIXES, E on rural rd. into Coast Range ≈ 15 mi. to Sugarloaf Mt., area talus slopes and stream gravels—**Nephrite**, **serpentine**.

WEDDERBURN (at mouth of the Rogue R.), area river gravels—**Grossularite** garnets.

DESCHUTES COUNTY

LAPINE (30 mi. S of Bend on US 97), N 5 mi., turn E for ≈ 13 mi., area between Paulina and East lakes—**obsidian**.

DOUGLAS COUNTY

AREA, Cedar Springs Mt., the Ball Mine—**Azurite**, **Chalcocite**.

GLENDALE, area old hydraulic placers and lode mines—**Gold**.

OAKLAND, SE, area old mines—**Cinnabar**.

REEDSPORT, W, all ocean beach gravels N and S of Winchester Bay—**agate**.

RIDDLE, NW, at Nickel Mt., area mines—**chrysoprase**, **Nickel** minerals.

ROSEBURG: ① SE 9 mi., area quarries—**marble**; ② E 12 mi., in gravels of Davis Cr.—orbicular **jasper**; ③ area gravels of the Umpqua R.—*Oregon Jade* (massive **Grossularite** garnet): (a) N, in gravel bars of the North Umpqua R. and (b) especially 22 mi. E in same river gravels, and (c) S, in gravel bars of the South Umpqua R.—**agate**, **chalcedony**, **carnelian**, **jasper**, **petrified** and **silicified wood**.

GRANT COUNTY

AREA: ① many old mining dists. In NE part of Co., including Alamo, Crane Creek, etc.—**Gold**; ② at Beach Creek, in cavities in volcanic rock—**Cowlesite**, **Levyne** (both fluorescent).

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CANYON CITY (just S of John Day on US 395), several area old placer mines—**Gold**.

GRANITE (far NE part of Co. and 14 mi. NW of Sumpter, in Baker Co.), many dredger tailings and area mines—**Arsenopyrite, Galena, Gold**, etc.

JOHN DAY, NE, in very broad area extending to Austin (30 mi., the Poker Flat mining dist.), hydraulic placers—**Gold**; ② and Granite (38 air mi.), all regional draws, washes, land surfaces—gem **jasper**.

PRAIRIE CITY: ① the Quartzburg Dist. mines—**Cobaltite, Chalcopyrite, Gold**; ② the Copperopolis claims—**Malachite**; ③ Saw Mill Gulch, hydraulic placers—**Gold**.

SUSANVILLE (Dist.), many area old mines—**Cinnabar, Chalcopyrite, Gold, Sphalerite**, etc.

HARNEY COUNTY

AREA, the Steens Mts. in SE corner of Co. (follow any desert rd. into general surrounding region of these abrupt, high isolated mts.): ① reds. S from Princeton 40 mi. Se of Burns via Rte. 78 lead to W side of the Steens, and ② rds. SW from Folly Farm 30 mi. SE of Princeton leading to the Alvord Ranch, Andrews, and Fields give access to the E side of the range, all regional land surfaces, draws, washes, etc.—**moss agate, jasper, thundereggs, geodes, Quartz** crystals, etc.

BURNS: ① W, broad general area, and ② E to Buchanan, area of the Harney Valley—**moss agate, jasper, thundereggs, geodes, Quartz** crystals, etc.; ③ N 18 mi. on US 395, then 7 mi. W, Silvies Canyon in Myrtle Park—wood **opal**; ④ E 40 mi., the Warm Springs Reservoir: (a) area surfaces—**agate, chalcedony, jasper, petrified wood**; (b) at milepost 171 on US 20 turn S on dirt rd. 14.2 mi. to the reservoir, on E side of rd. along lake and on surfaces of surrounding hills—**agate** (black dendritic and white plume).

DENIO, the Pueblo Mts. (S of the Steens Mts.), mines, as large masses—**Uraniferous silica**.

HARNEY CITY, area placers—**Gold**.

JACKSON COUNTY

AREA, This Co. and including adjoining Josephine Co. are located in the Mountain Region of SW Oregon. The **Gold** producing mines of SW Oregon belong to the same mineralized belt as the deposits in Siskiyou Co., CA.

APPLEGATE (Dist.): ① area diggings and hydraulic placers along the Applegate R. (originally worked by Chinese labor) —**Jade** (botryoidal, or *Monterey* type), **soapstone**, placer **Gold**; ② Upper Applegate Dist. (area drained by the Applegate R.): (a) area mines, (b) the Queen Anne Mine, and (c) the Sterling Mine—**Arsenopyrite, Calcite, Gold, Pyrite**.

ASHLAND: ① Big Butte, area—**agate**; ② SE, on Green Springs Mt. (elev. 4,551'), area slopes, draws, etc.—**agate** nodules, **carnelian, chalcedony, jasper**; ③ mining dist., including Mt. Ashland or Siskiyou Peak, Pilot Knob and Grizzly Peak plus the intervening Bear Cr. Valley, with several tributaries leading N as far as Phoenix (8 mi.): (a) Ashland area mines—**Gold, Pyrite, Pyrrhotite, Quartz** crystals, **Sericite**; (b) Columbine mines—**Chalcopyrite, Gold, Marcasite, Pyrite, Pyrolusite**; (c) Crackerjack mines—**Bornite, Chalcopyrite, Calcite, Gold, Pyrite**; (d) Mattern mines—**Calcite, Gold, Pyrite**; (e) Palmer Cr., small prospect—**Cinnabar**; (f) Reeder, area mines—**Calcite, Chlorite, Gold, Pyrite**; (g) Shorty Hope, mines—**Calcite, Chalcopyrite, Galena, Gold, Pyrite, Pyrrhotite**.

BUTTE FALLS, area stream gravels—**bloodstone**.

Oregon

CENTRAL POINT, area from 4 mi. E of town to 6 mi. NE at Eagle Point: ① Rogue R. gravel bars, and ② gravels of Antelope and Butte creeks and their tributary draws—**moss agate**.

EAGLE POINT, area stream gravels—**moss agate, bloodstone**.

GOLD HILL (Dist.), includes the Rogue R. Valley from Central Point and Table Rock E to Josephine Co., a great many important regional old mines scattered in the backcountry, most of which have similar minerals on their dumps—**Arsenopyrite, Bornite, Calcite, Chalcopyrite, Galena, Gold, Pyrite, Pyrolusite, Pyrrhotite, Sphalerite**.

JACKSON (Medford Dist.) The dist. adjoins the Ashland Dist. on the NW and includes all of the Bear Cr. Valley between Phoenix and Central Point; to the SW it extends to the divide between Bear Cr. and the Little Applegate R; to the NE it is limited by Antelope Cr.: ① the Norling Mine—**Gold, Pyrite**; ② the Opp Mine—**Calcite, Chlorite, Gold, Pyrite, Petzite**; ③ the Town Mine—**Gold, Pyrite, Quartz**; ④ the Yellow King Mine—**Gold, Pyrite**.

MEDFORD: ① on hills above McCloud on Rte. 62 to Crater Lake: (a) area basalt outcrops—**Natrolite**; (b) draws, washes, slopes, etc.—**Quartz** crystals; ② Big Butte, area—**medfordite** (green and white jasper); ③ Big Falls, area—**bloodstone**; ④ NE 10 mi. on Rte. 62, broad area—**carnelian moss agate**; ⑤ N 12 mi., Table Rock, area—**agate, petrified wood**.

JEFFERSON COUNTY

AREA, N and E parts of Co., tributaries of the John Day R., in regional gravels, draws, washes, etc.—**fossil ferns**.

ASHWOOD: ① area—**agate, chalcedony, geodes, jasper, thundereggs**; ② E 22 mi., the Horse Heaven Mine—**morrisonite** (chert).

MADRAS: ① general region—**agate, chalcedony, geodes, jasper, thundereggs**; ② NE 17 mi. and 4 mi. SE of Willowdale, the Fulton Agate Beds (formally known as the Friday Ranch), one of the best known gem locations (fee) —**agate, chalcedony, jasper, precious Opal, thundereggs**.

WILLOWDALE, general area surfaces, draws, washes, etc.—**agate, chalcedony, geodes, jasper, thundereggs**.

JOSEPHINE COUNTY

AREA, Josephine Cr., placer gravels—**Gold, Josephinite** (a Nickel mineral), **Platinum** nuggets.

CAVE CREEK JUNCTION: ① area gravels and placer mines along Cave Cr.—**Gold, Rhodonite**; ② E 18 mi. to famed Oregon Caves, all area surrounding the cavern—**agate, chalcedony, Gold** nuggets (in alluvial gravels of watercourses), **jasper, petrified wood, Rhodonite**.

GALICE (Dist.), occupies the Rogue R. Valley NW of the mouth of Jump-Off-Joe Cr. to the W boundary of Co., many area old mines—**Arsenopyrite, Azurite, Bornite, Calcite, Chalcopyrite, Chrysocolla, Galena, Gold, Malachite, Pyrite, Pyrolusite, Pyrrhotite, Sphalerite**.

GRANTS PASS (Dist.), occupies the Rogue R. Valley SE of the mouth of Jump-Off-Joe Cr. (except Applegate Valley), many old mines—**Arsenopyrite, Azurite, Bornite, Calcite, Chalcopyrite, Chrysocolla, Galena, Gold, Malachite, Pyrite, Pyrolusite, Pyrrhotite, Sphalerite**.

HOLLAND, S 1½ mi. along Althouse Cr., area—**agate, Garnets, Gold** nuggets, **jasper, Quartz** crystals, **serpentine**.

KERBY, W 10 mi., mine—**chrysotile** asbestos.

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WALDO (Dist.), occupies the SW corner of Co., an area drained chiefly by Althouse and Sucker creeks and the East Fork of the Illinois R.: ① a few placer and lode mines—**Azurite, Bornite, Chromite, Chrysocolla, Galena, Gold, Malachite, Quartz** crystals, **Silver**; ② near headwaters of the Illinois R., at Sailor's Diggings, placer—**Gold**.

KLAMATH COUNTY

AREA: ① Crater Lake National Park: (a) all area surrounding park—**agate, petrified wood**, etc.; (b) immediately S of park, area—*Crater Lake Flower jasper*; ② Klamath R. gravel bars—**agate, jasper, chalcedony**, etc.

LAKE COUNTY

AREA, far NE corner of Co. (reached 12 mi. Se of Hampton, Deschutes Co. via US 20), on SE side of hwy., Glass Butte (elev. 6,393'), center of a vast volcanic area (obsidian flow) denominated as the Glass Butte Recreational Rockhound Area in Sec. 3, 10 & 14, T. 23 S, R. 22 E (the Glass Butte-Black Butte area) —**obsidian** (various types).

LAKEVIEW: ① all surrounding desert area—**agate, jasper, geodes, nodules, sanidine, sunstone**; ② S 8 mi., in Crane Canyon, area—**agate, jasper, thundereggs**; ③ N 6 mi. on US 395, turn E on Rte. 140 to Warner Canyon, general area with long N-S dirt rd. giving access from Crane Mt. On the S to Crook Peak on the N—quartz family **gemstones, petrified wood**.

PLUSH, NE to Hart Mt.: ① W flank and draws—**agate, chalcedony, geodes, jasper, opal, thundereggs**; ② summit, cavities in Tertiary basalts—**chalcedony, opal**.

QUARTZ MT. (E side of Quartz Pass on Rte. 140 about 66 mi. E of Klamath Falls, Klamath Co.), area of the pass—**agate, chalcedony, jasper**, etc.

LANE COUNTY

BOHEMIA (S part of Co. 15 mi. SE of Disston), a mining dist. comprising placer claims on Sharps, Martin and Steamboat creeks and tributaries—**Gold, Barite, Cerussite, Chalcopryite, Pyrite**.

GOSHEN, E 3 mi., Mt. Pisgah, area—**agate, Calcite, Heulandite, jasper, Malachite, Mesolite, Quartz** crystals.

HAMPTON, LANDAX (on Rte. 58 about 30 mi. SE of Eugene), W, at June Mt., a ledge—**salt peter**.

TRENT, S on Hwy. 58, then ½ mi. to rd. E to Snyder ranch to dig (fee) —**agate** with **Realgar**.

LINCOLN COUNTY

AGATE BEACH (famed OR coast collecting locality, especially after every winter storm), in beach gravels—**agates, moonstones, jasper, chalcedony**, etc.

NEWPORT: ① area beaches, especially at Agate Beach to the N—**agate, chalcedony, jasper, petrified wood, Quartz** crystals (waterworn); ② Yakina Bay to Toledo, area black sands—placer **Gold**.

YACHATS: ① area beaches—**sagenite agate, chalcedony**, orbicular **jasper, moonstone, geodes**; ② beaches S to Florence, Douglas Co.; and ③ beach gravels 2 mi. N of the mouth of China Cr. to Commings Cr. beach 3 mi. S of town—**agate, jasper, petrified wood, enhydros, moonstones, Grossularite** garnets; ④ gravels of Big Cr. —**Garnets**.

Oregon

LINN COUNTY

SWEET HOME, HOLLEY, area: ① the Sweet Home Petrified Forest (embracing some 20 sq. mi.), especially along Ames Cr. and the shores of the Calapooya R., area—banded **agate**, crystal **geodes**, **silicious wood**; ② Chandlar Mt. SW of Holley, area—**agate** (purple or *Calapooya* blue), **carnelian**.

QUARTZVILLE, in placer sands of Quartzville Cr.—**Gold**.

MALHEUR COUNTY

BROGAN, all surrounding area—**agate**, **chalcedony**, **chert**, **jasper**, **petrified wood**.

IRONSIDE: ① all surrounding area; and ② NE, to the Willow Cr. Reservoir, all surrounding area—**agate**, **chalcedony**, **chert**, **jasper**, **petrified wood**.

JORDAN VALLEY: ① all area draws, washes, surfaces—chert, jasper; ② gravels of Jordan Cr.—**agate**, **chert**, **jasper**, **petrified wood**. (A dirt rd. runs E, rough and very steep in places, to the highly mineralized region of De Lamar and Silver City, Owyhee Co., ID, a back door entrance passable for stout cars and pick-ups; many great Silver mines, etc.)

MALHEUR, area extending NE to Rye Valley, Baker Co., many regional mines (some very deep lodes)—**Gold**.

NYSSA: ① area immediately surrounding town—**agate**, **geodes**, **nodules**, **jasper**, **petrified wood**, **thundereggs**; ② basalt rimrocks along regional cr. valleys—**moss agate**, **jasper**, **chalcedony**, **thundereggs**; ③ SW 8 mi. to Owyhee, then W and S on Co. rd to the Owyhee Reservoir Dam: (a) NW 10 mi., near Nigger Rock, area—**agate**, **chalcedony**, **jasper**, **petrified wood**; (b) the Morrison Ranch near S end of the reservoir, area—**morrisonite** (a gemmy jasp-agate); ④ S 35 mi., broad area extending over the ID state line, best reached S from Homedale, ID, on US 95, then S 2 mi. to large sign: *Graveyard Point*, 4 mi. W and 1 mi. S. (Brass Plaque). From the monument head S along a ditch bank to a bridge, cross W, and take main dirt rd. on right of emergency air strip, up a hill, through a gentle gap, and across a cattle guard back into OR: (a) all area surrounding both sides of the state line—**agate**; (b) W 2 mi. from the cattle guard to a rd. fork, take right fork, all area hills along both sides of rd. showing pits, trenches, excavations—**agate**.

ROCKVILLE (at S end of the Sucker Cr. Canyon about 43 mi. S of Nyssa), upstream along Sucker Cr. for entire length—**agate**, **chalcedony**, **chert**, **jasper**, **opalized wood**.

MARION COUNTY

DETROIT, the Santiam Dist., area placers—**Gold**.

MORROW COUNTY

HEPPNER, SE, to area of buttes—opal filled **nodules**.

PARKERSMILL, S, at Opal Butte, area—**Hyalite** opal.

POLK COUNTY

DALLAS, area land surfaces—**jasper**.

SHERMAN COUNTY

BIGGS, S 5 mi. along US 97, and 5 mi. S of Rufus, area—**agate**, **jasper** (*Wascoite* type).

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TILLAMOOK COUNTY

AREA, ocean beach gravels of entire Co. S of Oceanlake, Lincoln Co.—**agate, jasper, bloodstone, moonstone**.

UNION COUNTY

STARKEY, the Orofino Mine: ① area—**agate, jasper**; ② mine dumps—**Gold**.

WILLOWA COUNTY

JOSEPH, along the Lower Inmaha R., area—**agate, prase**.

WASCO COUNTY

ANTELOPE: ① general area—**agate** (iris, moss), **chalcedony** (rose, geodes), **Jade, jasp-agate, jasper**; ② E 1¼ mi., a quarry—red **jasper**; ③ E 10½ mi., area—**jasper**; ④ S 6.8 mi. on rd. to Ashwood, Jefferson Co., area—green **moss agate**; ⑤ SE 15 mi., area—**fossil** ferns.

MOSIER, area stream gravels—**petrified wood, silicified pine cones**.

PINE GROVE, W, and SE of Bear Springs Forest Camp, at Sunflower Flats, all hillsides and creek gravels—**jasper, thundereggs**.

SIMNASHO, the Warm Springs Indian Reservation: ① general area—brecciated **jasper**; ② S flanks of the Mutton Mts., area—**agate, chalcedony** geodes, black agate **geodes**.

THE DALLES: ① W, gravels of upper Chenoweth Cr. (E side of mts. from Mosier), area—white **opalized wood**.

WAPINITIA, N, in mts., area—**agate, chalcedony, jasper**.

WHEELER COUNTY

ANTONE, in gravels of Spanish Gulch, placers—**Gold**.

DAYVILLE: ① NW 7 mi., and ② E 13 mi., area—**fossil** bone, **petrified wood**; ③ gravels of the John Day R. (through entire Co.)—**fossils, petrified wood**.

FOSSIL, S and W 16 mi., the famed Clarno Fossil Beds, area—**agate, jasper, fossils, petrified wood**.

YAMHILL COUNTY

McMILLVILE, area—**Calcite** (fluorescent).

PENNSYLVANIA

Known as the Keystone State, Pennsylvania manifests an extraordinary geological history. Except for the coastal plains southeast of Philadelphia and around Lake Erie, the state is mostly hills and steep, high mountain ridges slashed by narrow valleys. Central Pennsylvania is a 2,500' plateau with a generally Arctic character, marked by the sprawling parallel Blue and Allegheny mountain system. Through these mountains drainage rivers, older than the mountains themselves, cut spectacularly scenic *water gaps* that enabled colonial pioneers to penetrate the rich interior limestone valleys.

During the Ordovician and Silurian periods, Pennsylvania was part of a great western syncline lying beneath shallow epeiric seas and being steadily filled by the wasting away of the western slopes of Precambrian Appalachia. This ancient continental land mass, now entirely gone and with its granite roots sunk beneath the Atlantic Ocean off the shores of New England, was the source land for the basic rock strata of the state—the coarse, deltaic Pottsville conglomerate. The sedimentary deposits reached thicknesses of 4,000' and 5,000' , and the widely extended beds of Pennsylvanian marine limestones were formed while much of America lay under the epicontinental seas.

During the 50 million year period of the Upper Carboniferous epoch, undoubtedly the greatest Coal forming era in the world. Vast tropical forests of Sigillarian, Lepidodendron and Calamities were extracting CO₂ from a steaming atmosphere to convert into the enormous Coal beds for which the state is famed. This Pennsylvanian epoch, which began some 330 million years ago, derives its name from *Penn's Woods*, the name given to the colony by the original Dutch who first began settling the land in 1681.

Although most of the gemstone and mineral localities of Pennsylvania are found in the southeastern counties, with a few in the south-central and southwestern portions of the state, a few minerals played an important role in the state's economic development. The Iron which was important in the Revolutionary War came largely from the Great Cornwall Ore Banks of Lebanon Co., opened on South Mt. at Cornwall, the greatest concentration of iron east of the Mississippi River. While coal constitutes the greatest of the state's natural resources, it was the associated petroleum which really began the world's oil industry after Col. Drake drilled his first famous wagon-wheel well near Titusville, Crawford Co., striking an oil gusher at 69½'.

Nickel and Copper were mined in Lancaster Co. before the Revolutionary War, and the Wood Chromite Mine provided most of the **Chromite** used before the Civil War. Very little Gold and Silver have been found, and what Gold was produced came as a by-product of the Cornwall Iron Mine. Most minerals mined in the state, other than a little Lead and Zinc, are in the nature of marble, limestone, sandstone and other building products. From 1839 to 1892 a good deal of Corundum came from several mines in Chester and Delaware counties, and gem **Corundum** crystals are still gathered from pegmatite exposures in these counties. Mountain stream gravels produce **Epidote**, **Calcite**, **Quartz** crystals and silicified woods. Many quarries and gravel pits prominent along most of the state's great rivers yield a never ending supply of Quartz family gemstones. Hundreds of Coal mines produce high quality **Pyrite cubes**. Limestone quarries yield the usually familiar crystals of **Calcite**, **Dolomite** and **Pyrite**.

ADAMS COUNTY

AREA, S part of Co. along the Md. State line, many regional Copper mines—**Azurite**, **Cuprite**, **Malachite**, etc..

CASHTOWN: ① 2 mi. N of Newman School at head of the Buchanan Valley, in large Quartz vein—specular **Hematite**; ② W 1 mi. (W of Virginia Mills and N of Marshall), area

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outcrop—specular **Hematite**, **Piedmontite** (a red Epidote); ③ Charmain, outcrop along RR—**Piedmontite**; ④ E, at Fox Fills, area—**Garnets**; ⑤ N, on W side of Piney Mt., area—**Piedmontite**; ⑥ Caledonia State park, area—**agate**, **jasper**.

FAIRFIELD, N 1½ mi., at foot of Sugarloaf Mt., area—**Garnets**.

GETTYSBURG: ① Culp's Hill, Bushman's Quarry on S slope—native **Copper**; ② E 2 mi. to Rocky Grove School (2½ mi. SE from the Baltimore Turnpike), many area quarries along the rte.—native **Copper**; ③ SE 2½ mi. on US 140, on W bank of Rock Cr. (just before the Power Hill jct.), the Teeter Stone Quarry—**Chabazite** (peach colored crystals), **Epidote**, **Malachite** (as coatings), **Pectolite**, massive **Quartz**; ④ NE 4 mi., Granite Hill, area quarries—**Feldspar**, **Magnetite**, **Olivine**, **Quartz**, etc.

MARIA FURNACE: ① SW 2 mi., on N banks of Tom's Cr., the Reed Hill Mine; ② Pine Mt., on rd. from town: (a) NE ½ mi., on W side of rd., the Bingham Mine; (b) W ¾ mi., the Virgin Mine—**Azurite**, native **Copper**, **Cuprite**, **Epidote** (on Pine Mt.), **Malachite**, **Quartz**.

ALLEGHENY COUNTY

ETNA, N 2 mi., at Wittmen and RR cut near Rte. 8—**Barite**, **Calcite**, **Pyrite**, **Sphalerite**, **Wurtzite**.

GLASSMERE, area quarry—**Barite**, **Calcite**, **Pyrite**, **Sphalerite**, **Wurtzite**.

TRAFFORD CITY, S 0.3 mi., a limestone quarry—**crystals**, **minerals**, abundant **fossils**.

ARMSTRONG COUNTY

APOLLO, GIRTY, KITTANNING, McWILLIAMS, many regional limestone quarries and mines extending for many miles along a major outcrop: ① mine dumps—specular **Hematite**, **Magnetite**, etc.; ② area quarries—**Calcite**, **chert**, **Pyrite**, etc.

EDDYVILLE, S, in large old quarry—**gem** crystals, **minerals**.

KAYLOR, on Sugar Cr. between town and Snyder's Run, a large quarry—**Calcite**, **Iron** minerals, **fossils**, **Pyrite**.

MANORVILLE, area quarries—**Pyrite** cubes.

NORTH VANDERGRIFT, in stream bed of Gravel Bar Hollow, old Lead/Zinc pits—**Galena**, **Calcite**, massive **Barite**, **geodes**, **Sphalerite**, etc.

SOUTH BETHLEHEM, all along Redbank Cr. (N boundary of Co.), area both upstream and downstream—**jasper**, **petrified wood**.

BEDFORD COUNTY

BARD, BUFFALO MILLS, HYNDMAN, MANNS CHOICE, NAPIER, all regional quarries (many)—**crystals**, **fossil** corals.

EVERETT, NE 6 mi. and 4 mi. S of Hopewell, between Ray's Hill and Broad Top Mt., the Sherman Valley: ① 2 mi. N of Hopewell, mine dumps and in cuts and exposures along the Sherman Valley rd.; ② ½ mi. E of Cypher Sta., near gap on Ray's Hill; ③ 1½ mi. E of the Sherman Valley open-cut mine—**Calcite**, **Chlorite**, **Cryptomelane**, **Orthoclase**, **Limonite**, **Quartz** crystals, **Tourmaline**, **Zircon**.

ST. CLAIRSVILLE, take the Pennsylvania Turnpike at the Bedford Interchange, go 6 mi. on Rte. 220, take right turn E over Brumbaugh Mt. To Morrison Cove, an area of 10 sq. mi.—*Herkimer diamonds*, **Quartz**, **Amethyst**, **Calcite** crystals.

WATERSIDE: ① area fields all way to New Enterprise—**Amethyst**, **Quartz** crystals; ② S 1 mi., at Morrison Cove; and ③ N 1 mi., on W side of Yellow Cr., area—**Calcite**, **chalcedony**, **chert**.

Pennsylvania

BERKS COUNTY

BIRDSBORO, S 1 mi., in quarry—**Zeolite** crystals.

BLANDON, HANCOCK, TOPTON, READING, area deposits—**ochers**.

BOYERSTOWN, W ½ mi., on Ironstone Cr. (first Iron furnace erected in state)
—**Magnetite**.

EARLVILLE, 2 mi. W of Hill Church, the Dotterer Mine—specular **Hematite**.

FURNACE HILL, ROCKLAND, area Iron mines—specular **Hematite**.

JACKSONWALD, S 1.3 mi. on the Lorane rd., in rd. cut at base of hill—**Calcite** (orange), **Chabazite** (peach color), **Prehnite** (green), **Epidesmine** (rare var. of Stilbite, as white translucent crystals and rosettes).

MORGANTOWN: ① E ¼ mi. on Rte. 122, the Grace Mine—**Actinolite**, **Apophyllite**, **Byssolite**, **Calcite**, **Epidote** (massive, pale moss green), **Garnets**, **Natrolite**, **Quartz** (massive, white and smoky), **Selenite**, **Stilbite**, **Tremolite**; ② the Jones Mine—**Malachite**.

READING: ① area: (a) Alsace Twp., area mines—**Pyrrhotite**; (b) gravels of the Schuylkill R.—**jasper**; (c) the Fritz Island Mine—**Azurite**, **Malachite**, **Magnetite**, **Chalcopyrite**; ② E 1 mi., old mine—**sienna**.

SINKING SPING, S 2 mi. on the Fritztown rd., turn E ½ mi. on Chapel rd., then N on Wheatfield rd. for 1 mi. to the Wheatfield Magnetite Mine—**Calcite** crystals, **Fluorite** (amber crystals), **Magnetite**, **Melanite** garnets.

BLAIR COUNTY

ALTOONA: ① NE, in village of Culp (on W and N border); and ② W of the Birmingham Sta., all area Lead/Zinc mine dumps (very many) —**Anglesite**, **Barite**, **Calcite**, **Cerussite**, **Dolomite**, **Galena**, **Hemimorphite**, **Pyrite**, **Smithsonite**, **Sphalerite**; ③ Bald Eagle and Dunning mts., area mines—**Anglesite**, **Barite**, **Calcite**, **Cerussite**, **Dolomite**, **Galena**, **Hemimorphite**, **Pyrite**, **Smithsonite**, **Sphalerite**.

CANOE CREEK (and Sinking Valley), many regional mines—**Calamine**, **Galena**, **Smithsonite**, **Sphalerite**, **Calcite**, **Cerussite**, **Anglesite**, **Dolomite**, **Hemimorphite**, **Pyrite**.

CLAYSBURG, SPROUL, regional quarries—gemmy **chert**, **Quartz** crystals.

DUNCANSVILLE, HOLLIDAYSBURG, ROARING SPRING, ROYER, TYRONE, many regional limestone quarries—**crystals**, **gems**, **minerals**.

BRADFORD COUNTY

NEW ALBANY, the Carpenter Mine—**Azurite**, **Chalcopyrite**, **Cerussite**, **Malachite**, **Melaconite**.

BUCKS COUNTY

AREA, countywide cr. beds and banks—**petrified wood**.

BUCKINGHAM, EUREKA, NEW HOPE, RUSHLAND, TREVOSE, regional limestone quarries—**crystals**, **gems**, **minerals**.

BUCKMANVILLE, area mines—**Copper** mineral, native **Copper**.

COOPERSTOWN, E 2 mi., area—gemmy **diabase**.

DURHAM (Twp.), at Mine Hill, area—**Feldspar**, **Hematite**, **Magnetite**, **Quartz**.

EUREKA, at Eureka Quarry to NE—**Smoky Quartz** crystals

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FEASTERVILLE: ① area outcrops—**sunstone**; ② Triassic rock outcrops: (a) S and SE of Holland Sta., (b) NE of Leonard's Sta., (c) ¼ mi. SE of Roelof's Sta., (d) 1½ mi. N of Woodburne Sta., (e) numerous other outcrops—**agate**, **chalcedony**, **chert**, **silicified wood**.

MORRISVILLE: ① gravels of the Delaware R. opposite Trenton, NJ—**jasper** pebbles; ② all regional gravel pits between town and 20 mi. S of Philadelphia—**jasper**.

NESHAMINY, N 2 mi. and ¾ mi. W of Neshaminy Cr., the Vanartsdalen Quarry—*Chesterlite* (blue orthoclase **moonstone**).

NEW BRITAIN, area mines—**Galena**, **Sphalerite**.

NEW GALENA, area mines—**Galena**, **Sphalerite**.

NEWTOWN, W, and ¼ mi. SE of Roelof's Sta., in Neshaminy Cr.—**jasper**, **petrified wood**.

PERKASIE, N 2 mi., at Rock Hill (largest quarry in Co.)—**gem** crystals in pockets and vugs.

QUAKERTOWN, area traprock quarries, in pockets—**gem** crystals.

RIEGELSVILLE, area stream gravels and gravel pits—gem **Quartz** minerals.

VAN SCIVER, gravel operation—**gem** crystals and **minerals**.

CARBON COUNTY

BOWMANSTOWN, S, at Lehigh Gap (on Penn. Turnpike on the Lehigh Co. line), area mines—**Siderite**.

CHRISTMANS (in the Leighton quad.), S 2,000', on both E and W sides of the Lehigh R. gorge—**Uranium** minerals.

JIM THORPE: ① area fields, stream gravels, etc.—**jasper**; ② 0.4 mi. S of the courthouse and ¾ mi. E of RR bridge over the Lehigh R. (1 mi. S of town) area—**Uranium** minerals; ③ E, on N side of nose of Mt. Pisgah, area—**Allanite**, **Andersonite** (fluorescent), **Autunite**, **Carnotite**, **Chlorite**, **Liebigite** (fluorescent), **Metatorbernite** (fluorescent), **Mica**, **Pyrite**, **Quartz**, **Schrockerite** (fluorescent), **Sklodowskite** (fluorescent), **Soddyite** (fluorescent), **Tyuyamunite**, **Uranophane** (fluorescent), **Uraninite**.

MAUNCH CHUNK: ① N ¾ mi., on Mt. Pisgah in exposure of conglomerate—**Carnotite**; ② SE 7 mi., extending in a SW direction for 20 mi., many regional mines, especially at Hazard and Millport—**ocher**.

CENTRE COUNTY

LEMONT, in Neidgh Quarry and loose in soil—**Quartz** crystals.

CHESTER COUNTY

AREA, many regional Corundum mines in Co.—**Corundum**, **Feldspar**, **Diaspore** (clear crystals), **Kyanite**, **Margarite** (pearly plates), **Sillimanite**, **Spinel**, **Tourmaline**.

AVONDALE (London Grove Twp.): ① the Leiper Quarry—**Garnets** (Almandite, Essonite); ② N ¼ mi., area—**Apatite**; ③ E ¼ mi., area—**Quartz** crystals (clear, smoky), **Rutile** crystals.

CHATHAM, SW 1 mi., area—**Apatite**.

CHESTER, NORTHROP, area pegmatite outcrops—gem **Beryl**, **Garnets**.

COATSVILLE, NW 1½ mi., pegmatite outcrop on Rte. 30 by-pass and just S of, on S side of hwy. (park on side rds. and walk), area—**Amethyst**, **Beryl**, **Epidote**, **Garnets**, **Smoky Quartz** crystals.

DOWNINGTOWN, N on Rte. 282 through Lyndell, turn NE to crossrds. Of Cornog, to the Keystone Trap Rock Co. quarry on N side of hwy.—**Byssolite**, **Epidote**, **Feldspar**,

Pennsylvania

Garnet, Prehnite, Quartz crystals (blue, clear, smoky, w/ inclusions), **Sphene, Tourmaline**.

EAST BRADFORD (Twp.), S and SW of Sconnetown, between Brandywine Cr. and Plum Run, area—rock **crystal**.

EAST NOTTINGHAM (Twp.), 1½ mi. NE of Chrome, area pegmatites—**Corundum**.

FAIRVILLE, area quarries—**Labradorite, sunstone**.

FREMONT (West Nottingham Twp.), SW 2 mi., area—**Corundum, Albite** crystals.

GOAT HILL, area bounded by Co. line and the MD border, numerous old pits and prospects—**Albite, Magnesite, Sepiolite** (Meerschaum).

HAUTO, area—**Quartz** crystals.

KENNETT SQUARE: ① SE ½ mi., at Pierce's Paper Mill (on E branch of Red Clay Cr.); and ② SE 2 mi., on Cloud's farm (on a brook that enters the E branch) —**Labradorite, sunstone**.

KNAUERTOWN, 0.12 mi. N of village of St. Peters, at French Cr. Magnetite mine and dumps—**Apatite, Apophyllite** crystals, **Azurite, Calcite** (green crystals w/ inclusions of Byssolite, Malachite or Chalcopyrite), **Chrysocolla, Erythrite, Malachite, Pyrite** crystals, **Quartz** crystals, **Rhodochrosite, Stilbite, Wernerite**.

LYNDEL, the Cornog Quarry—blue gemmy **Quartz**.

NOTTINGHAM: ① general area, exposures—**sunstone**; ② SW 2 mi., on S bank of Black Run, numerous quarries (largest is Brandywine) —gem **serpentine, Garnets, Feldspars, Tourmaline**; ③ Nottingham Park: (a) across cr. bordering park and S of the main office, trails lead through woods to many old mines, on dumps—**Albite, Chrome** minerals; (b) SW 1¼ mi., the Keystone Quarry; and (c) W, at the Sparvetta Quarry —fibrous **Actinolite, Apatite, asbestos, moonstone**, massive **Quartz, Tourmaline, Williamsite**; ④ Cooper School, N, in fields—**Colerainite** (in rosettes with Feldspar), **Goethite**.

OXFORD, S, on the MD state line—**Brucite, Chromite, Kämmererite, Magnesite**, gemmy **serpentine, soapstone, Williamsite, Zaratite**, etc. Very many old Chromite mines of the Scott, Pine Groves and White Barrens—gem **serpentine, Williamsite**.

PARKESBURG, area pegmatite outcrops—**Rutile** crystals.

PHOENIXVILLE: ① area Lead / Zinc mines, the Jug Hollow Mine in Schuylkill Twp. —**Barite, Cerussite, Chalcopyrite, Galena, Malachite, Melaconite**, gold-bearing **Pyrite**; ② S, to the Wheatly Lead Mine and the Chester County Mine (0.2 mi. S of rd. between Pickering and Willaims Corner) —**Anglesite** (fluorescent), **Apatite** (fluorescent), **Azurite, Barite** (clear crystals), **Cerussite** (fluorescent), **Chalcopyrite, Cuprite, Fluorite, Galena, Hydrozincite** (fluorescent), **Linarite, Malachite, Mimetite, Pyromorphite** (green & yellow), **Quartz** crystals, **Silver** minerals, native wire **Silver, Sphalerite** (rare), **Sulfur, Wulfenite**.

POMEROY, area—**Rutile** crystals.

UNIONVILLE (Newlin Twp.): ① area farms, small mines and prospects—**Corundum**; ② NE ½ mi. at Corundum Hill, in pegmatite exposures—gem **Beryl, Corundum, Diaspore, Citrine**; ③ 1 mi. N of Corundum Hill: (a) area; and (b) NE 2 mi. on Northbrook rd. at Corundum Hill—**Corundum, serpentine**.

VALLEY FORGE, W 1½ at abandoned Jug Hollow Mine—**Amethyst**.

WAKEFIELD, S on US 222 to near MD border, turn E on rural rd. to Cedar Hill Quarry—**verde antique, Williamsite**.

WARWICK (Twp.), French Cr., area Iron and Copper mines—**Chalcopyrite**, native **Copper**, specular **Hematite, Limonite, Magnetite**.

WEST CHESTER: ① N, area—gem **serpentine**; ② ¼ mi. E of Pocopson Sta. (in Birmingham Twp.), many outcrops in area—rutilated **Amethyst, Quartz** crystals (clear, smoky); ③ S 1.4 mi. to Darlington Corners, the Brinton Quarry (on Radley Run on N side of Rte. 926, W of Rte. 322, just SW of center of Darlington Corners) —**Actinolite**, gem **Beryl**,

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Bronzite, Clinocllore, Feldspar crystals, **Garnets, Quartz** crystals, **Tourmaline, Williamsite** (translucent green), **Zircon**; ④ S 2½ mi., on W side of Osborn Hill, area—**Corundum, Quartz** crystal (clear, smoky).

WEST PIKELAND Twp., Opperman's Corner, on Rte. 113, NE ½ mi., at old Ben Franklin Mine (reached via exit 23 from Penn. Turnpike onto Rte. 111, S for ½ mi. to Rte. 113), quarries on the N—**Garnets, Graphite, Limonite, Quartz** (gemmy blue), **Pyrite** crystals, **Zircon**.

WESTOWN Twp., many area outcrops—**Quartz** crystals (clear, smoky).

WILLOWDALE (East Marlboro Twp.): ① SW 1 mi., on W branch of Red Clay Cr., area—rock **crystal**; ② at Baiey's farm SW of Willowdale—**Tourmaline**

COLUMBIA COUNTY

CENTRAL, near town—**Meta-zeunerite, Uranospinite** (both fluorescent), and other **radioactive minerals**.

ESPY, area mines—**Calamine**.

CUMBERLAND COUNTY

BOILING SPRINGS: ① SE 2 mi.; ② SE 3 mi.; ③ White Rock, 1 mi. E of Reading Bank, area—**Cryptomelane** (gemmy, blue black), **Goethite, Quartz** crystals, **Tourmaline, Zircon**; ④ N, in a traprock dike crossing the Co.—**Calcite, Fluorite, Quartz** crystals.

CARLISLE: ① area farm fields—banded **agate, Quartz** crystals; ② E 1 mi. from the Carlisle Interchange on the Penn. Turnpike, area on S side of Rte. 11—banded **agate**; ③ NW 1½ mi., area—**agate, jasper, Amethyst, Quartz** crystals (clear smoky).

CLEVERSBURG-PINE GROVE FURNACE, South Mt., area mines—**Copper** minerals, native **Copper**.

MT. HOLLY SPRINGS: ① W, general area of fields, ditches, cut banks, etc.—agate **nodules**; ② SW 1 mi., area mine dumps—**Cryptomelane** (gemmy, blue black), **Goethite, Quartz** crystals, **Tourmaline, Zircon**; ③ S on Rte. 34 through Holly Springs, turn W at main intersection for ½ mi., take right fork to a farm 1.2 mi. from Rte. 34 on N side of rd., area fields S of farm, ditches, banks, along fences, etc.—**agate, chalcedony, jasper**; ④ SW 3 mi., on N flank of South Mt., the Wharton Mine—gem **Cryptomelane**; ⑤ W 3½ mi. on Huntsdale rd., turn S opposite cannery by RR to South Mt. phosphate mine dumps—**Apatite, Braunite, Cacozenite**, banded **chalcedony, Quartz** crystals, **Strengite, Wavellite** (often with Pyrolusite); ⑥ W 4 mi., in vicinity of Moores Mill, area mines—**Wavellite**.

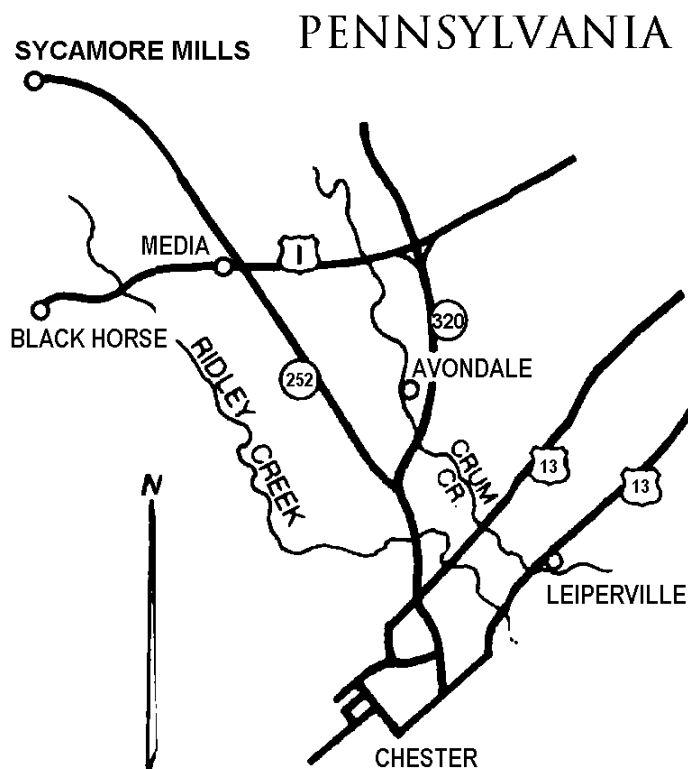
PINE GROVE FURNACE, N 1 mi. along Little Rocky Ridge, in area **Quartz** outcrops—specular **Hematite, Quartz** (milky, smoky, yellow).

DAUPHIN COUNTY

HARRISBURG, take I-83 S across Penn. Turnpike to overpass, the 1 mi. farther to Fairview church, collect from weathered material—**agate, Garnet**.

DELAWARE COUNTY

AVONDALE (Springfield Twp.): ① area quarries, in small amounts—**Chalcopyrite**; ② Leiper's Quarry (now Faccenda Quarry) on E side of Crum Cr.—**Aquamarine, Golden Beryl**; ③ in a quarry to SE on W side of Crum Cr.—**Quartz** crystals; ④ 1 mi. W in quarry on George Sharpless Farm—**Amethyst**.



BAKER: ① area quarries—**Amethyst, Smoky Quartz** crystals; ② area rd. cuts, excavations, etc.—**Amethyst, Quartz** crystals.

BOOTHWYN (Upper Chichester Twp.): ① SW 0.3 mi., and W of the E branch of Naaman's Cr., on N side of the B & O RR Sta.—**Sphene**; ② N ½ mi., on the Armstrong farm E of the Chelsea rd.—**Amethyst**; ③ N 2 mi.: (a) and E of the Chelsea-Boothwyn rd., area; and (b) at J.B. Okie's farm—**Amethyst**; ④ loose in soil at McCay's farm—**rutilated Quartz** crystals; ⑤ in pits on W side of E branch of Naaman's Cr.—**Quartz** crystals, **Garnets**.

CHADD'S FORD: ① SW 1 mi., area transparent **Oligoclase** crystals; ② S 1½ mi., in gravels and banks of the Brandywine R.—**Amethysts**.

CHELSEA: ① SW 1 mi., mined as an abrasive—**Garnet**; ② W 2 mi., a pegmatite mine—**Garnet**. CHESTER (Twp.): ① area gravels of Chester Cr.—**Amethyst, Smoky Quartz** crystals; ② area quarries—gem **Beryl, Feldspar**, rock **crystal**; ③ E ¼ mi., Shaw & Esrey Quarry (N of the B & O RR) —**Amethyst, Beryl, Smoky Quartz** crystals; ④ Bridgewater Sta. on the Penn. RR, opposite, at John Mullen's Quarries (on E side of Chester Cr.) —**Mica, Quartz** crystals, **Sphene**.

CHESTER HEIGHTS (Aston Twp.), S 1 mi.: (a) in soil above Peter's Mill dam in Green cr.; and (b) in gravels of Green's Cr.—**Almandite** garnets.

CROZIERVILLE: ① area fields, rd. cuts, etc.—**Amethysts**; ② W ½ mi., on S side of Chester Cr. opposite Lenni, area—**Amethysts**.

CRUM LYNNE (RR Sta.), Ward's Quarry on Crum Cr.—**Amazonite**, gem **Beryl, Feldspar, Quartz** crystals.

DARBY (Upper Providence Twp.): ① Sycamore Mills, E along Ridley Cr., pegmatite dike exposures—**Amazonite**, transparent **Oligoclase** crystals, **sunstone**; ② 3½ mi. below, at the Shaw & Esrey Quarry—**Aquamarine, Beryl**; ③ near White Horse, 3 mi. S—**Beryl**.

ELWYN STATION, area farm fields—**Corundum**.

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GLENDAL (SW corner of Lansdowne quad. In Haverford Twp.), take Glendale rd. N of Darby Cr., 1 mi. S of jct. of cr. with Rte. 3, a pegmatite mine—gem **Beryl** (to 4" long), **Garnets**, **Feldspar**, **Quartz**, black **Tourmaline**.

GLEN MILLS (Thornbury Twp.), area—**Amethyst**, **Albite**, rutilated **Quartz** crystals.

LEIPERVILLE (Ridley Twp.): ① W ½ mi., at Deshong's Quarry on E side of Ridley Cr.—**Aquamarine**, **Golden Beryl**, **Thulite**, **Quartz** crystals; ② E ¾ mi., in fields of Sherz's and Hibbard's farm—**Corundum**.

MARPLE Twp.: ① general area—**Amethyst**, **Quartz** crystals (clear, rutilated); ② Plamer's Mill, area mines—**Chromite**.

MEDIA (Middletown Twp.): ① the Media Quarry—gem **Beryl**, **Feldspar**, **Quartz**; ② W: (a) in area pegmatite outcrops—**Corundum**; (b) on the Schofield and Hibbard farms—**Corundum**; ③ W 1 mi., at Mineral Hill: (a) area farm fields, rd. cuts, etc.—**Albite**, **Amazonite**, **Corundum**, **sunstone**; (b) the Mineral Hill Quarry (W of Ridley Cr. and N of Blackhorse) —**Albite**, **Amazonite**, **aventurine**, **Aquamarine**, gem **Feldspar**, **Garnets**, **moonstone**, **sunstone**; ④ N, at the Phillips Chromite Mines—gem **serpentine**; ⑤ Black Horse: (a) S ¼ mi. along rd. to Elwyn, area—**Corundum**; (b) SE ½ mi., pits in pegmatites—**Corundum** (crystals to 6" long, in area farm fields as gray, blue, white and brown crystals), **Amazonite**, **Beryl**, **Feldspar**, **Kyanite**, **moonstone**; (c) NE ½ mi.—green **Quartz**; (d) ¾ mi. (1 mi. W of Media), area—**Albite**, **Amazonite**, **sunstone**; (e) SW, to Chrome Run, area of widespread pegmatite outcrops—**Albite**, **Amazonite**, **sunstone**; ⑥ NW 2½ mi., Blue Hill, area—**Albite**, **Amazonite**, **Beryl**, **Oligoclase**, **sunstone**; ⑦ NW 2½ mi.: (a) ¾ mi. NE of Sycamore Mills, at Blue Hill Crossroads —**Quartz** crystals (blue, green); (b) 1 mi. E of Rose Tree dam on Crum Cr., area —**Amethysts**; ⑧ Lenni Sta.: (a) E, in RR cut—**Albite**, **Amazonite**, **Oligoclase**, **sunstone**; (b) N 1 mi., on Dismal Run, area—transparent **Oligoclase** crystals.

Morgan station: ① S ¼ mi., area—**Corundum**; ② W, area fields, cuts, etc.—**Amethysts**; ③ Dutton's Mill rd., a pegmatite dike outcrop—**Amethysts**; ④ Village Green, area—**Corundum**, yellow **Quartz** crystal.

MORTON, NW, in area quarries—**Garnet**, **Feldspar** crystals, rock **crystal**.

NEWTON SQUARE (Newton Twp.): ① W 1 mi., in pegmatite outcrops and rd. cuts—**Oligoclase**; ② a mine near Ox Run, in serpentine—**Chromite**.

SWARTHMORE, S, on Crum Cr., in Leiper's Quarry—gem **Beryl** (golden to pale yellow green), **Amethyst**, **Garnets**, **Quartz** crystals.

SCAMORE MILLS: ① E, in fields of Reece's farm on Ridley Cr.—**Corundum**; ② W ½ mi. on Walker Yarnell's farm—**Smoky Quartz** crystals; ③ S ¾ on J. Tyler's farm—green **Quartz**.

TRAINER STA. (Lower Chichester Twp.): ① N 1½ mi., on a knoll near the Linwood Mill Dam—**Quartz** crystals (clear, smoky); ② at William Trainer's farm ½ mi. N—**Quartz** crystals (clear, smoky), green **Beryl**.

UPLAND: ① area quarries on Chester Cr.—**Feldspar**, **Garnets**, **Quartz** crystals; ② E: (a) area around Henvi's Quarry N of Chester Cr.—**Amethyst** geodes; (b) area around Waterville rd.—**Amethyst** geodes.

UPPER DARBY (P.O.), along West Chester Pike, W ½ mi., area—**Quartz** crystals (large clear, smoky).

WAYNE, E, area quarries and stream gravels—**Garnets**, blue **Quartz** crystals.

FRANKLIN COUNTY

AREA: ① South Mt., in gemmy rhyolite porphyries, breccias and conglomerates; and ② Pigeon Hills, area—gem red **jasper**.

Pennsylvania

CALEDONIA PARK: ① area around the Caledonia State Park—**agate, jasper**; ② N slope of Huckleberry Hill—**Garnets**.

CHAMBERSBURG, area mines—**Barite**.

LANCASTER STA., area quarries—**Fluorite**.

WAYNESBORO, area mines—**Barite**.

FRANKLIN & ADAMS COUNTIES

AREA, the Blue Ridge Summit (E of Waynesboro), E on Rtes 16 and 116 (toward Fairfield), with Greenstone being a center for a large area of many old mines and mills: ① on mine dumps—**Copper** minerals, native **Copper, Quartz**; ② the Ruberoid Quarry—**Copper** minerals, **Epidote** (in rhyolite, some with native Copper inclusions); ③ the Bingham Mine—**Cuprite**; ④ Mt. Hope area quarries and mine dumps—**Talc**, native **Copper** (at Bechtel Copper Mine); ⑤ the Snively Copper Mine (a popular rock club field trip locally)—**Cuprite**.

FULTON COUNTY

FORT LITTLETON, N 1 mi., pits and trenches along Aughwick Cr.—**Barite, Calcite, Chalcopyrite, Pyrite, Quartz** crystals.

NEEDMORE: ① Beaverdam Pond, area—**Manganese** minerals; ② Duvall Cove, along Oregon Cr. —**Manganese** minerals; ③ McConnell's Cove, area limestone quarries—**gems, minerals**; ④ W 4 mi., on Sideling Hill at Whips Cove—**Cryptomelane, Psilomelane, Pyrolusite**.

GREENE COUNTY

CARMICHAELS, DURBIN, MT. MORRIS, WHITELEY, regional quarries in sandstone—**Quartz** crystals.

JEFFERSON, along Tenmile Cr. to Laurel Run, area quarries—**Quartz** crystals.

MORRIS TWP., SE section, along Browns Run, area—**Iron** minerals, **nodules**.

OAK FOREST, 2 mi. above, at Pursley Run—**Iron** minerals, **nodules**.

TRUMBULL, on S bank of Tenmile Cr., a quarry—**Calcite, Pyrite**.

WAYNESBURG, S 1½ mi., in a sandstone quarry—**Quartz** crystals.

HUNTINGTON COUNTY

MAPLETON, area quarries—**Quartz** crystals.

McCONNELLSTOWN, ORBISONIA, UNION FURNACE, area limestone quarries—**Calcite** crystals, **Fluorite**, etc.

MT. UNION, THREE SPRINGS, in area sandstone quarries—**Quartz** crystals.

WARRIORSBURG, S 3 mi., on S slope of Dry Hollow Ridge, numerous Iron mines—gemmy **Cryptomelane, jasper, Quartz** crystals.

LANCASTER COUNTY

BAINBRIDGE (Paradise Twp.): ① N 1 mi., area fields—**petrified wood**; ② Kinzer, area—rutilated **Quartz** crystals; ③ 2 mi. NW of Churchtown; and ④ 3 mi. NE of Churchtown—**petrified wood**.

BART, E of ruins of smelter ¾ mi. N of Gap Nickel Mines—**Smoky Quartz**.

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BLUE BALL: ① many area quarries—**gems, minerals**; ② N on Rte. 23 to the Showalter Quarry on N side of rd.—dogtooth **Calcite**, **Fluorite**, specular **Hematite**, **Quartz** crystals, **Rutile**.

BROWNSTOWN, a nearby quarry on Conestoga Cr.—crystals of **Calcite** and **Quartz**.

CENTERVILLE, an abandoned quarry on Chickies Cr.—crystals of **Calcite** and **Quartz**.

COLUMBIA: ① E, a quarry—crystals of **Calcite**, **Dolomite** and **Quartz**; ② N 1 mi. from jct. of Rte. 30 with the St. Joseph's Academy rd., then N toward Chestnut Hill, park car on summit, area fields to E and W); and ③ 1 mi. farther NE, to Grubb Lake and Mud Lake, area—**Limonite** (geodes).

EAST PETERSBURG, SILVER SPRINGS, TALMAGE, very many area quarries—crystals of **Calcite** and **Quartz**.

EPHRATA, SW 1 mi., a quarry—**Dolomite** (tinted pink and green).

GAP: ① SW 4 mi., the Gap Nickel Mine—**Chalcopyrite**, **Millerite**, **Pyrite**, **Pyrrhotite**; ② many area quarries—**gems, minerals**.

JERKINS CORNER: ① W 0.3 mi., at Rock Springs Run (Fulton Twp.) and 1¼ mi. NNE of Rock Springs, MD, area—moss **agate**; ② at Cedar Hill Quarry, reached via Hwy. 222 going E on road (along PA-MD line) and following signs to mine—**Brucite**, **Magnesite**, **Talc** (all fluorescent), and **Williamsite**.

LANCASTER: ① area quarries along Conestoga Cr.; ② quarries along Little Conestoga Cr.—crystals of **Calcite**, **Dolomite** and **Quartz**; ③ NE, in the Stoner Quarry, abundant—**Pyrite** crystals; ④ the Blue Ball Quarry—**Calcite**, **Dolomite**, **Fluorite**, **Hematite**, **Pyrite**, **Quartz** crystals, **Rutile**; ⑤ area Zinc mines—**Calamine**, **Cerussite**, **Smithsonite**; ⑥ N 1 mi., near Fruitville Pike, on E side on the property of a nursery—**Limonite** cubes.

LITITZ, N, in a quarry—pink **Calcite** crystals.

MILLERSVILLE, W 1 mi., a quarry—**Calcite** crystals, **Pyrite**.

MT. PLEASANT (Bart Twp.), NW 1 mi., area—**Amethyst**.

PEQUEA, the Pequea Mine—**Galena**, **Sphalerite**, **Wulfenite**.

QUARRYVILLE, SE on Rte. 472 to Union, turn W onto left trending rd. before reaching edge of village, go ½ mi. to the Stillwell Quarry—**Brucite**, **Chlorite**, **Chrysotile**, **Magnetite**, **Williamsite**.

TEXAS, area outcrops—**serpentine**.

WAKEFIELD, S, the famed State Line Dist.: ① the Cedar Hill Quarry (just N of the PA-MD state line, reached from US 222 via an E trending rd.—**agate**, **Aragonite**, **bloodstone**, **Brucite**, **Calcite**, **chalcedony**, **Chromite**, **Deweylite** (fluorescent), **Dolomite** crystals, **Hydromagnesite**, **Magnesite**, common **opal**, **prase**, **Williamsite** and many other minerals; ② the Octoraro Cr. dist., in serpentine exposures—**Chromite**.

WINGDALE, SE 3 mi. on rd. to Lee's Bridge (9 mi. SW of Oxford), the old Wood Chromite Mine shafts and adjoining pits—**Brucite**, **Cacoxenite**, banded **chalcedony**, **Chromite**, **Uvarovite** garnet, **Millerite**, **serpentine**, **Steatite**, **Vesuvianite**, **Williamsite**.

LEBANON COUNTY

ALMA, AVON, CLEONA, MILLARDSVILLE, MYERSTOWN, PALMYRA, very many regional quarries, wide assortment—**gems** and **minerals**.

CORNWALL: ① many area quarries—**gems** and **minerals**; ② area mines—**Azurite**, **Chalcopyrite**, **Magnetite**, **Malachite**, **Pyrite**; ③ S, just NW of a rd. at Big Hill (on old Rte. 322), extensive mine dumps—**Actinolite**, **Andradite**, **Calcite**, **Chlorite**, **Diopside**, **Epidote**, **Fluorite**, **Grossularite**, **Gold** (traces), **Labradorite**, **Magnetite**,

Pennsylvania

moonstone, **Prehnite**, **Pyrite** crystals, **Sphene**, **Talc**, **Tremolite**, **Wurtzite** (crystal form), **Zeolites**.

JONESTOWN: ① S 1 mi., in Bunker Hills, in white sandstone—**Quartz** crystals; ② S 2 mi., a traprock quarry—**gem** crystals.

LEHIGH COUNTY

ALBURTIS, BREINIGSVILLE, area deposits—**ochers**.

ALLENTOWN: ① area hills, washes, fields—gemmy **jasper**; ② S 7 mi., near Penn. Turnpike, area fields, washes, rd. cuts—colored **chert**.

BETHLEHEM, S 4 mi. on Rte. 12, at Friedensville: ① area Zinc mines—**Aragonite**, **Calamine**, **Greenockite**, **jasper**, **Quartz** crystals, **prase**, **Pyrite**, **Smithsonite**, **Sphalerite**; ② ½ mi. W of main town intersection, the New Jersey Zinc Mine—**Aragonite** crystals (fluorescent), **Nicholsonite** (fluorescent, phosphorescent), **Pyrite** crystals, **Quartz** crystals, **Smithsonite** (banded), **Sphalerite** crystals, **Spinel**.

MACUNGLE, SE 2 mi. (½ mi. N of Shimerville), area—blue **Corundum** (Sapphires; large crystals, asteriated).

SHIMERVILLE, N ¾ mi., area—**Sapphires** (large crystals, asteriated).

VERA CRUZ (13 mi. S of the Lehigh Interchange of the Penn. Turnpike), in regional hills—**jasper** (red, brown, yellow), **Sapphires**.

LUZERNE COUNTY

HAZELTON, WEST PITTSTON, area anthracite coal mine dumps—**Pyrite**.

WHITE HAVEN: ① area quarries—gemmy red **quartzite**; ② N 5 mi., the Moosehead mines—**ochers**.

WILKES-BARRE, area coal mines: ① W, at Naticoke; ② S, at Ashley (4 mi. S of Ashley jct., near village of Mountaintop)—**Pyrite**.

LYCOMING COUNTY

BEAVER LAKE: ① W 0.7 mi., on the Leon Myers farm (just S of Strawbridge), in a sandstone outcrop—**Meta-zeunerite**, **Uranospinite** (both fluorescent), and other **radioactive minerals**; ② E side of Beaver lake, ½ mi. N of outlet, a sandstone outcrop and an old Copper mine—**Copper** minerals (radioactive); ③ S ½ mi. from the Beaver Lake Hotel, on W side of Beaver Run 250' from hwy. Crossing of cr., an old Copper mine—**Copper** minerals (radioactive); ④ SW of the S end of Beaver Lake 1 mi., on hill facing S between two branches of Beaver Run, old Copper mine—**Azurite**, **Chalcocite**, **Chalcopyrite**, **Malachite**, **fossils** (plants).

MUNCY, the Muncy Quarry—**Calcite** (fluorescent).

TIVOLI, N edge of town on N side of Big Run 200' NW of US 220, area—**Copper** minerals (radioactive), **fossils**.

MONROE COUNTY

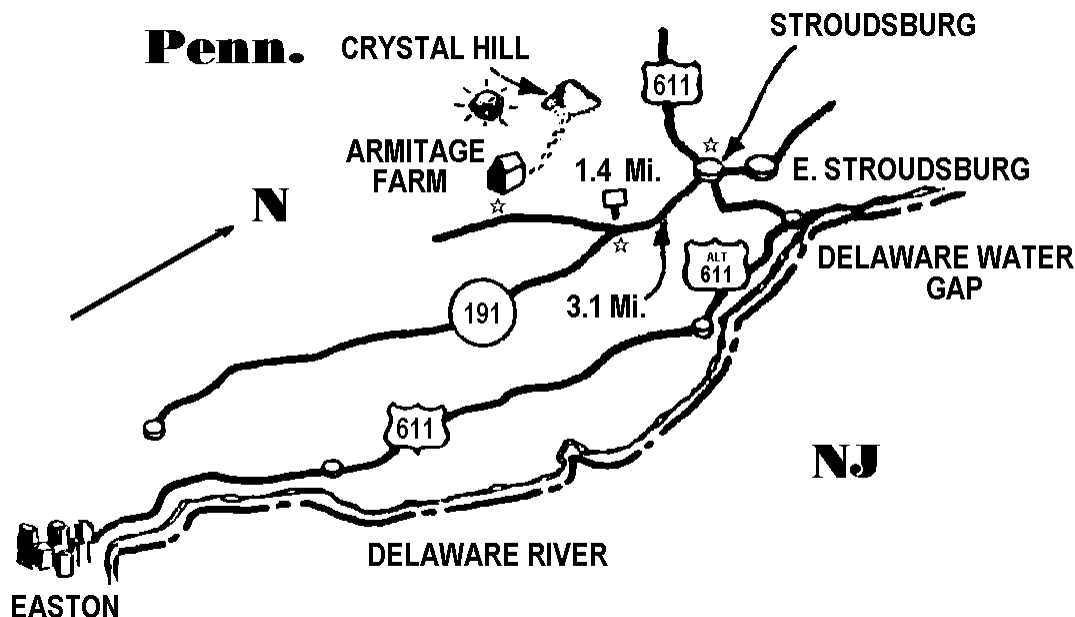
AREA: ① SE part of Co., all regional limestone quarries—**Calcite**, **Pyrite**, etc.; ② Delaware Gap, area quarries—**Fluorite**.

KUNKELTOWN: ① area stream beds and banks—**Quartz** crystals (some coated with tiny crystals of Azurite); ② S, in sand and clay pits—**Quartz** crystals.

STROUDSBURG: ① area close to NJ line—**agatized corals**, **Quartz** crystals and gemstones; ② steep wooded area located on the Christian Armitage farm S of Stroudsburg.

A Location Guide for Rock Hounds in America

Crystal Hill is reached by taking Rte. 611 E from Stroudsburg to a blinker light and turning S on Hwy. 191 for 3.1 mi., then keeping right 1.4 mi. to Armitage house, walk up steep hill to site where quartz crystals are loose in fine grained quartz conglomerate (fee) —**Quartz** crystals.



MONTGOMERY COUNTY

AREA: ① Alsace Twp.: (a) Spies Church, NNW 1½ mi., and (b) 1½ mi. S of Jacksonwald, at Kensey Hill, area—**chalcedony, jasper, jasp-agate**; ② Edge Hill (and near Spring Hill), area mines—**Pyrolusite**; ③ Lower Providence Twp., the Eaton Mine—**Cerussite, Copper** minerals, **Iron** minerals.

AUDUBON, the Ecton Mine—**Cerussite, Sphalerite** (both fluorescent).

BOWERS Sta.: ① S 1 mi., on Flint Hill (on Rte. 320 on the Schuylkill R.), and ② Olney Furnace, NE 1¼ mi., at Green Hill, area—**Amethyst, chalcedony, silicified wood**.

BRIDGEPORT, SE ½ mi., on Rte. 202, the Bridgeport Dolomite Quarry (along side the RR) —**Calcite, chalcedony, Dolomite, Goethite, jasper, Malachite, rock crystal, Sphalerite**.

CONSHOHOCKEN, GLENSIDE, MONTGOMERYVILLE, NORRISTOWN, PLYMOUTH, all regional quarries—gem **serpentine, Steatite**.

DURHAM (Twp.), general area outcrops of Cambrian quartzite—**chalcedony, jasp-agate, jasper**.

JARRETTOWN, W 2 mi. at Hill Crest, quarry—gem **serpentine, Talc**.

LAFAYETTE Sta. (Lower Merion Twp.): ① SE, in quarries on both sides of the Schuylkill R.—**serpentine, Steatite**; ② NE bank of river, at Prince's Quarry, variety—gemmy **minerals**; ③ the Lafayette Soapstone Quarry (on the Schuylkill R.) —**serpentine, Steatite**; ④ Lafayette Hill, a quarry—**Chalcopryrite, soapstone**.

MONT CLARE (across the Schuylkill R. from Phoenixville, Chester Co., near confluence of river with Perkiomen Cr. and trail to Audubon's Home): ① many area old Copper mines; ② the Perkiomen Mine—**Azurite, Chalcopryrite, Barite, Malachite**; ③ N of bridge over small cr., mine—**Goethite, Linarite, Malachite, Mimetite, Glauberite**.

Pennsylvania

MORGANVILLE Sta.: ① E $\frac{1}{4}$ mi., and ② Maple Glen, area gravel pits—**petrified wood**.

PERKIOMENVILLE, E $\frac{1}{2}$ mi. on Rte. 29 and about 8 mi. SW of the Quakertown exit of the NE extension of the Penn. Turnpike, in a quarry—**Actinolite**, **Calcite** (fluorescent), **Chlorite**, **Epidesmine** (crystals with Calcite and Pyrite), **Epidote**, **Fluorite** (purple, translucent), **Garnet**, **Heulandite**, **Limonite**, **Natrolite**, **Pyrite** crystals, rock **crystals** (in groups), **Stilbite**, **Zeolites**.

PHILADELPHIA (Philadelphia Co.), N and W, in cr. beds and rural country fields, cut banks, etc.—**agate**, **chalcedony**, **chert**, **jasper**, **Quartz** crystals, **petrified wood**.

ROSE GLEN, NW $\frac{3}{4}$ mi., at the Gladwyne quarries, many kinds—**Quartz** family gemstone.

SUMNEYTOWN: ① nearby mine in Upper Salford Twp.—**Azurite**; ② S 1 mi., on the Kobers farm, an old Copper prospect—**Azurite**, **Tenorite**, **Zeolites**.

WEST MANAYUNK, along Rock Hill rd., many quarries—gem **serpentine**, **Steatite**.

NORTHHAMPTON COUNTY

BETHLEHEM: ① many area quarries—**chert**, oolitic **flint**, **crystals**, **fossils**; ② NE $3\frac{1}{2}$ mi., the Camels Hump Mine—**ocher**; ③ E 5 mi. and S of Redington (Lower Saucon Twp.), on South Mt., area—**Cat's-eye**, **chalcedony**, **chert**, **prase**, **Quartz** crystals.

EASTON: ① area: (a) mines—**ocher**; (b) limestone quarries below town—oolitic **chert**, dark **flint**; (c) quarries along Bushkill Cr.—**chert**, **flint**; ② N side of Rte. 611 and 1.3 mi. N of jct. with Rte. 22, at Chestnut Hill (Forks Twp.), area quarries—**Apatite**, **asbestos**, **Bronzite**, **Diopside**, **Epidote**, **Pyrite**, **Quartz** crystals, **radioactive minerals** (rare), noble **serpentine**, **Sphene**, **Talc**, **Tremolite**, **Vesuvianite**, **Williamsite**.

FREEMANSBURG, HANOVERVILLE, HELLERTON, ISLAND PARK, many regional limestone quarries—**chert**, oolitic **flint**, **crystals**, **fossils**.

PHILADELPHIA COUNTY

FRANKFORD: ① area gneissic outcrops—**Chalcoppyrite**; ② Falls of Schuylkill, area—**Fluorite**; ③ Wissahickon Cr., area gneiss outcrops—**Chalcoppyrite**.

SCHUYLKILL COUNTY

AREA, numerous anthracite Coal mines—**Pyrite** cubes.

MAHONEY CITY, area anthracite Coal mines, gemmy—**Pyrite** cubes.

POTTSVILLE: ① the Mammoth Coal Bed, gemmy—**Pyrite** crystals; ② the Diamond Bed—**Pyrite** crystals.

ST. CLAIR, area, **Dickite** (fluorescent), **Siderite**.

SULLIVAN COUNTY

LAIRDSVILLE, NE 1 mi., turn N from Rte. 115 for $\frac{1}{2}$ mi., turn right 1 mi. to second rd. fork, bear left 2.7 mi. (from Rte 115) to an abandoned house, behind it is an old prospect pit—**Galena**, **Chrysocolla** (turquoise colored), **Copper** and **Uranium** minerals, **Marcasite**, **Metatorbernite** (flakes), **Uranophane**, plant **fossils**.

STRONESTOWN, S $\frac{1}{2}$ mi. on Rte. 220, Eagles Mere, S on rd. opposite jct. $\frac{1}{4}$ mi., a hillside exposure—**Copper** and **Uranium** minerals.

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WESTMORELAND COUNTY

ALEXANDER, area farm fields, cut banks, ditches, etc.—**chalcedony, jasper**, variously colored **Quartz**.

DERBY, area exposures, gravels, quarries—rock **crystal**.

GREENSBURG: ① area limestone quarries—**Marcasite, Pyrite**; ② area clay beds—**petrified wood**; ③ E 7 mi., a quarry—**Quartz** crystals.

HUFF, IRWIN, JEANETTE, PENN, area shale exposures in pits, rd. cuts, quarries—**Marcasite, Pyrite**.

KINGSTON: ① area fields—**jasper**; ② ½ mi. above the waterworks, in Loyalhanna Gap, area—**Calcite, Marcasite, Pyrite, fossils**; ③ gravels of the Conemaugh R.—**petrified wood**.

LIGONIER, W 3 mi. on US 30 to a large quarry (½ mi. long) —**Quartz** crystals, **fossils** in limestone.

McCHANCE, W 1 mi., at Long Bridge, an extensive quarry—**Quartz** crystals, **fossils**.

YORK COUNTY

DELTA, PEACH BLOSSOM, a quarry on the York Co.-MD boundary—**Verde Antique** (called Cardiff green marble).

DILLSBURG: ① S ½ mi. on US 15, a diabase exposure—**Analcime, Apophyllite, Calcite, Laumontite, Leonhardite, Natrolite, Pyrite, Quartz** crystals, **Sphalerite**; ② N 2½ mi., a limestone quarry, many varieties—gem **crystals, minerals**; ③ the James Iron Mine—**Magnetite, Pyrite**.

HARRISBURG, S on I-83 to Reesers Haven via Lemoyne and new Cumberland interchanges, 1 mi. beyond an overpass, area—**agate, Amethyst, chalcedony, Andradite** garnets, **opal, Quartz** crystals, **silicified wood**.

LISBURN, N, in gravels of Yellow Breeches Cr., a conglomerate decorative stone—**Potomac marble**.

MARCH RUN, on W bank of the Susquehanna R., area—**Potomac marble**.

MOUNT HOPE: ① the Bechtel Min (in town); ② S 1 mi., mine; ③ NE 1 mi., on E side of mt., the Snively Mine—**Azurite, Bornite, Chalcopyrite**, native **Copper, Malachite, Cuprite**.

THOMASVILLE: ① area quarries—**Fluorite, Pyrite, Quartz** crystals; ② S on US 30 (5½ mi. SW of West York), quarries along both sides of rd. N of the RR intersection—**Calcite** crystals (some fluorescent), **Fluorite, Hematite, Marcasite, Pyrite, Quartz** crystals.

WEST YORK, W 1 mi. on Rte. 234, in cement quarries—**Azurite, Calcite** crystals, **Chalcopyrite, Galena, Malachite, Quartz** crystals.

YORK HAVEN, S and SW 2 mi., area fields—**petrified wood**.

RHODE ISLAND

Smallest and most densely populated of the fifty states, Rhode Island was named from the principal island in Narragansett Bay. With a western boundary only 42 miles long and a maximum width across the south of 35 miles, the surface of this state is rolling and hilly, cut by short, swift streams that pour over many waterfalls. Sandwiched between Connecticut and Massachusetts, Rhode Island's geology partakes of both. Sedimentary deposits, other than Pleistocene to Recent, are extremely rare, since the whole state was scoured to bedrock by Ice Age glaciers.

The state's geology was extensively studied in the nineteenth century, with some areas being prospected and mined for iron, Graphite, manganese and talc. There are few gemstones occurrences of any consequence.

BRISTOL COUNTY

BRISTOL, area gravel pits and deposits, as pebble—**jasper**.

KENT COUNTY

WARWICK, in gravels along the shores of Narragansett Bay—**carnelian** pebbles.

WEST GREENWICH, at Nooseneck, Weaver Hill rd. and I-95—**Amazonite**.

NEWPORT COUNTY

JAMESTOWN, near Jamestown bridge abutments on Cananicut Island—**Staurolite**.

TIVERTON: ① S 4 mi., a mine—**Graphite**; ② in quarry on Fish rd.—**rutilated Quartz**.

PROVIDENCE COUNTY

AREA: ① Calumet Hill, area quarries—**agate, chalcedony, jasper** and **sagenite Quartz** crystals; ② Fenner Ledge, a large mine—**Graphite**; ③ Mt. Hope Bay, area beach gravel—**agate, Amethyst, carnelian** and **jasper** pebbles.

BRIDGEPORT, PAWTUCKET, VALLEY FALL, area mines—**Graphite**.

CRANSTON, area deposits—**Graphite** and **Hematite**.

CUMBERLAND HILL: ① area quarries—**agate, chalcedony, jasper** and **Quartz** crystals; ② (a) Iron Mine Hill Quarry at Sneece Pond, take Copper Hill rd. W to West Wrentham rd., N ½ mi. and W ¼ to Ballou Meeting House—**serpentine** with **Diopside**; (b) Iron Hill Mine dumps—**Amethyst**; (c) near Sneece Pond, area extensively prospected during the second decade of the 19th Century, mines and prospect pits—**Chalcopyrite, Garnet, Magnetite** (especially in beach sands on the S side of the Pond), **manganese ore** (resembling **Knebelite**, in a bed 40 ft. thick), **Molybdenite, Rhodonite** and **Wad**; ③ at McLaughlin's Ledge—**Smoky Quartz**.

DIAMOND HILL: ① (a) area quarries—**agate, chalcedony, jasper** and **Quartz** crystals; (b) Diamond Hill Granite Quarry in dumps—**Arsenopyrite, Epidote, Magnetite, Sagenitic Quartz** and **Tremolite**; ② area mines—**Hematite**; ③ area limestone exposures, in pockets—**agate, chalcedony, Amethyst** and **Quartz** crystals (clear, smoky).

JOHNSTON, in Hwy. 6 road cuts—**Beryl**.

LIMEROCK, in Conklin Lime Company Quarry—**serpentine, agate** and **Quartz**.

A Location Guide for Rock Hounds in the United States

MANVILLE, area quarries—**talc**.

PAWTUXET, area beach gravels—**agate, carnelian, Amethyst** and **jasper**.

PROVIDENCE, 5 mi. N of North Providence, at Dexter: ① an area lime quarry—**Bowenite** (a jadelike serpentine); ② the nearby Conklin and Harris quarries—**Bowenite**; ③ Wanskirch Granite Quarry—**Quartz**.

SMITHFIELD, area quarries in mica slate and from outcrops of quartz mica schist—**whetstone**.

SPRAGUEVILLE, at jct. of Mann School and Wanskuck Hill rds. in road cut—**Beryl**.

WOONSOCKET, E 2½ mi., the Iron Mine Hill (and a prominent constituent of the regional gabbroid rock)—**Magnetite**.

WASHINGTON COUNTY

KINGSTON, TOWER HILL, area mines—**Galena**.

NARRAGANSETT, in outcropping pegmatites along the eastern shore, at Bonnet Point, Bonnet Shore Beach, Ft. Varnum and Watson Pier—**Beryl** and **Quartz**.

SAUNDERSTOWN, area mines—**Graphite**.

WESTERLY, Westerly Granite Quarry—**Beryl**.

SOUTH CAROLINA

This subtropical state divides roughly into three main geological regions: the broad sea level Coastal Plain, separated from the rolling Piedmont down the middle of the state by the Fall Line, and the small Inner Piedmont in the extreme northwestern corner as part of the Blue Ridge of the southern Appalachian Mountain system. The *Upcountry*, as the Inner Piedmont is known, covers approximately 500 sq. mi. of mountainous territory that culminates near the North Carolina boundary in Pickens Co. at Sassafras Mt., 3,560' high.

The underlying rock formations of the Inner Piedmont are primarily gneissic schists and granites of Precambrian to early Paleozoic age, cut by granite intrusives and smaller bodies of dunite and peridotite. Regional pegmatite exposures provide sources for **Amethyst**, **Beryl**, **Corundum**, **Garnets**, smoky and clear **Quartz**, **Tourmaline**, **Topaz** and **Zircon**. These more showy gem crystals were discovered early, but not commercialized until the 19th century. Although mining of **Copper**, **Lead** and **Zinc** remains minor, some placer **Gold** was worked. The pegmatite gems were found in the stream gravels, along with an occasional alluvial **Diamond**.

In the northern Kings Mountain Belt the regional metamorphism that accompanied intense folding and faulting produced widespread conglomerates, marble, quartzites and schists in which **Vermiculite** mines became the major minable mineral. The many Vermiculite mines scattered throughout the Inner Piedmont also yield collectable gemmy specimen of **asbestos**, **Barite**, **Copper** minerals, **Feldspar**, **Garnets**, **Kyanite**, marble and **Mica**.

With the exception of the Piedmont and the Blue Ridge section, South Carolina's surface is largely Upper Cretaceous (Tuscaloosa Fm.) laden with **fossils**, Tertiary and Recent sediments.

ABBEVILLE COUNTY

AREA: ① countywide stream gravels, rock exposures, cut banks, fields, etc.—**Beryl**, **Corundum**, **Epidote**, blue **jasper**; ② regional mines (in long belt extending NE across several counties)—**Gold**.

ABBEVILLE: ① area mines—**Gold**; ② S 9 mi. and ½ mi. E of Beula Cross Roads, a mine—**Gold**.

ALLENDAL, take Hwy. 301 SW across the Savannah R., turn NW for 8 mi. to where rd. makes sharp turn S, continue ahead on dirt rd. 12 mi. and collect along rd.—**chert**.

ANTREVILLE, go 3 mi., W on Hwy. 284, then a mi. N on S-1-72, and ¾ mi. farther and right to house (fee), return to next rd. S and go E and N a mi. to mine—**Amethyst**, **Smoky Quartz**.

CALHOUN FALLS, area mines—**Chalcopyrite**, **Graphite**, **Ilmenite**.

DONALDS, SE 4 mi., on the J.T. Algary farm—**Amethysts**.

DUE WEST, at the nearby Ellis-Jones Amethyst Mine—**Amethyst** (largest crystals up to 45 lbs.).

LOWNDESVILLE: ① N 1.8 mi. at Barnes place; and ② just S of town on the McCalla farm—**Amethyst**; ③ S 46° W 3 mi., a mine—**Gold**.

McCORMICK STATION, the Dorn Mine—**Gold**.

A Location Guide for Rock Hounds in the United States

AIKEN COUNTY

AREA, Silbur Bluff on the Savannah R., at base of alluvial deposit, mined—**Manganese** mineral (bearing Cobalt).

AIKEN, area of Herse Cr. Valley, 1 mi. off old US 1 near Clearwater, as area float and in gravel pits—**Amethyst**, **chalcedony**, **Ilmenite**, **Monazite**, **Quartz** crystals (clear smoky, rutilated), **Rutile** crystals, **Zircon**.

ALLENDAL, S of US 301 across the Savannah R. bridge, turn N on Co. rd. 8 mi. to a sharp left turn, take dirt trail along track—*Savannah River agates*.

ANDERSON COUNTY

AREA: ① Savannah R boundary of Co., on NE bank of river $\frac{1}{4}$ mi. from mouth of Big Generostee Cr.: (a) the old Gaillard Mica Mine, and (b) the Fretwell prospect—**Aquamarine**, **Golden Beryl**; ② numerous exposures along a belt extending from near Anderson part Iva on to Lake Secession to Due West, Abbeville Co.—**Amethysts**.

ANDERSON: ① W 2 mi., area, as occasional clear crystals—**Beryl**; ② E 3 mi., several pegmatite exposures: (a) area—**Beryl**, **Almandite** garnets, **Limonite** cubes, **Mica**, **Quartz** crystals (clear, smoky), black **Tourmaline**; (b) $\frac{1}{4}$ mi. NNE, area—**Aquamarine**; ③ SW 8 mi., in narrow veins—**asbestos**; ④ N 9 mi., near dam on Twenty-six Mile Cr., the Burgess Mine—**Feldspar**, **Garnets**, **Mica**, **Quartz** crystals; ⑤ at J.M. McConnell place $3\frac{1}{2}$ NE in schist—**Emerald**; ⑥ at Ferguson Mine 5.6 mi. N on Hwy. 187, and $\frac{1}{2}$ mi. SW of McConnell place in pegmatite—**Beryl**; ⑦ S 15 mi. on Hwy. 28 where rd. cuts dike near lake—**Amethyst**, **Garnet**.

IVA: ① NW $1\frac{3}{4}$ mi. along Wilson's Cr. on Rte. 413, on the Frank Pruitt farm—**Golden Beryl**; ② S, area of the Sherard farm near Moffettsville, in exposure of mica slates—**Amethyst** (single crystals and clusters); ③ SW 3 mi., the J.B. Anderson farm—**Golden Beryl**; ④ N 5.7 mi. on US 187, the Martin-Blackwell-Ferguson Mine—gem **Beryl**; ⑤ SE 11 mi., on the Thompson and Jackson farms—gem **Corundum**, **Garnets**, white **Quartz**, **Zircons** (orange, brown).

PELZER, on Co. line, pegmatite outcrop (extends $1\frac{1}{2}$ mi. SW of Piedmont to 1 mi. S of Pelzer)—**Aquamarine**, **Indicolite** tourmaline.

CHEROKEE COUNTY

AREA: ① E part of Co., in prospect pits, mines, rd. cuts, stream gravels and banks—**Barite**, **Hematite**, gem **Kyanite**, **Sillimanite**, etc.; ② the Bowen R. region, in exposures in the Archean gneiss—**Corundum**, **Sapphire**.

BLACKSBURG: ① NW, the Bowen R. drainage basin, extending to Buffalo Church: (a) area slate exposures—**Corundum**, **Garnets**; (b) regional stream gravels—**Corundum**; (c) tributaries of the Bowen R., in gravel beds—**Corundum**, **Sapphire**; ② NW $2\frac{1}{2}$ mi. on Rte. 83 (the Buffalo Church rd.) and on the Andrew Moore farm—**Emeralds**, **Sapphires**; ③ Porter's Hill, area stream gravels—**Corundum**, **Garnets**, **Quartz** crystals, **Topaz**, **Zircon**, etc.; ④ Earles Sta. (10 mi. S of Shelby), area pegmatites—**Emeralds**, etc.

BUFFALO CHURCH: ① area stream gravels—**Amethyst**, **Rutile** crystals; ② W, on the W.T. Gibbons farm—**Amethyst**, **Corundum**, etc.

COWPENS, NE 3 mi., several area mines—**Corundum** (particles), **Gold**, **Monazite**, **Pyrite**, **Tourmaline**.

GAFFNEY: ① area, pegmatite dike outcrops—**Cassiterite**; ② NE $1\frac{1}{4}$ mi., the Ross Mine, and other nearby mines—**Cassiterite**, **Feldspar** crystals, **Fibrolite** (banded kyanite), **Quartz** crystals, **Pyrrhotite**; ③ SE 2.8 mi., on Limestone Cr. (tributary of the Broad R.), the Cameron Mine—argentiferous **Galena**, **Pyrite**, **Pyromorphite**, **Siderite**; ④ SW 8 mi., at Love Springs, the Troy Blanton Mine—**Garnets**, **Mica**, **Tourmaline**; ⑤ SE 11

South Carolina

mi. (and 1 mi. W of Smith's Ford on the Broad R.), the old Darwin Mine—**Gold**; ⑥ SE 12 mi., near the 12 mi. post, Flint Hill, area mines—**Gold**; ⑦ at Porter's Hill, on Bowen R.—**Sapphire**.

KINGS CREEK: ① area mines—**Barite**; ② SW 2 mi., the Barkat Mines—**Gold**; ③ Canaan Church, W, mines (Bolin, Wyatt)—**Gold**; ④ E from Rte. 97 (and S of Rte. 5), mines (Dixon, Eutis, Southern Gold, Wallace)—**Gold, Chalcopyrite, Copper** minerals, **Galena, Hematite, Kyanite, Quartz** crystals, **Pyrite, Sillimanite, Steatite**.

WALHALLA, N 15 mi., area mines—**Galena**.

CHESTERFIELD COUNTY

AREA, numerous old mines—**Gold, Pyrite**.

JEFFERSON: ① area N of Rte. 265, along the Lynches R., numerous old mines—**Topaz**; ② W 3 mi. to Brewer Knob on the Lynches R. (Co. line), the old Brewer Mine—**Cassiterite, Covellite, Enargite, Gold, Kyanite, Pyrite, Quartz** crystals, **Rutile** crystals, **Staurolites, Topaz** (massive, blue, champagne, golden).

DARLINGTON COUNTY

DARLINGTON, E to the Pee Dee R. crossing of I-95, on W side of river near bridge, abundant—**petrified wood**.

HARTSVILLE, along Bellyache Cr.—**petrified wood**.

DARLINGTON & FLORENCE COUNTIES

REGION, all fields, stream beds, rd. cuts, etc. —**petrified wood**.

EDGEFIELD COUNTY

EDGEFIELD: ① N 6° W 12 mi. (2½ mi. N of Meeting St.), E side of Sleepy Cr., a large area of old mines—**Gold**; ② in Turkey Cr. within sight of Hwy. 25—**serpentine**.

FAIRFIELD COUNTY

AREA: ① countywide sand and gravel pits—**petrified wood**; ② Lake Murray Dam, in rock exposures along river bank—**Garnets, Kyanite** crystals.

LITTLE MOUNTAIN, E, to the W side of the Broad R., an old mine—**Kyanite** crystals.

GREENVILLE COUNTY

GREENVILLE: ① N 5 mi., near E end of Parris Mt. State Park, pegmatite exposure at jct. of two streams, the Boling prospect—**Beryl, Garnet, Quartz** crystals (clear, smoky), **Sillimanite**, black **Tourmaline**; ② SW 7 mi., just W of Rte. 20 across RR near Saluda R., the Cleveland Mica prospect—gem **Beryl, Mica**; ③ SE 9 mi., the Willimon Mine—gem **Kyanite**; ④ numerous old area Vermiculite mines, on dumps—**Amazonite, Feldspar, Rutile** crystals, **sunstone, Xenotime** (resembling zircon).

GREER: ① area mines, and ② NW 8 mi.: (a) the McBee Mine, and (b) 1 mi. above, on opposite side of Middle Tyger R., mines—**Gold, Pyrite**.

MARIRTTA, 4 mi. distant, area mines—**Polycrase**.

PIEDMONT, at the D.D. McNeely place—**Beryl**.

A Location Guide for Rock Hounds in the United States

PRINCETON, NW 3 mi., the Desota Mine—**Gold**.

TIGERVILLE, E 1 mi. on Rte. 414, near Baptist church, a Vermiculite mine—gem **crystals, minerals**.

GREENWOOD COUNTY

AREA, NE part of Co., from 4 mi. SE of Shoals Jct. to 1 mi. SW, across Co. line E of Due West, Abbeville Co., numerous exposures, outcrops, fields, etc.—**Amethyst, Quartz** crystals, etc.

BREEZEWOOD, W 2 mi., mine—**Psilomelane**.

GREENWOOD: ① NW to jct. of US 25 and US 178, then N 4.3 mi., in rd. cut —**Limonite** cubes (to 2" dia.); ② S 5 mi., area mines—**Psilomelane**; ③ at Stockman's Quarry—**Garnet**; ④ at Wrenn's place—**Amethyst**; ⑤ at Harper's place at powerhouse—**chalcedony**; ⑥ at Milford place—**Quartz** crystals (clear, smoky).

SALUCA, on W shore of lake Greenwood—**Unakite**.

SHOALS JUCTION: ① SE 1½ mi., and ② SW 1 mi. (3 mi. SE of Donalds, Abbeville Co.), area fields, cut banks, etc.—**Amethyst, Quartz** crystals; ③ as float near Lake Greenwood—**Amethyst**.

HORRY COUNTY

MYRTLE BEACH, area beach gravels—**agate, chalcedony, Quartz, fossil** shark teeth.

KERSHAW COUNTY

CAMDEN, NW 9 mi. (1 mi. NW of Getty's Bridge over Sawney's Cr.), the Lamar Gold Mine—**Gold**.

LANCASTER COUNTY

KERSHAW: ① area mines; ② N 51° E 3.8 mi., the Haile Gold Mine (large scale) — **Gold, Pyrite, Quartz**, etc.; ③ N 5° E 8 mi., on Flat Cr. tributary of Lynches R., the Blackmon Gold Mine—**Gold, Pyrite, Sericite**; ④ the Maile Mine—**Molybdenite**.

LIBERTY HILL, a deposit near the Wateree Reservoir on a tributary of the Catawba R.—gem **Smoky Quartz** crystals (to 6" long and 2½" dia.), **Zircons**.

LAURENS COUNTY

CROSS HILL: ① S on Rte. 39 to jct. (marked by white house on the right), turn right on dirt rd. to next right turn, in farm field; and ② N on Hwy. 39 to crossrds. With large white house, turn right 3 mi. until rd. takes shape turn, turn and go ½ mi. to rd. right into pines, dig in field to right of rd.—**Amethyst**.

LAURENS: ① at New Cemetery and inside city at Dead Man's Cut in railroad—**Corundum**; ② at Dead Man's Cut—**Pyrope** garnets.

MARLBORO COUNTY

BLLENHEIM, in sand pits 4 mi. S—**petrified wood**.

South Carolina

McCORMICK COUNTY

McCORMICK: ① area creek sands, placer—**Gold**; ② 2½ mi., old mine—**Gold**; ③ W 2 mi. on Rte. 378, turn left on Plum Branch rd. 2 mi. to cr. bridge, area on right just before bridge—**Limonite** cubes.

NEWBERRY COUNTY

PROSPERITY, area, as crystal masses—**Rutile**.

OCONEE COUNTY

AREA, gravel beds of the Toxaway and White Water rivers, old placer mines—**Gold**.

ADAMS CROSSING, SW 3 mi., a mine—**Gold**.

CHERRY, SW 1½ mi., a mine—**Gold**.

PULASKI, N 4 mi. (10 mi. N 40° W of Ft. Madison), a mine—**Gold, Graphite**.

SENECA: ① area mines—**asbestos**; ② N 2 mi., on the Leroy farm—gem cat's-eye **Sillimanite** crystals; ③ S 5½ mi., old mine—**Gold**.

WALHALLA: ① N 11½ mi., old mine—**Gold, Pyrite**; ② W 14 mi. (1 mi. W of Rogues Ford and 2 mi. below Cannon's Stone), on E scarp of the Chatooga R., the Henckel Mine—**Gold**; ③ N 15 mi., on the Middle Fork of Cheochee Cr., old mine—**Gold, peridotite, Pyrite**.

PICKENS COUNTY

CALHOUN, N 1 mi., mine—**Gold, Mica**.

CLEMSON: ① area of mica mines around Clemson College; ② N 4½ mi. and 0.7 mi. NW of Twelve Mile Cr., the Head prospect; and ③ NW 7 mi. (SW of cr. 1 mi. E of the Seneca R.), the Davis prospect—**Garnets, Quartz** crystals.

EASLEY, area schist outcrops—carvable **Steatite** (with Chlorite).

RICHLAND COUNTY

COLUMBIA, at Lake Murray—**Amethyst**.

SLUDA COUNTY

SALUDA, NE 6 mi. (12 mi. S of Newberry), in fork of Big Cr. and the Little Saluda R., the Cultbreath Mine—**amphibolite, Chalcopyrite, Chlorite, Gold, green Hornblende** crystals, **Magnetite, Niccolite, Pyrite**.

SPARTANBURG COUNTY

AREA, countywide stream gravels—placer **Gold**, rare **Diamonds**.

COWPENS, N 2 mi., old mica mines—**Mica**, black **Tourmaline**.

ENOREE: ① area of jct. of Enoree rd. and Dutchman's Cr.—gemmy red **quartzite**; ② E 5 mi. on Rte. 92, then 1 mi. on Rte. 30 and 3 mi. E on Co. rd. to Vermiculite prospects (in Cross Anchor Twp.)—massive **Quartz**, pegmatite **gems** and **minerals**.

GLENN SPRINGS, S 8 mi., area mines—**Psilomelane**.

SPARTANBURG: ① area mines—**asbestos**; ② area stream gravels, placers—**Gold, Zircons**; ③ E, in a granite quarry—**crystals, minerals**.

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UNION COUNTY

AREA, numerous old mines scattered through Co.—**Gold**.

WEST SPRINGS, on Fair Forest Cr., the Nott Mine—**Gold**, native **Copper**, **Pyrite**.

YORK COUNTY

AREA, numerous well known old Gold mines in Co.—**Gold**.

BETHANY, N 3 mi. on W side of Rte. 161, the Patterson Mine—**Gold**, **Pyrite**, **Quartz** crystals.

BLACKSBURG, E, to Kings Mt. Battlefield: ① S 1.3 mi., area pits—**Barite**; ② E 2 mi., the Ferguson Mine—**Gold**, **Pyrite**, **Quartz** crystals.

CATAWBA JUNCTION, SE 4 mi., extensive exposure—**Wad**.

CLOVER: ① NW 3 mi. on Rte. 508, in rock exposures on Henry Knob—**Andalusite**, gem **Kyanite**, **Lazulite**, **Staurolites**, **Tourmaline**; ② SW 5.7 mi., old mine on Bullock's Cr. of Broad R.—**Gold**, **Magnetite**, **Monzonite**, **Pyrite**, **Sericite**, **slate**.

HICKORY GROVE: ① N 1 mi., the Wylie Mine—**Gold**; ② SE 2 mi., alongside Rte 221, the Thunderhead Mine—**Gold**, **Pyrite**; ③ W 2.2 mi. on Smith's Ford rd., at head of a branch of Guin Moore's Cr. on S side of rd., the Magnolia Mine—**Gold**, **Malachite**, **Biotite**, **Quartz** crystals; ④ SW 3.2 mi., old mine—**Gold**; ⑤ SW 4 mi., and ⑥ ½ mi. NW of Rte. 211, area—**Andalusite**, **Kyanite**, **Lazulite**, **Staurolites**, **Tourmaline**.

Hickory Grove-Smyrna, AREA OF Quartz vein outcrops extending NE between both towns, some 50 Gold mines and prospects along both sides of Rtes. 5, 97 and 221—**Calcite**, **Galena**, **Gold** nuggets, **Sphalerite**, **Tourmaline**.

KINGS CREEK, SW 3 mi., the Carroll & Ross Mine (on Wolf Cr. tributary of the Broad R.)—**Gold**, **Pyrite**.

PIEDMONT SPRINGS, N 1 mi. and just N of Rte. 55, numerous pits (mainly W and N from Zoar Church on Rte. 731)—**Barite**.

ROCK HILL, W 5 mi. and 0.2 mi. S of jct. of Co. rd. 46-102 with Co. rd. 46, as area float—**Sillimanite**.

SMYRNA: ① NE 1 mi., the Horn Mine; ② E 2 mi., the Castles and Scoggins mines—**Gold**, **Pyrite**, **Quartz** crystals; ③ W 1 mi., the Martin Mine—Gold nuggets; ④ SW 3 mi., area rock outcrops—**Andalusite**, **Kyanite**, **Lazulite**, **Staurolites**, **Tourmaline**; ⑤ W 3½ mi., the Hull Mine—**Calcite**, **Galena**, **Gold**, black **Tourmaline** (sunbursts), etc.; ⑥ SW 4.4 mi.: (a) the Dorothy Mine; and (b) an old prospect ½ mi. E of the mine—**Gold**, **Malachite**, etc.

YORK: ① area mines, such as (a) the Big Wilson Mine; and (b) E 4 mi., the Mary Mine—**Chalcopyrite**; ② NE, an old Copper Mine—**Malachite**, **Cuprite**, native **Copper**; ③ Five Points crossrds. On Nanny Mt.: (a) ¼ mi. W of jct. of Rtes. 49 and 56, on right side of rd. leading to Clover, along the NC boundary, area fields, cuts, breaks, etc.—black **Corundum**; (b) area mines 11 mi. NE of York on Nanny Mt.—**Pyrrhotite**.

SOUTH DAKOTA

This northwestern Great Plains state varies from nearly level farmland to hill ridges, increasing steadily in elev. From 1,000' on the eastern border with Montana and Iowa to 3,500' along the western boundary with Wyoming. In the far western counties of Lawrence, Meade, Custer and Pennington the land rises abruptly into the 6,000 sq. mi. Black Hills region enclosed by the Belle Fourche and Cheyenne rivers. These pine covered mountains, higher than the Alleghenies, culminate in Harney Peak in southern Pennington Co. At 7,242' this peak is the highest point in America east of the Rocky Mts.

Cambrian rocks are exposed as thick bands around the entire mountain system. The rising granite mass intruded the famed Cretaceous Dakota sandstone, which underlies most of the Great Plains, and bent the broken edges sharply upward into steep hogbacks unusual in outward appearance. These hogbacks catch the regional precipitation and channel it into the underlying porous sandstone. Laid down in Early Cretaceous times, as the continental seas were advancing from the south, the Dakota sandstone represents topset beds, wave reworked, and spread as a vast deltaic accumulation of water absorbing sands covering tens of thousands of sq. mi. with extraordinary homogeneity. Throughout the Great Plains, wells drilled deep into this unit provide an inexhaustible supply of cold artesian, Rocky Mountain snow melt water.

Harney Peak is the crest of the geologically notable granite dome uplift which also produced a most remarkable series of pegmatite dikes ranking with those in Maine and Southern California for their production of gems and minerals. The pegmatites are off shoots of the otherwise barren granite. From then have come some of the world's most spectacular crystals of **Beryl** and **Spodumene**. For instance, a single **Spodumene** crystal from the Etta Mine near Keystone on the east side of the Mount Rushmore National Memorial in Pennington Co. measured 42' long and weighed 90 tons. Also huge crystals of sparkling blue **Beryl** from the Black Hills pegmatites have measured from 18' to 27' long. In addition, gem **Garnets**, **Quartz** crystals, **Topaz** and **Tourmaline** add to the fascination of these pegmatites.

The commercial production of minerals, principally **Gold**, **Silver**, **Copper**, **Iron**, **Lead**, **Manganese** and **Zinc**, along with lesser amounts of **Beryllium**, **Cesium**, **Lithium**, **Tantalum**, **Tin**, **Tungsten** and **Uranium** has come only from the core of the Black Hills region. Two divisions are recognized: the Northern Section, centered in lead and Deadwood in Lawrence Co.; and a Southern Section, covering a somewhat larger area around Harney Peak. The northern section is characterized by vein deposits, while the Southern Hills Dist. Includes both Veins and the extensive pegmatite dike exposures and mines.

BON HOMME & CHARLES MIX COUNTIES

SCOTLAND to WAGNER, regional rd. cuts, breaks, river banks, stream beds, excavations, etc.—**Selenite** roses.

BRULE COUNTY

AREA: in the Oacoma zone of the Pierre Fm. On Elm Cr. Near its jct. with the Missouri River (about 15 mi. S of Chamberlain) —gray **Barite** rosette up to 5 or 6 inches.

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CAMPBELL COUNTY

MOUND CITY, W to the Missouri R., regional hillsides, ridges, cut banks, tributary gravels, etc.—**petrified wood**, wood **opal**.

CORSON COUNTY

LITTLE EAGLE: ① area ridges, slopes, stream beds, etc. —**petrified wood**, wood **opal**; ② along the Grand R. though entire Co., regional banks, breaks, gravels, etc. —**petrified wood**, wood **opal**.

CUSTER COUNTY

AREA: The November Mine, 1.2 mi. SE of the Needles Eye Tunnel, on the W side of Hwy. 87—**Arsenopyrite**, **Fluorapatite** (fluorescent orange).

BUFFALO GAP, entire region W 37 mi. to the WY line, in stream gravels, cut banks, breaks, hillsides, etc.—*Fairfield agates*.

CUSTER: ① N, (1) near Laughing Water Cr., many area mines—**Columbite**, **Gold**, **Silver**, etc.; and (2) Old Marble Quarry on the Needles Hwy. 5.5 mi. NE—**Scheelite**, and deep brown to black crystals of **Sphene**; ② E 6 mi., on French Cr., the Scott Rose Quartz Quarry—**Amblygonite** (large yellow crystals), **Aquamarine**, **Chrysoberyl**, **Quartz** (milky, rose), **Spodumene**; ③ W 7 mi., the Tin Mt. area, to Deer Camp rd., turn in ¼ mi.: (a) area mines, (b) in rocky uplift along side of rd., and (c) adjoining stream gravels—gem **Almandite** garnets, **Cassiterite**, pale lavender crystals of **Fluorapatite**, **Kasolite**, **Quartz** crystals, **Mica**, **Tourmaline** and **Zircon** (reddish brown crystals); ④ W 14 mi. on US 16 to Teepee Canyon, diggings on N of hwy. Extending up canyon—**agate**, **Beryl**, **Almandite** garnets, **Lepidolite**, **Staurolite**, **Tourmaline**, etc.; ⑤ E on US Alt. 16 for 15 to 17 mi. (near Rte. 79), pegmatite outcrops—**Rose Quartz**; ⑥ S along US 385 for 32 mi. to Hot Springs in Fall River Co., all regional side rds., look for limestone outcrops and ridges—*Fairhill agates*; ⑦ in Bull Moose mine dump 5 mi. SE—**Barbosolite**, exceptional reddish-violet crystals of **Metastrengite**, showy black and gold **Pyrite**, and **Reddingite**; ⑧ at Beecher Lode 4.9 mi. SE—**Amblygonite**, **Beryl**, **Lepidolite**, **Spodumene**, blue-green **Tourmaline**; ⑨ Gayle Royal Flush pegmatite, 5.9 mi. SE—**Amblygonite**.

FAIRBURN: ① NW about 10 mi. and just S of the Game Farm (zoo) on US Alt. 16, area—*Fairburn agates*; ② W on unmarked dirt rd. and S several mi. into hilly area to old windmill, park car; in dry bed of Lame Johnny Cr., as large waterworn boulders, gemmy—**jasper** conglomerate; ③ E 15 mi. on Co. rd. to S trending side rd. (just E of the McDermond ranch) leading to picnic grounds, continue on N toward badlands buttes to end of rd., all area from picnic grounds to road's end—gem *Fairburn agates*, **agatized wood**, yellow **jasper**; ④ E 15 mi.: (a) general area, and (b) S to the Cheyenne R., along both sides and on adjoining slopes—*Fairburn agates*.

FOURMILE, W 14 mi. to Jewel Cave National Monument, then N up Hell Canyon from US 16, area—banded **agate**, **Jade**, **jasper**, **fossils**, **geodes**.

PRINGLE: ① area to Minnekahta in Fall River Co.—*Fairhill agates*; ② W on Rte. 89 to Rte. 316, then W to Carter Ranch and S along Pleasant Valley Cr. in Red Canyon, area—banded **agate**, **Jade**, **jasper**, **fossils**, **geodes**; ③ E on US 385 about 10 mi. (halfway to Cave Park boundary), on N side of rd. a few yds., outcrop—**Rose Quartz**.

DOUGLAS COUNTY

CORSICA, S on US 281 to Armour, area rd. cuts, stream banks and gravel beds, excavations, etc., occurring mainly in black gumbo—**Selenite**.

South Dakota

FALL RIVER COUNTY

AREA: The Uranium-Vanadium mines of the Edgemont Mining Dist.—**Autunite**, **Becquerelite**, **Carnotite**, **Coffinite**, **Haggite**, **Hummerite**, **Ilsemanite** (as deep blue coatings), **Jordisite**, **Marcasite** & **Pyrite**, **Meta-Hewettite**, **Montroseite**, **Paramontroseite**, **Rauvite**, and other **Uranium-Vanadium** minerals.

ARDMORE, E 7 mi. on dirt rd. to ranch, then S and E several mi. into badland breaks, area—**Fairburn agates**, **agatized wood**, **jasper** (green, lavender, red, yellow), **chalcedony**, quartz **nodules** (rose, white).

BURDOCK, E, in S part of the Elk Mts., many mines and prospect pits—**Carnotite**.

HOT SPRINGS: ① area quarries—**Calcite** and **chalcedony** (both fluorescent), **Gypsum**; ② E on US 18 for about 3 mi. to first bridge, in banks of the Fall R.—**travertine**; ③ W 12 mi. on US 18 to RR siding of Minnekahta, then S on USFS rd. (to top of Parker Peak), take left fork to dam and through 3rd gate beyond to a large open flat, all general area—gem **agatized wood**; ④ W all way 12 mi. to Parker Peak, all regional breaks, cut banks, washes, land surfaces—**silicified wood**.

MINNEKAHTA (RR siding), all around Parker Peak (1½ mi. E of US 18, 2 mi. S of siding) and all area outside the Cycad national Monument—**silicified cycad stumps**.

OELRICHS, E from hwy. Intersection in town: ① 1 mi., take S trending side rd. toward nearby buttes, park at fence, area to S—**Fairburn agates**; ② 1½ mi. on buttes to S—**agate**, **jasper**; ③ 7.4 mi. to new hwy. Cuts in badlands area, land surfaces to N—gem **agate**; ④ E 9 mi., at stock dam, area breaks, etc.—**agate**; ⑤ E 18.4 mi., on N side of US 18, area—**agates**; ⑥ S from town on US 385, turn E on first dirt rd. for 1 mi., then S for 2 mi. (past large ranch), then E along winding track for 4 mi. to a dim N trending track and follow 1½ mi. NW to huge alluvial gravel area, abundant—**agate**, **chalcedony**, **jasper**, **jasp-agate**, cone-in-cone **Calcite** (some fluorescent), **agatized wood**, **concretions**, etc.

HARDING COUNTY

CAMP CROOK, regional gravel bars of the Little Missouri R. and all tributary creeks—**moss agate**, **chalcedony nodules**.

LAWRENCE COUNTY

DEADWOOD, ① on W edge of town on US 14A, the Broken Butte Gold Mine—**Arsenopyrite**, **Galena**, **Gold**, **Pyrite**, **Sphalerite**. Visitors tour the mine from May through Sept. each year (fee); ② the Rattlesnake Jack mine at the bottom of Strawberry Gulch, 4 mi. SE—**Alunite**.

LEAD: ① S side of town on US 14A and US 85: (a) the Homestake Gold Mine, and (b) other area mines—**Arsenopyrite**, **Cummingtonite**, **Galena**, **Gold**, **Pyrite**, **Sphalerite**. Visitors tour the mine from June through Aug. weekdays. ② W about 3 mi. to Trojan (on W slope of Bald Mt.): (a) the Carbonate, Iron Hill and area mines—**Atacamite**, **Cerargyrite**, **Cerussite**, **Fluorite**, **Galena**, **Lead carbonates**, **Matlockite**, **Plattnerite**, **Pyromorphite**, **Scheelite**, **Wulfenite**, **Vanadinite**; (b) the Ulster Mine—**Fluorite**; ③ the Hidden Fortune Mining Co. (at the head of Bobtail Gulch), just N of town—**Barite** crystals.

NEMO: ¼ mi. N at Camp Old Broadaxe, small prospects—white **Calcite**, **Fluorapatite** (light yellow prismatic crystals), **Talc**.

PIEDMONT: ① E ¾ mi., area—**Selenite** crystals; ② SE 3 mi. on US 14, area—**fossils**.

SAVOY, the Ragged Top Mt. Dist. (5 mi. long, lying immediately W of Spearfish Cr. in the large bend of Spearfish Canyon, center of a productive mining dist. With the first

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mines opened $\frac{1}{2}$ mi. N of Ragged Top Mt. 2 mi. NE of town, at Dacy) —**Gold, Fluorite** (purple), **Silver, Tellurium**.

SPEARFISH: ① area quarries—**Gypsum**; ② S, in gravels of adjoining Spearfish Canyon—**Amethysts**, Amethyst lines **geodes, chalcedony**, chalcedony **geodes, silicified wood**.

TINTON: ① area pegmatite mines—**Cassiterite, Columbite, Scheelite**; ② in the selvages of the Rough & Ready and Giant-Volney pegmatite dikes—**Dravite** tourmaline.

WHITEWOOD ($6\frac{1}{2}$ air mi. NE of Deadwood), gravel bars and banks of Whitewood Cr. —**Amethysts**, Amethyst lines **geodes, chalcedony**, chalcedony **geodes, silicified wood**.

MEADE COUNTY

AREA, in the banks of Elk Cr.(fluorescent)—superb crystals of **Barite** (colorless, yellow, amber, smoky), **Whewellite** (fluorescent)

MAURINE, EES 5 mi., on top of Fox Ridge, area—**moss agate**.

SCENIC: ① the Badlands region, all breaks, washes, etc.—blue **chalcedony**; ② W on Co. rd about 2 mi., to buttes on N side of rd., area ravines—black gemmy **agate**; ③ SE to Imlay along Rte. 40, both sides of hwy.—gem **chalcedony** and **carnelian**, some **Aquamarine, Beryl, Garnets** and **jasper**.

MINNEHAHA COUNTY

SIOUX FALLS, all regional stream gravels, cut banks, gravel pits, excavations, etc.—**agate, catlinite, jasper**.

PENNINGTON COUNTY

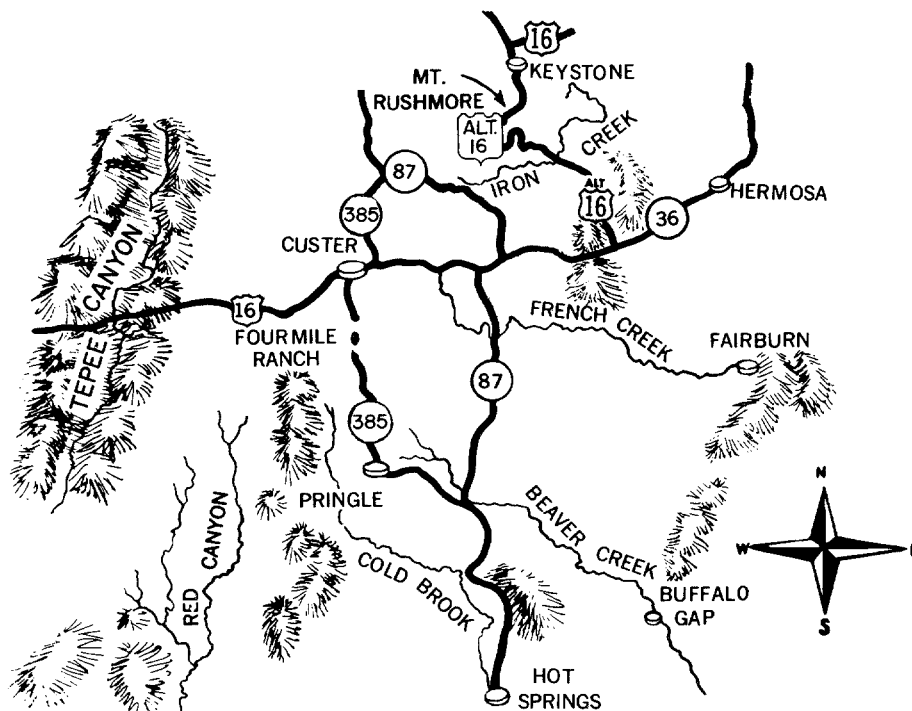
AREA, gravels of Bear Butte Cr., Box Elder Cr. and Warrens Gulch—**Amethyst**.

HILL CITY, area mines (in a belt extending from 6 mi. SW of town to 5 mi. NE), deposits in quartz veins, fissure veins and mineralized shear zones—**Beryl, Cassiterite** (Ruby red), **Cervantite** (as dull yellow to white fine crystal coatings), **Columbite, Ferberite, Graphite, Wolframite**.

KEYSTONE: ① area mine dumps (in a belt about 5 mi. long extending from 3 mi. W of town to $1\frac{1}{2}$ mi. SE): (a) on dumps—**Tourmaline** (blue, green, red); (b) the Etta Mine dumps—**Alluaudite, Arsenolite, Eucryptite** (fluorescent), **Lepidolite, Loellingite**, gem **Kunzite, Spodumene** (fluorescent), **Tetrahedrite**; (c) the Bob Ingersoll Mine—**Amblygonite, Autunite, Becquerelite, Golden Beryl, Cassiterite, Garnets, Gummite, Lepidolite, Loellingite** (silver white crystals), **Quartz** crystals, **Spodumene, Tourmaline** (blue), **Uraninite** and **Zircon**; ② regional pegmatite outcrops (over a broad area) —**Apatite, Aquamarine, Beryl** (golden, green); ③ S 1 mi., the Peerless Mine (Hugo Mine) and nearby claims—**Amblygonite**, blue **Apatite, Augelite, Loellingite, Montebrasite, Morinite, Wardite**; ④ S 4 mi., on Co. line, area mines (with Iron mines on Iron Mt.) —**Hematite, ocher**; ⑤ S 4 mi. and 2 mi. E, in the Spokane Dist., area mines—**Arsenopyrite, Galena, Gold, Pyrite, Silver, Sphalerite**; ⑥ tunnel on US 16A (between US 16 and town), park car and take trail around tunnel, in rock piles on both sides—abundant pegmatite **minerals**; ⑦ take shortcut rd. W from town toward Hill City: (a) on first mine dump—**Scheelite**; (b) on dumps of other area tin mines—**Cassiterite, Scheelite**; (c) area stream gravels— **Cassiterite, Columbite, Scheelite, Tantalite, Tungsten** minerals; ⑧ W on Mt. Rushmore area: (a) regional pegmatite outcrops (very many)—green **Beryl**; (b) along rd. behind Mt. Rushmore (connecting US 16A with Rte. 89),

South Dakota

on both sides for whole length—jasper **nodules**; ⑨ the Hardesty Homestead Mine, 2.5 mi. NW—**Topiolite, Topaz**.



MOON, at Nigger Hill in the Hills Dist. (almost on the WY line), in gravels of Bear Gulch and other area creeks—**Cassiterite, Columbite, Scheelite, Zircons**.

OREVILLE, E 1½ mi., the Tin Queen claim—**Amblygonite, Cassiterite, Scheelite**, etc.

PACTOLA, area mines and prospects—**Cinnabar**.

RAPID CITY, E along I-90 to Wall in Meade Co., in all regional rd. cuts, breaks, washes and on hillsides as huge concretions—gem golden **Barite** crystals, **fossils**.

ROCHFORD Dist. (includes mines in a belt 9 mi. long extending from 4 mi. SW of town at Myersville to 5 mi. N 30° W at Nahant in Lawrence Co.): ① regional mines and prospects—**Cinnabar**; ② many mines in the *Hornblende belt* and the *Iron Quartz-tremolite belt*—**Arsenopyrite, Galena, Gold, Pyrite, Silver, Sphalerite**.

SILVER CITY, N 2 mi., area mines on Rapid Cr. —**Arsenopyrite, Boulangerite, Galena, Gold, Jamesonite, Mica, Sericite, Silver, Sphalerite**.

WASTA, N on gravel rd. to Elk Cr. (second cr. crossing), turn W through farm, park car by a dry cr. bed, all surrounding territory—concretions of gemmy golden **Barite, Calcite** crystals (some fluorescent), **Quartz** crystals.

SHANNON COUNTY

OGLALA, in breaks along the rd. to Smithwick in Fall River C. in the badlands region—**agate, chalcedony, jasper**, etc.

RED SHIRT, area especially in breaks along the Cheyenne R. —**agate, chalcedony** (some blue), **jasper**.

ROCKYFORD, W, in regional breaks and washes—blue **chalcedony**.

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TODD COUNTY

MISSION, W 12 mi. on US 18: ① in banks of the Little White R., and ② in gravels of the South Fork—**opalized wood**, brown **agatized wood**, vertebrate **fossils**.

WALWORTH COUNTY

MOBRIDGE, N and S along the Missouri R., in cut banks, breaks, tributary gravels—**opalized wood**, **agatized wood**.

WASHABAUGH COUNTY

CEDAR PASS: ① area to NW, on side of US 16—**agatized wood**, **chalcedony**, **jasper**, **jasp-agate**, etc.; ② in regional gravel beds, banks and tributary draws of the White R. —**agate**, **agatized wood**, **chalcedony**, **fossils**, **Meta-Uranocircite** (fluorescent).

INTERIOR, general region to N and E, abundant everywhere—eye **jasper**, **chalcedony**, **agate**.

YANKTON COUNTY

YANKTON, W 4 mi., on Gavin's Point rd. on S side in an abandoned brick yard's clay pit—**Selenite** (crystals, roses).

ZIEBACH COUNTY

DUPREE, SW at famed geological formation of Rattlesnake Butte, on top and slopes of the south butte—sand **Calcite** crystals (often perfectly terminated to 8" long and over 2" dia.).

TENNESSEE

This narrow, 450 mi. long scenic state extends across much of the south-central US and can roughly be divided into three main physiographic regions: the Cumberland Plateau and the associated Unaka and Great Smoky Mts., the rich gently rolling grasslands of central Tennessee and the alluvial river bottomlands of western Tennessee. The craggy, heavily forested mts. of the eastern part of the state constitute a vast geologic *thrust mass* which developed along the Appalachian fault belt, so that very ancient Precambrian and Cambrian granites, gneisses, schists, quartzites, conglomerates, sandstone, slates and shales, all intensely folded and faulted, overlie much of the younger sedimentary rocks, a reversal of the normal order of rock deposition.

Although these three main topographic regions roughly describe the state, they subdivide irregularly into eight distinct and well defined geological provinces: the valley of eastern Tennessee, the Cumberland plateau, the Unaka Mts. of Unicoi Co., the Highland Rim (and its enclosed Central Basin), the Plateau Slope of Western Tennessee, the Western Valley, and the Mississippian Alluvial Plain. The Cumberland plateau crosses Tennessee as a vast tableland averaging 2,000' above sea level extending NE to SW through southern West Virginia, into northern Alabama; it is relatively rich in minerals, especially coal. Most of the plateau is underlain with Pennsylvanian age sandstones and conglomerates interbedded with shales and coal seams. The plateau escarpment drops off on the west in sharp breaks, exposing even older Mississippian formations.

Extending from the Cumberland plateau to the Western Valley in the province of the Highland Rim, which also encloses an oval shaped area 80 mi. long by 50 mi. wide known as the Central or Nashville Basin. The Mississippian limestones which underlie the basin dip away in all directions from the central rise of the Nashville Dome, exposing Ordovician, Silurian and Devonian limestones and shales wherever stream erosion has deeply cut the formations. Far western parts of the Highland Rim are capped by Cretaceous gravels.

About 35 mi. SE of Knoxville, in southeastern Tennessee, a series of craggy peaks of the Great Smoky Mts. culminate in 6,642' Clingmans Dome in southern Sevier Co. on the North Carolina border. The 1,900 sq. mi. of the Great Smoky Mts. National Park, stretching 54 mi. wide with overlap into western North Carolina, embrace some of the oldest rock formations in America, well exposed throughout the park. Trails outside the park, especially the Appalachian Trail which follows the ridge crests, lead to countless gem and gemstone localities, not yet well prospected, all along the mts. NE to Virginia.

West and north of the mts., extending for 135 air mi. NE across the state from Chattanooga in southern Hamilton Co. on the Georgia line to the Cumberland Gap in northern Clairborne Co. on the Kentucky line, is the broad Valley and Ridge Province. As its name implies, the region is characterized by a succession of NE - SW ridges averaging 2,000' high and separated by narrow fertile valleys a thousand feet lower. The underlying formations are mainly Cambrian and Ordovician limestone, dolomites, sandstones and shales dipping toward the SE.

Farther west lie the long narrow valley of the Tennessee R., the West Tennessee Uplands and the West Tennessee plain sloping gently toward the Mississippi R. Many of the western counties yield agates, jasper, petrified wood, travertine and fossils from gravel pits, stream beds and excavations. Counties in central Tennessee offer Calcite crystals and Quartz pebbles to collectors. But as far as gemstones are concerned, Tennessee has been little prospected and mainly the mountainous regions offer the best possibilities.

The eastern mountain counties have produced most of the state's commercial minerals, principally **Barite**, coal, limestone, clay, **Pyrite** and **Zinc**. Another major metal mined for more than a century is **Copper**, principally from the single district of Ducktown in southeastern Polk Co. From these mines has come the most of the **Gold** produced in Tennessee (as a by-product).

A Location Guide for Rock Hounds in the United States

BEDFORD COUNTY

SHELBYVILLE: ① ENE via any of several rtes. (Fairfield Pike, Rte. 64, Railroad Ave., Horse Mt. rd.) to the famed Horse Mt. gem fields, area, wide variety, sizes and colors—*Horse Mt. agate*: . (a) Pannell Ridge on the Horse Mt. rd. (about halfway between Shelbyville and Wartrace), area plowed fields, ditches, cr. beds; (b) area around Philippi Church; (c) all regional side rds. And stream gravels, cut banks, etc., along the Nashville, Chattanooga and St. Louis RR; (d) all hwy. Dept. limestone quarries in region—**agatized corals** and casts; ② W, in rd. cuts, fields, stream beds; and ③ SW, along Rte. 64, at Sugar Cr., area—**agatized corals**; ④ widespread exposures throughout region of the Hermitage formation—*Horse Mt. agate*, **agatized corals**.

WARTRACE: ① the Velmer Cutlow farm on mail rte. 2, (fee); ② the W.E. Dye farm on same mail run, (fee)—*Horse Mt. agate*, **agatized corals**.

BLOUNT COUNTY

FRIENDSVILLE: ① area quarries—**marble**; ② NE 2½ mi., a quarry—*French pink marble*; ③ S, a quarry—**marble**.

MARYVILLE, area of Montvale Springs: ① regional stream gravels, placer—**Gold**; ② placer sands E of the Chilhowee Mts.—**Gold**.

TOWNSEND, in rd. cuts and stream gravels—**Epidote**.

BRADLEY COUNTY

CLEVELAND: ① area mines—**Sphalerite**; ② S 6 mi., at Blue Springs, area mines—**Galena**.

MINERAL PARK, S a few mi., mine (20 mi. E of Chattanooga in Hamilton Co.)—**Galena**.

CAMPBELL COUNTY

JELLICO, regional rd. cuts along US 25W to La Follette—**agate**, **chalcedony**, **jasper**, etc.

CANNON COUNTY

AREA, countrywide cr. gravels, cliffs and bluffs, rd. cuts, plowed fields, quarries, etc.—**Calcite**, **Fluorite**, crystal **geodes**, **Goethite**, **Limonite**, **Pyrite**, **Celestite**.

WOODBURY, E 5 mi. on US 70S, area rd. cuts, plowed fields, stream and cr. gravels—crystal **geodes**.

CARTER COUNTY

ELIZABETHTON, area mines—**Bauxite**.

ROAN MT.: ① along US 19E from Elk Park to Blevins; ② along Rte. 143 to S, all area rd. cuts, stream beds and banks, excavations, etc.—**Unakite**; ③ in exposures on both sides of Roan Mt. —**Unakite**.

SADIE (12 mi. NE of Elizabethton): ① area mine dumps—**Pyrite**; ② Stony Cr., a mine in black shale—**Pyrite**, **Pyrolusite**.

Tennessee

CLAIBORNE COUNTY

AREA, Lead mine on Lake Norris—**Galena**, **Hydrozincite** (fluorescent), **Sphalerite**.

NEW TAZEWELL, SW 5 mi., the Straight Creek dist., area mines—**Galena**, **Sphalerite**.

COCKE COUNTY

AREA, Rag Mt. and Bluffton, regional stream gravels—**Unakite**.

DEL RIO: ① area stream gravels—**Unakite**; ② area mines—**Barite**, **Calcite**, **Celestite**, etc.; ③ the Mine Ridge prospects—**Copper**, **Iron**, **Lead**, **Zinc** minerals.

HARTFORD: ① area gravels and banks of tributaries of Big Cr., weathering out of igneous exposures as pebbles—**gemstone**, **Quartz** (light green); ② S of Cogdill Chapel, on the Coggins farm, prospects—**Copper**, **Lead**, **Zinc** minerals; ③ SE 1.3 mi., on Raven Branch in quartz vein, various—**crystals**, **minerals**; ④ E 2½ mi. along the Gulf Fork of Big Cr., area mines—**Chalcopyrite**, **Galena**, **Pyrite**, **Sphalerite**.

NEWPORT, the Yellow Springs Mine and other area dumps—**Psilomelane**.

COFFEE COUNTY

BEECHGROVE, S and W of US 41—chalcedony **nodules**.

CUMBERLAND COUNTY

CROSSVILLE, E 4 mi., numerous quarries—*Crab Orchard stone* (polishable varicolored sandstone).

DAVIDSON COUNTY

HAYSBOROUGH, area Lead mine—**Barite**, **Galena**.

FENTRESS COUNTY

BOATLAND, N side of Boles Cr. and 1 mi. from the church—**Calcite**, **Celestite**, **Dolomite** crystals, **geodes**, **Marcasite**, **Pyrite**, etc.

JAMESTOWN: ① NW 2½ mi., at Carpenter Hollow; and ② SW 3½ mi. in the Buffalo Cove section, all area quarries—**Calcite**, **Celestite**, **Dolomite** crystals, **geodes**, **Marcasite**, **Pyrite**, etc.; ③ take US 127 to rd. W at S edge of town to Herbert Tipton farm in Buffalo Cave, area (fee) —**onyx**.

FENTRESS, OVERTON & WARREN COUNTIES

AREA, these counties constitute the state's primary Celestite region, in Mississippian age limestone exposures, quarries, etc.—**Calcite**, **Celestite**, **Dolomite** crystals, **geodes**, **Marcasite**, **Pyrite**, etc.

GREENE COUNTY

AREA: ① scattered Co. Hwy. Dept. quarries (Cove Cr., Dog Walk, Midway, Radcliffe, etc.)—**chert**, **crystals**, **fossils**; ② Davy Crockett Lake, area mines—**Mica**, etc.

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GREENEVILLE: ① area mines—**Sphalerite**; ② 12 mi. distant, veins in dolomite outcrop—**Barite** crystals.

MOSHEIM: ① jct. of US 11E and rd. into town, N 2.7 mi. to exposure of the Mosheim anticline (a mineralized belt) —**Dolomite** and **Quartz** crystals, quartz **geodes**. The anticline is 8 mi. long and nearly 2 mi. wide with many regional rds. Leading to mines, prospects and quarries. ② N 3 mi. to ½ mi. N of the Mosheim-Albany crossrds., then W on gravel rd. to Gethsemane School, N ½ mi. on dirt rd. to the Brown-Tipton Mine—**Calcite**, **Cerussite**, **chert**, **Dolomite**, **Galena**, **Pyrite**, **Smithsonite**, **Sphalerite**.

GREENE, HAWKINS, SULLIVAN & WASHINGTON COUNTIES

AREA: ① all regional limestone quarries, rd. cuts, excavations, etc.—**Calcite** crystals, **Celestite**, **Dolomite** crystals, **Fluorite**, golden **jasper**, **Pyrite**, **Quartz** crystals; ② region bounded by Greenville (Greene Co.), Rogersville (Hawkins Co.), Kingsport (Sullivan Co.), and Johnson City (Washington Co.): (a) all regional quarries, rd. cuts, banks, stream beds, excavations, etc.—**Quartz** crystals (clear, smoky, doubly terminated); (b) all regional old Barite mines—**Barite**, **jasper**, **rock crystals**; (c) regional Iron mines— **jasper**, **Iron** minerals, **rock crystal**; (d) all regional building excavations, gravel pits, prospect holes—**agate**, **jasper**, **Quartz** crystals, etc.

HAMBLÉN COUNTY

RUSSELLVILLE, area gravels, pits, rd. cuts, etc.—quartz **geodes**.

HAMILTON COUNTY

CHATTANOOGA, area mines at nearby Missionary Ridge—**Bauxite**.

HARDIN COUNTY

AREA, countywide rivers and stream gravels (Tennessee, Elk, Cumberland, Clinch and Wagauga rivers; Snake, Owl, Indian and Holland creeks), buried in muds and sands, fresh-water mussels—**pearls**.

MILLEDGEVILLE, area of Coffee Landing (at Coffee Bluff on banks of the Tennessee R.), in sands—**Amber**.

HICKMAN COUNTY

CENTERVILLE, area mines—**Cobalt** in **Wad**, **Nickel** minerals.

JEFFERSON COUNTY

MOSSY CREEK, area exposures of the Knox Dolomite are mines—**Calamine**, **Smithsonite** (locally called *dry bone*), **Sphalerite**.

NEW MARKET, extensive area mines—**Smithsonite**.

KNOX COUNTY

MASCOT, extensive area mines—**Smithsonite**.

Tennessee

LAWRENCE COUNTY

LAWRENCEBURG, area rd. cuts, excavations, cut banks, etc.—**chalcedony**, **chert**, **geodes** (calcite, quartz).

MARION COUNTY

AREA: ① Iron Ridge, mines—**jasper**, **Hematite**; ② regional pits, quarries, stream gravels—**Barite**, **Fluorite**, **Galena**, **Pyrite**, **Selenite**.

JASPER, the Chattanooga Shale Quarry—**gem** crystals.

MONTEAGLE, just S, in a rd. cut, as masses—**calcite onyx** (peach, pink, some clear).

MONROE COUNTY

AREA: ① in reddish clay banks along the Little Tennessee R.—rock **crystal**; ② SE part of Co., Coker Cr., much early activity and many old mines—**Gold**; ③ Coco Cr. at mouth on Hiwassee R., the Buck Miller Mine—argenteiferous **Tetrahedrite**; ④ Whippoorwill Branch of the Tellico R., gravels and area lode mines—**Gold**.

SWEETWATER (Dist.): ① area mines and quarries—**Barite**; ② E 5 mi., near village of Rocky, on rd. to Vonore, the Bullard Barite Mine—**Barite**, **Fluorite**, yellow **Sphalerite**.

TEQUA, in clay banks of the Little Tennessee R.—rock **crystal**.

OVERTON COUNTY

LIVINGSTON, NW 4 mi., near Allons and W of Rte. 52, a quarry—**Calcite**, **Celestite**, **Dolomite** crystal, **geodes**, **Marcasite**, **Pyrite**, etc.

MONROE, SE $\frac{3}{4}$ mi., on NE side of Pilot Knob, area mines—**Calcite**, **Celestite**, **Dolomite** crystal, **geodes**, **Marcasite**, **Pyrite**, etc.

POLK COUNTY

COPPERHILL: ① area streams, rd. cuts, etc.; and ② the many regional Copper mines of the Ducktown-Copperhill Dist., dumps scattered over many sq. mi.—**Azurite**, **Chalcopyrite**, **Garnets**, **Gold**, **Pyrite**, **Pyrrhotite**, **Malachite**, **Quartz** crystals, **Staurolites**, **Chalcanthite**, **Chalcocite**, **Cuprite**, **Galena**, **Graphite**, **Melaconite**; ③ take rd. to Ducktown for 1 mi., look on right side for rough place in bank—**Staurolites**.

DUCKTOWN: ① area mines—**Azurite**, **Chalcopyrite**, **Garnets**, **Gold**, **Pyrite**, **Pyrrhotite**, **Malachite**, **Quartz** crystals, **Staurolites**, **Chalcanthite**, **Chalcocite**, **Cuprite**, **Galena**, **Graphite**, **Melaconite**; ② the Cherokee Mine—same as area mines but with very large sized **Pyrite** cubes.

PUTNAM COUNTY

COOKEVILLE, in nodules in streams from the Cumberland Plateau—**jasper**, **agate**.

MONTEREY, N 2 mi. on US 70N, mine dumps—**Calcite**, **Celestite**, pink **Dolomite** crystals, **Fluorite**, **Quartz** crystals.

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ROBERTSON COUNTY

SPRINGFIELD, area rd. cuts, stream gravels, etc.—Quartz **gemstones**.

RUTHERFORD COUNTY

MURFREESBORO, in chert at rd. cuts and ditches—agate **nodules**.

SEVIER COUNTY

GATLINBURG: ① all area stream banks and gravels—**gemstones, minerals**; ② Pigeon R. and tributaries along numerous improved side rds.—black **chert, Quartz** (blue, smoky), **moonstone, Unakite**; ③ the Webb, English and Chilhowee Mts.: (a) regional surfaces and outcrops, and (b) regional stream gravels, varied—**minerals**; ④ the Unaka Mts., in outcrops of the Max Patch granite—**Epidote, Quartz, Unakite**.

SEVIERVILLE, E 8 mi., in Nun's Cove dist., numerous old mines—**Calcite**, bluish **chert, Barite, Sphalerite** (pale yellow crystals).

SHELBY COUNTY

MEMPHIS, at Richardson's landing, area dredging operations, stream gravels and banks, etc.—**agate** (*Lake Superior* type), agatized **fossils**.

SMITH COUNTY

CARTHAGE, W 8 mi., the Foley Mine—**Fluorite**.

TROUSDALE: ① area mines—**Calcite, Fluorite, Sphalerite**; ② mines on the Ferry-Lebanon rd. (into Wilson Co.) —**Barite**.

SULLIVAN COUNTY

BRISTOL, at bypass rd. cut in Hwy. 421—**onyx**.

KINGSPORT: ① area quarries—common limestone **minerals**; ② cuts in hillside just outside town, massive—**Barite**; ③ the Rockaway and Lambert limestone quarries—**Calcite, Celestite, Dolomite** crystals, etc.; ④ rd. cuts along I-81—limestone **minerals**.

UNICOI COUNTY

AREA: ① N section of Co., in regional limestone quarries—**Calcite, Celestite, Dolomite** crystals, etc.; ② Unaka Mts., area—**Unakite**.

ERWIN: ① area pits and quarries of the Brooks Sand & Gravel Co. and Unicoi Hwy. Dept.—**chalcedony, jasper**; ② 4 mi. out at Bumpass Cove (dist.), many area mine dumps reaching from Embreeville on Co. rd. 107 and an unmarked rd. paralleling Bumpass Cr. and an old RR grade: (a) drive SW around the *Horseshoe* of the Nolichucky R., mines along both sides of rd.—brown **jasper** (patterned with Pyrolusite); (b) mines and dumps of the Bumpass Cove dist.—**Anglesite, Chalcopryrite, Cerussite, Hematite, Hemimorphite, Galena, Psilomelane, Sphalerite**.

FROG POND (village): ① area outcrops of epidotized granite (laced with quartz veins) —red **Feldspar**; ② halfway to Erwin and ½ mi. from US 23: (a) granite exposures N of hwy.; and (b) granite extending as main body to S—**Unakite**; ③ NW 2¾ mi., the Chandler Mine—**Barite, Quartz, Unakite**; ④ W, at the Higgins property, as well as the

Tennessee

nearby Willis, Lloyd and Stockton farms, and the Del Rio Stackhouse exposures—**Unakite** (with Max Patch granite, red and gray, course grained, showing Biotite, Epidote and pink Feldspar). US 23 crosses a massive body of the Max Patch granite just E of the village of Flag Pond, the larger portion extending S to the Walnut Mts. of NC. Highway cuts reveal gemmy variety of the Beech granite which is usually associated with the Archean Cranberry granite.

ROCK CREEK, area quarries and mine dumps—**Barite, Hematite**.

UNION COUNTY

NEW PROSPECT, area mines and the Stiner's Zinc Mine—**Calamine, Smithsonite, Sphalerite**.

POWELL RIVER, area mines—**Calamine, Smithsonite**.

WARREN COUNTY

McMINNVILLE, S 5 mi., on W side of Ben Lomond Mt. between Bennett Hollow and McCorkle Hollow—**Calcite, Celestite, Dolomite** crystals, **geodes, Marcasite, Pyrite**, etc.

WASHINGTON COUNTY

ERWIN, go 5 mi. N on Hwy. 81, cross river and turn at Embreeville to Bumpass Cove for dark variegated material with blue areas—**jasper**.

WAYNE COUNTY

WAYNESBORO, all countywide area limestone exposures—gemmy **chert, agatized fossils, flint, Quartz** crystals, etc.

WHITE COUNTY

SPARTA, take US 70 S 1 mi. to White Company limestone quarry—**jasper**.

WILLIAMSON COUNTY

NOLANSVILLE, area mines—**Galena**.

TEXAS

This huge spade-shaped state, second in size only to Alaska, reveals a varied topography and geologic structure. Its rock formations run the gamut from Upper Cambrian of the Llano Estacado or Staked Plain to Pleistocene alluvials along the Gulf Coast from Harding to Hidalgo counties. The eastern portion, between Sabine, in Jefferson Co. on the Louisiana border, and the Trinity R. running through Liberty and Chambers counties, is a region of cypress swamps and pine covered knolls. Central and northern Texas comprises rolling blackland prairies, among the most fertile farmlands in the world, underlain by Cretaceous formations. Especially notable is the Comanche series of the Lower to Middle Cretaceous, outcropping in a line south from the Oklahoma border all the way into central Mexico and forming a broad E - W belt from the Arkansas line to the westernmost county of El Paso. These Cretaceous rocks are not only enormously rich in fossil but are productive of such sedimentary formation minerals as **Alum**, **Barite**, **Celestite**, **Calcite**, **Gypsum** and **Fluorite**.

The Texas panhandle and all of west Texas is high arid land rising westward by sweeping plains and eroded uplands. In far northwest Culberson Co., the Guadalupe Mts. achieve the highest point in Texas at 8,751' Guadalupe Peak. The mountain range itself is actually a great uplifted sea reef of corals and calcareous algae more than 280 million years old. The flat topped escarpment is protected from erosion by a cap rock of massive Permian limestone.

A North-South geologic divider occurs along the Balcones Escarpment, a long curving fault line through central Texas marked by rough, tree covered hills and many waterfalls. West of the escarpment lie the Edwards Plateau and that portion of the Great Plains known as the *north-central short-grass plains*. The Cap Rock separates the short-grass plains from the high, wind-swept, canyon-cut Llano Estacado, famed for its bitter winter blizzards and searing hot summers.

Commercial mining plays little part in the Texas economy. Gnarly speaking, the gemstone fields of Texas can be grouped into several broad areas in each of which specific collecting localities are far too numerous to list. The gravel beds of the Rio Grande delta area from N of Laredo in Webb Co. to 20 mi. S of the Falcon Reservoir Dam in Starr Co. yield great amounts of **agate** of every description, **chalcedony**, **carnelian**, flower **jasper**, **Quartz** and a host of other quartz based gemstones. The Big Bend region, including Needle Peak and Bouquet, from 17 mi. S of Marfa in Presidio Co. to Loma Linda on the Mexican side of the east end of Big Bend National Park in Brewster Co., is productive of all types of **agates**, **jaspers**, **Fire Opals**, **Spinel**, etc. It is especially noted for its *pompom* or *bouquet agate*.

The Catahoula group of counties, which stretches 350 mi. in a SW-NE direction and includes a region some 100 mi. broad from the lower Rio Grande to the Louisiana border produces agate and petrified woods. Taken in SW-NE order, collecting centers are at Freer, Duval Co.; George West, Live Oak Co.; Gonzales, Gonzales Co.; Kennedy, Karnes Co.; Giddings, Lee Co.; Bryan, Brazos Co.; and Nacogdoches, Nacogdoches Co.

ARMSTRONG COUNTY

WAYSIDE, N and E by ranch rds., in banks and bed of Prairie Dog Town Fork of the Red R.—**agatized wood**.

Texas

BASTROP COUNTY

SMITHVILLE: ① wide surrounding region, in breaks, cuts, surfaces—**agates**, **petrified wood**; ② N 7.2 mi. on Rte. 71 to cr. crossing (7.8 mi. SE of Bastrop), at abandoned hwy. Bridge on the E, 100 yds. Up dr. in bank walls on S side in red shale —**Selenite** crystals (to 12" long, water clear).

BAYLOR COUNTY

SEYMOUR, take rd. to Rendham, then E and NE along the escarpment (capped by the Beaverburk ls.), as small cleavable masses in red shale—**Barite**.

BREWSTER COUNTY

ALPINE: ① N 10 mi., in gravels of Musquiz Cr.—small **moonstones**; ② E about 15 mi., on W side of the Glass Mts., area—**agate** (moss, plume), **chalcedony**, **jasper**, **Quartz** crystals; ③ SW 6 mi. on US 90 to RR water tank, beyond tank in valley, area—**agate**, **geodes**; ④ S 16 mi. on Rte. 118, area lava flow area—**agate** (moss, plume), **chalcedony**, **jasper**, **Quartz** crystals; ⑤ S 16 to 17 mi. on Rte. 118 to the Woodward ranch—*Texas plume agate*, *pompom agate*, **jasper**; ⑥ S 58 mi. on Rte. 118 to W trending side rd. (locked gate), then WSW 10 mi. to the Agua Fria ranch (32,000 acres), area draws, flats, slopes, etc.—**agate**, **agatized wood**.

ALTUDA, area mines—argentiferous **Galena**.

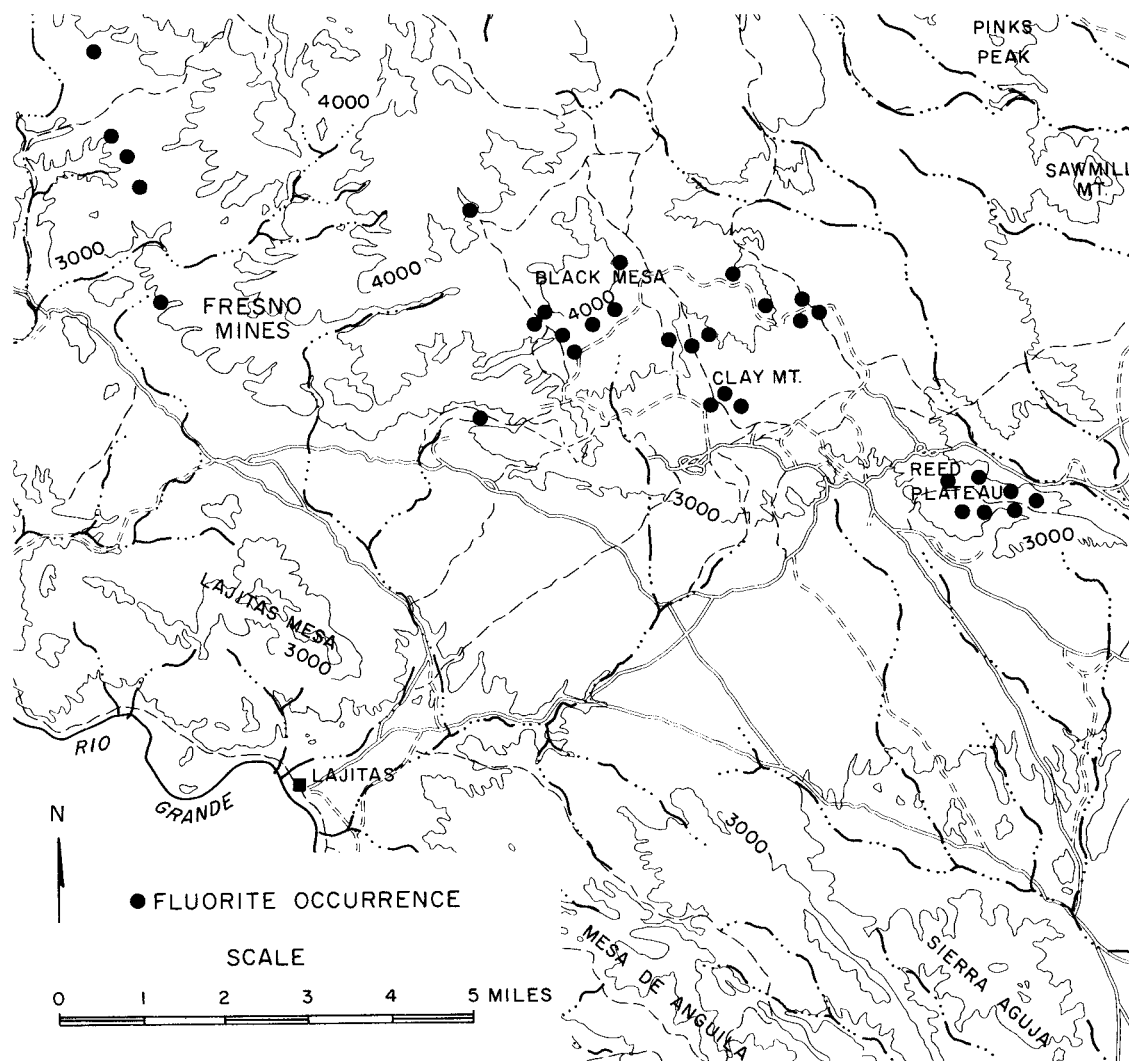
MARATHON, S on US 395: ① 37 mi., the Love ranch (fee), then 2 mi. to collecting area—**agate**; ② 29 mi. to SE trending side rd. (just n of Big Bend natl. Park), then 6.2 mi. to the Stillwell Ranch and Trailer Park (fee), area—**agate**; ③ 50 mi., on E side of Maravillas Cr. and E, SE or NE of Dog Canyon in the Santiago Mts., area deposits—**Barite**.

SOLITARIO (Dist.), area mines, excellent specimen on dumps—**Galena**.

STUDY BUTTE: ① SE, in NW portion of the Chisos Mts., area mines—native **Alum**; ② SW, to Needle Peak, a broad area—**agate**.

TERLINGUA (ghost town): ① area mines in Cretaceous limestones and shales—**Calcite** (dual wave length fluorescent), **Calomel** (fluorescent), **Cinnabar**, **Eglestonite**, **Fluorite**, native **Mercury**, **Montroydite**, **Terlinguaite** (fluorescent), and on dumps also *pompom agate* pseudomorphs after **Aragonite** crystals (to 6" long and in clusters); ② Bed and banks of Terlingua Cr. all along W side of Co.—**Amber**, **agate**, **chalcedony**, **jasper**, etc. (see map next page)

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Fluorite occurrences in the Terlingua quicksilver district, Trans-Pecos Texas.

BROWN COUNTY

BLANKET, W and SW, in Cretaceous Glen Rose fm., as replacement deposits—**Barite**.

ZEPHYR, area of E part of Co., extending into portions of both Comanche and Mills counties, numerous mined deposits—**Celestite**.

BURLESON COUNTY

CALDWELL to SOMERVILLE, and W to Giddings in Lee Co., a broad region, in regional cr. beds, breaks, hill slopes, etc.—**petrified** and **agatized wood**.

BURNET COUNTY

BURNET, the Silver Creek area, mines and prospects in calcareous sandstone—**Galena**.

Texas

CHILDRESS COUNTY

CHILDRESS, N on US 83 across the Red R., deposits in area between the Red R. and US 62 in NE part of Co.—**alabaster**.

COMAL COUNTY

NEW BROUNFELS, area stream beds and banks, plowed fields, rd. cuts, excavations—**petrified wood**.

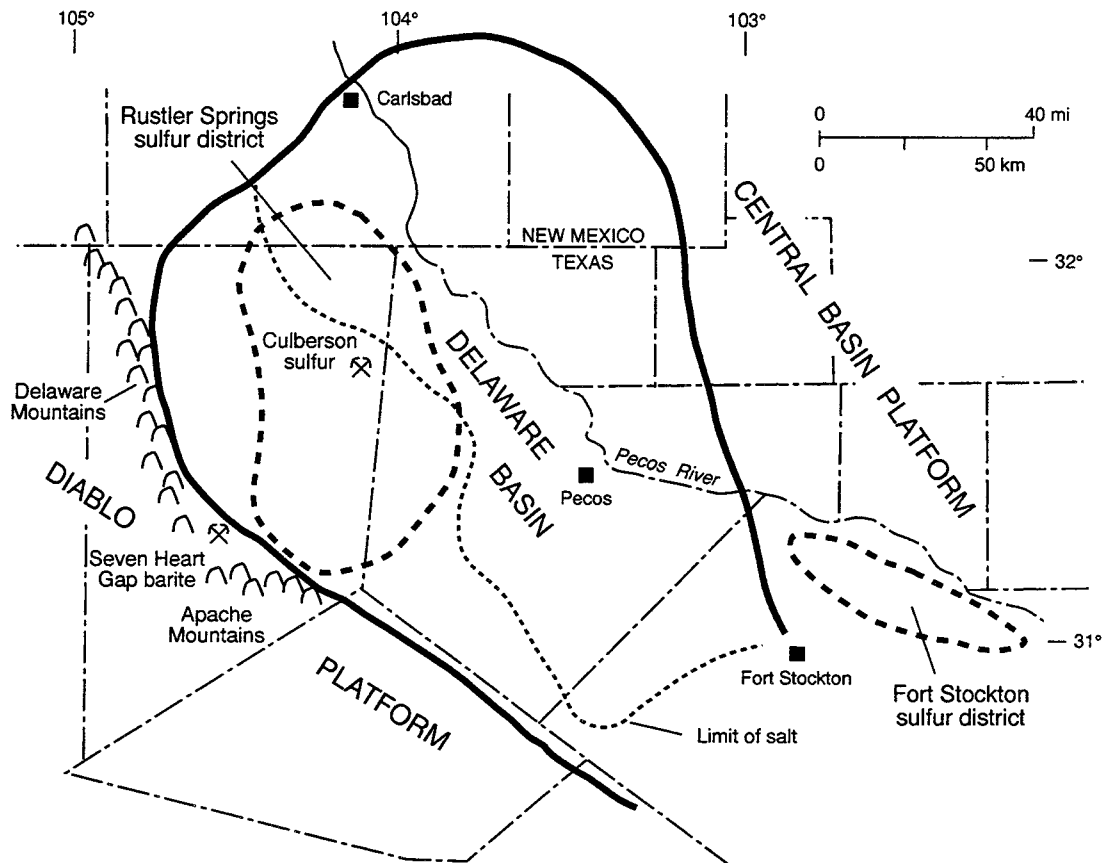
CORYELL COUNTY

GATESVILLE, S 1 mi. to Rte. 107, then SE 11 mi., rd. cuts 2 mi. W of RR tracks show limestone—*turritella* **agate**.

OGLESBY, S 3 mi. to Rte. 107, then W 2 mi., area rd. cuts cutting Turritella Ls.—*turritella* **agate**.

CULBERSON COUNTY

KENT, N, to Seven Hearts Gap (between the Apache and Delaware Mts.), area about 1 mi. long by ¼ mi. wide, replacement deposit in limestone—**Barite**.



Geologic setting of sulfur and barite deposits in the Delaware Basin and surrounding areas.

A Location Guide for Rock Hounds in the United States

VAN HORN: ① W on US 80, rd. cut on S lane of freeway—**Talc**; ② 1 mi. N of the Texas & Pacific RR, area on NE side of the Carrizozo Mts., prospects—**Limonite** cubes, **Turquoise**; ③ W 5 mi., area prospects—**Turquoise**; ④ N 32 mi., area mines and prospects—**Wolframite**; ⑤ SSW of town in the foothills on the NW side of the Van Horn Mts. (just inside Hudspeth Co.), Plata Verde Mine—**Anglesite**, **Barite**, **Bromargyrite** (main ore mineral), **Cerussite**, **Malchite**, **Microcline**, **Muscovite**, **Quartz**, also to a lesser extent **Azurite**, **Chrysocolla** and **Smithsonite**.

DONLEY COUNTY

CLARENDON, N 5 mi. on Rte. 70, just across the Salt Fork of the Red R. bridge, in rd. cuts, gemmy—pink **Dolomite**.

DUVAL COUNTY

FREER: ① area to SW—**agate**, **silicified wood**; ② W 15 to 18 mi., along Co. rd. 44, area—**petrified palm wood**.

ELLIS COUNTY

MIDLOTHIAN: ① area immediately NW, along both sides of US 287—**fossil** shark teeth; ② SE 5.2 mi. on US 287, along both sides of cr. N and S of hwy.: (a) both sides, area—**Pyrite** roses; (b) S side of hwy. In shale formation near cr. bank—**fossil** leaf prints.

EL PASO COUNTY

AREA, the Quitman Mts.: ① E side, the Bonanza Mine—**Chalcopryite**, **Galena**, **Sphalerite**; ② W side, the Sierra Diablo and other mines—**Chalcopryite**, **Galena**; ③ the Old Hazel Mine—**Lead** and **Silver** minerals.

DAHLBERG, N, as a mined deposit—**Muscovite**.

EAGLE FLAT, area mines—**Smithsonite**.

EL PASO: ① N, along Rte. 375 (connecting I-10 with US 54), all rd. cuts in the Franklin Mts.—**Garnets**, **Mica**, **serpentine** (pink banded); ② N 12 to 15 mi., mines—**Cassiterite**, **Wolframite**; ③ N 14 to 16 mi., area mines in the Franklin Mts.—**Cassiterite**.

FAYETTE COUNTY

LEDBETTER, S on Rte. 957, across Rabs Cr. to the Nechanitz and Matejowsky store: ① along Rabs. Cr.—**petrified** and **opalized wood**; ② all surrounding farmlands.—**petrified** and **opalized wood**.

WARDA, S 1 mi. on US 77, turn E on Co. rd. mail rte. For about 6 mi., all area farms and rd. banks to the Matejowsky store—**petrified** and **opalized wood**.

FISHER COUNTY

ROBY, E of Buffalo Cr., in the Hobbs community, regional mines—**Celestite**. From N to S in Fisher, Nolan and upper Coke counties, the Nolan Mining Dist. Constitutes a narrow belt of deposits about 45 mi. long, with major mining centers described under Nolan Co.—**Celestite** (commonly white, somewhat massive, crystalline aggregates).

Texas

GILLESPIE COUNTY

FREDERICKSBURG: ① S 8 to 9 mi. on US 87, rd. cut on E side of hwy.—**fossils**; ② N 24 mi. on Rte. 16 (30 mi. via rd. from Round Mt., Blanco Co.), area about 9 mi. NNW of Willow City, quarries and exposures—**Barite** (some), **serpentine**, **soapstone**; ③ to NE at Amethyst Hill—**Amethyst**, **Citrine**; ④ in area stream gravels—**Alamandine** garnets.

WILLOW CITY, NE 9.6 mi., a mined lenticular deposit—**Barite**.

GILLESPIE, LLANO & BLANCO COUNTIES

AREA, the Coal Cr. and Comanche Cr. dists., many mines and quarries—abundant **Magnetite**, **asbestos**, **Zaratite**, **serpentine** (prospected for Chromite), **soapstone**.

GONZALES COUNTY

GONZALES: ① all general area farms, and ② bed and banks of Peach Cr.—**agate**, **petrified wood**.

GRIMES COUNTY

BEDIAS, broad surrounding area—**bediasites** (tektites, walnut sized) The town is center of a famed location for tektites locally called *black diamonds* or *fire pearls*. These meteorites are black when found but become dark green when faceted.

LAMB SPRINGS, SW 2 mi. to 2 mi. NE of Keith: ① area, and ② in gravels of Alum, Dinner, Jarvis and Lake creeks, and around the head of Gibbons Cr.—**tektites**.

HIDALGO COUNTY

SULLIVAN CITY, E to Rte. 886, then S about 2 mi. cross RR and turn W on old military rd. to gravel pits next to the Rio Grande: ① all along the rd., ② in the many pits—*Rio Grange* **agates**, **jasper**, **agatized wood**, etc.

HOUSTON COUNTY

CROCKETT, broad triangular area (including Groveton and Trinity in Trinity Co.), all regional stream beds, draws, washes, side rds., rd. cuts, bar pits, etc.—**jasper**, **agatized wood**, etc.

HUDSPETH COUNTY

ALLAMOOR, broad general region: ① area, and ② along S edge of the Quitman Mts. —**agate**, **Amethyst**, **carnelian**, **chalcedony**, **jasper**, **petrified wood**, etc.; ③ S, the Van Horn Mts., general area—**agate**, **chalcedony**, **jasper**, etc.

EAGLE FLAT, gem grade—**Augite** with black **Spinel**.

INDIAN HOT SPRINGS, E in the Eagle Mts., area mines—**Barite**.

SIERRA BLANCA, NW 8 mi., in the Sierra Blanca, area mines and prospects—**Turquoise**.

A Location Guide for Rock Hounds in the United States

JASPER COUNTY

JASPER: ① area of McGee Bend Dam—**agatized wood**; ② N 11½ mi. on US 96—**agatized wood**.

JEFF DAVIS COUNTY

CHISPA Sta. (on the S.P. RR), W 5 mi. and S, area mines—**Barite, Manganese** minerals.

KARNES COUNTY

FALLS CITY: ① NE 1.1 mi. on Co. rd. to Gillett, crossing a cr., to the Erdman farm (Maymes Rock Haven-small fee), area **petrified palm wood, opalized wood, fossils**; ② SW 9.3 mi. on Rte. 791 to jct. with Rte. 1344, then W 1¾ mi. to the Tessman farm (fee), area—golden **agatized palm wood**.

LAMPASAS COUNTY

LAMPASAS: ① Area, the famous fluorescent—**Calcite**; ② N 5 mi., exposure of the Glen Rose limestone, as large crystals filling pockets—**Celestite**; ③ N 6 mi., bed and banks of the Little Lucy Cr.—**Celestite**.

LA SALLE, McMULLEN & LIVE OAK COUNTIES

COTULLA (La Salle Co.), E along Rte. 97 across McMullen Co. to Three Rivers in Live Oak Co., entire area of the Catahoula formation, regional rd. cuts, farm fields, excavations, etc.—**petrified palm wood, agatized fern buds**.

LAVACA COUNTY

MOULTON, area gravel pits, stream gravels, farm fields, etc.—**agate, petrified wood**.

LEE COUNTY

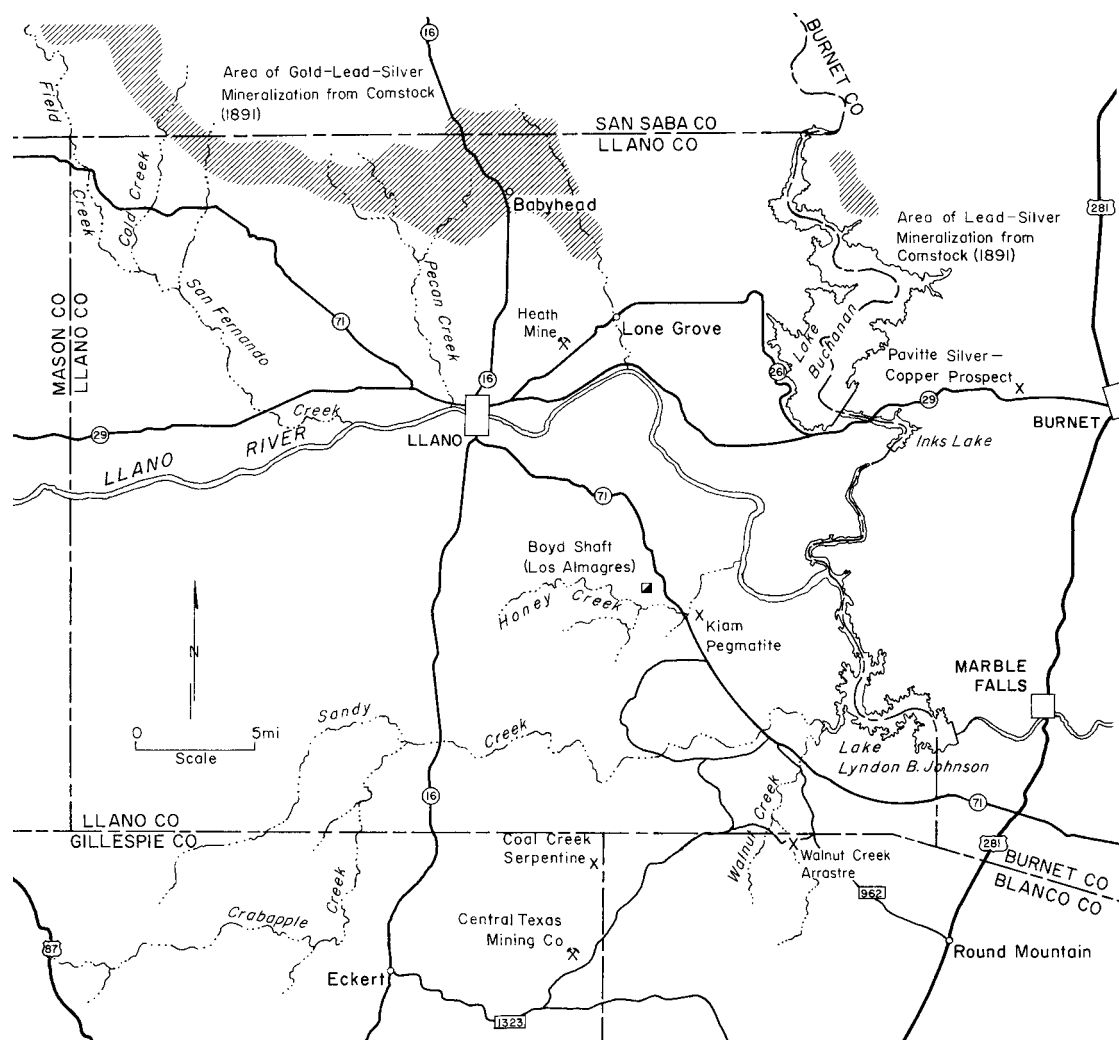
DIME BOX, NE, at Nails Cr. State Park on S side of Somerville Lake, all outside draws, adjoining farms—**tektites**.

LIVE OAK COUNTY

THREE RIVERS: ① W on Rte. 72: (a) at 2.8 mi. turn S on Rte. 1545 for 6.3 mi., to gate to the H.D. House ranch (fee), area—**agatized fern buds, jasper, chalcedony**; (b) continue W ≈ 70 mi. (including Rte. 97) across McMullen Co. to Cotulla in La Salle Co., all area rd. cuts, banks, farm fields, excavations en route, exposing the Catahoula formation—**agatized fern buds, jasper, chalcedony**; ② NE via any rtes. Or side rds.: (a) ≈ 90 air mi. across Karnes Co. to Gonzales, Gonzales Co., and (b) beyond another 47 air mi. NE to La Grange, Fayette Co., then (c) E ≈ 190 air mi. to the Louisiana border, all regional exposures along all regional rds. of the Catahoula formation—**agatized fern buds, jasper, chalcedony**.

Texas

LLANO COUNTY



Location of gold and silver occurrences in Central Mineral Region, Texas.

AREA, ① all countywide pegmatite exposures (many)—**Topaz, Zircon**, etc.; ② Gold and Silver prospects, the Heath mine and Kiam Pegmatite, in graphite and mica schists and limestone transected by quartz stringers—**Gold and Silver**; ③ in Field and Walnut Creek, placer—**Gold and Silver**.

BABYHEAD: ① SSE $1\frac{3}{4}$ mi., a series of dikes reaching to summit of Miller Mt.—**Llanite** (a gemmy granite containing pink Feldspar spots and Blue-agate spherules), **opal-quartz**; ② S side of Babyhead Mt. (between Llano and Wilbern's Glen and E to Wilbern's Gap), area outcrops—**Llanite, opal-quartz**.

BARRINGER HILL, area mines—**Allanite, Cyrtolite, Fergusonite, Fluorite, Gadolinite, Ilmenite, Mackintoshite, Nivenite, Rowlandite, Tengerite, Thorogummite, Tveitite** (fluorescent).

FIELD CREEK, E and about 2 mi. S of the San Saba-Llanon Co. line, the Pecan-Wolf Cr. area, as thin exposed veins—**Barite**.

A Location Guide for Rock Hounds in the United States

KINGSLAND, area mines—**Allanite**, **Cyrtolite**, **Fergusonite**, **Fluorite**, **Gadolinite**, **Ilmenite**, **Mackintoshite**, **Nivenite**, **Rowlandite**, **Tengerite**, **Thorogummite**.

LLANON: ① N 9.4 mi. on Rte. 16, rd. cuts on both sides of hwy. And along all regional ranch rds.—**Llanite**; ② S 15 mi. on Rte. 16, to Rte. 965, then W 8 mi. to Enchanted Rock (about 5 mi. SW of Oxford), area of the Charles Moss ranch (fee), in crevices in granite—**Epidote** (large clusters of green crystals), pink **Feldspar**, **Quartz** crystals (clear, smoky).

OXFORD: ① area mines—**Magnetite**, **serpentine**, **soapstone**, **Vermiculite**; ② S 5 mi., to Rte. 965, then W to Enchanted Rock—green **Epidote**, pink **Feldspar** and **Quartz** crystals (clear, smoky).

LLANO & GILLESPIE COUNTIES

AREA, the Llano Uplift formation: ① ranches along Rte. 16—**Calcite** (fluorescent), **Fluorite**, **Quartz** crystals, **Wollastonite**, **fossils**, etc.; ② ranches along Sandy Cr. (24 mi. SW of Llano and along Co. rd. 2323) (fee)—**Calcite** (fluorescent), **Fluorite**, **Quartz** crystals, **Wollastonite**, **fossils**, etc..

MADISON COUNTY

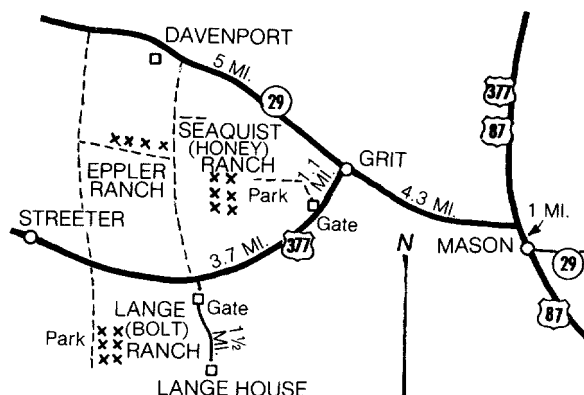
MADISONVILLE, farm rd. 978 to Normangee, to Rte. 39, between hwy. And RR S to Cross and all surrounding region, banks, cuts, fields, draws, washes, etc.—**petrified wood**.

MASON COUNTY

AREA, countywide granite outcrops of the Llano Uplift formation—**Amazonite**, **Feldspar** crystals, **Smoky Quartz** crystals, **Topaz** (blue, colorless), black **Tourmaline**.

GRITT, area pegmatite outcrops—**Topaz**, **Zircon**, etc.

KATEMCY (12 mi. N of Mason)—**Amazonite**, **Feldspar** crystals, **Smoky Quartz** crystals, **Topaz** (blue, colorless), black **Tourmaline**.



MASON: ① area along E side of US 87—**Amazonite**, **Feldspar** crystals, **Smoky Quartz** crystals, **Topaz** (blue, colorless), black **Tourmaline**; ② SW on Co. rd. 1871 to the Llano R., camp and picnic area, walk short distance upstream from low-water bridge, area, weathering out of gray to black limestone—**crinoid stems** sections; ③ NW on US 87 and Rte. 377 for 5 mi. to jct. with Rte. 29, roadside park camping and picnicking: (a) W on Rte. 377 0.6 mi. to locked gate of N trending rd. to the Seaquist ranch, park car at end of rd., hike

Texas

up cr. to locality (cr. bed and hillside) —**Topaz** (large crystals); (b) W 3.3 mi. to S trending rd., then S 1.2 mi. to locked ranch gate (fee), area in hills N of ranch reached via another locked gate—large **Topaz** and **Quartz** crystals.

STREETER (8 mi. W of Mason) —**Amazonite**, **Feldspar** crystals, **Smoky Quartz** crystals, **Topaz** (blue, colorless), black **Tourmaline**.

MAVERICK COUNTY

EAGLE PASS: ① area—agate, amber, chalcedony, jasper; ② N 10 mi. on US 277 to W trending rd.: (a) first house on left (Helms ranch, fee), area—*Rio Grande* **agate**, **chalcedony**, **jasper**, **petrified wood**; (b) 1½ mi. W of the Helms ranch to a power plant, all surrounding area, abundant—*Rio Grande* **agate**, **jasper**; (c) 1½ mi. W of the Helms ranch to canal, then 2 mi. to entrance to the Cunningham ranch (small fee) —*Rio Grande* **agate**.

QUEMADO, NW 2.7 mi. on Rte. 1908, to entrance of the Villarreal ranch (fee), area, abundant—*Rio Grande* **agate**, **jasper**, etc.

McMULLEN COUNTY

TILDEN: ① W 5½ mi. on Rte. 72, gravel pit on S side of rd.—**agatized wood**.

MONTAGUE COUNTY

SAINT JO, area quarries—**Sphalerite** crystals (in **Calcite**).

MONTGOMERY COUNTY

NEW CANEY, E, in area cr. beds and banks—**jasper**, **petrified palm wood**.

MOORE COUNTY

DUMAS, S 12 mi. on US 87 / 287 to E trending Co. rd., then E to NW tip of Lake Meredith, along Plum Cr. near the public campground, in prehistoric Indian quarries and all regional breaks—*Alibates* **flint**.

NACOGDOCHES COUNTY

DOUGLASS, E 4 mi. on Rte. 21 to Loco Cr., W of bridge, in rd. cut on N side of rd.—**Pyrite**, **Selenite**.

NOLAN COUNTY

BLACHWELL (extreme S part of Co., with deposits extending S into upper Coke Co.), from the valley of Brushy Cr. N to the W trending Co. rd. to Maryneal, with central part of dist. Near the Antelope School (4 mi. W of Blackwell and 1.2 mi. N of the Nolan-Coke Co. line), area mines—**Celestite**.

SWEETWATER, S and W about 0.5 mi.: ① area mines and pits, and ② Boothe dist., ½ mi. N of the Ada School, on top of a low bluff on E side of Sweetwater Cr., open pit mine—**Celestite**.

PARKER COUNTY

WHITE SETTLEMENT, the Stover Peak area, outcrops—**prase**.

POLK COUNTY

CAMDEN, E along US 287 or Co. rd. 1745, to Chester in Tyler Co., large region—**petrified palm wood** (often coated with white lime).

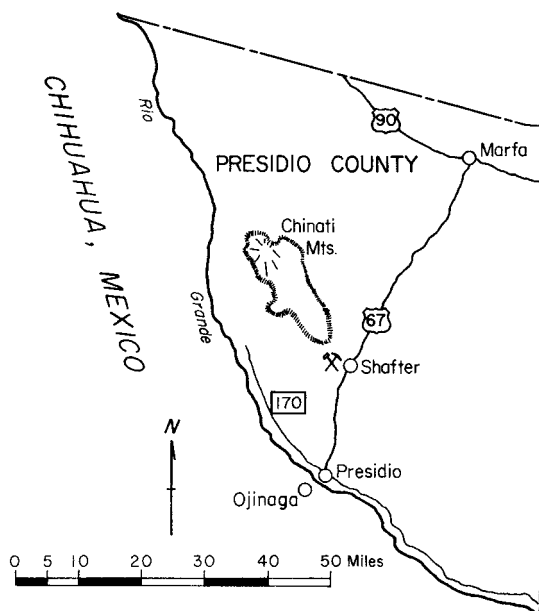
PRESIDIO COUNTY

MARFA: ① S 7 mi. on US 67, turn SE on Rte. 169 to the Bishop ranch (fee), area—**agate**; ② US 67 all way to Presidio (59 mi.), both sides of hwy.—Texas *bouquet agate*; ③ the area between Marfa and Van Horn in SW Culberson Co. via US 90 (NW about 71 mi.) is the Lobo Valley, oldest agate region in Texas—Texas plume **agate**; ④ SW about 30 mi., all along rd. to the Chinati Mts., regional draws, washes, surfaces, etc.—**agate, chalcedony, jasper**; ⑤ S 80 mi., mines in Fresno Canyon—**Alum**; ⑥ NE, along Rte. 17, to Ft. Davis in Jeff Davis Co., all regional rd. cuts, breaks, ranchlands, etc.—**agate, chalcedony, jasper**.

RUIDOSA, ① E, in the Chinati Mts., SW side of San Antonio Canyon, area mines with good specimen on dumps—**Fluorite, Galena**; ② W of the Infiernito Caldera (on the NE corner of the Chinati Mts.), along fracture faults—**Autunite, Meta-torbernite** and **Tyuyamunite**.

SAN CARLOS, area coal mines, on dumps—**jet**.

SHAFTER, W 2 mi., ① in the sheet-like joints zones in the West Chinati stock, in veins; and ② area mines—**Argentite, Cerargyrite, Fluorite, Galena, Pyrite, Smithsonite, Sphalerite**, and minor amounts of **Chalcopyrite**.



RANDALL COUNTY

CANYON, E 20 mi. on Rte. 217, into Palo Duro Canyon State Park (extending into Armstrong Co.), area of canyon outside park boundaries—**agatized wood**.

REAL COUNTY

LEAKY, N on US 83 to jct. with Rte. 39, the Horsecollar Roadside Park: ① S ½ mi. down hill to steep bank on W—Calcite crystal **geodes** weathering out of white limestone (large, containing clear dogtooth crystals); ② 1½ mi. S of the geode field via US 83, and S of bridge on W side of rd.—**fossils**.

Texas

REEVES COUNTY

BALMORHEA: ① area quarries—**onyx**; ② Balmorhea State Park: (a) on mt. sides and in washes of flats, and (b) around N and E sides of Lake Balmorhea, area—*Balmorhea blue agates*; ③ E 17 mi., all area along Barilla Draw—**agate**.

PECOS, W 18 mi. on US 80, any ranch rd. in area, on either side—**agate, petrified wood**.

TOYAH, all area ranch rds. running out of town W, NW, NE or S; entire area and the farther off the main rds. the better—**plume agate, agatized wood**.

TOYAHVALE, E, on rd. around Lake Balmorhea on N side, in area washes, draws, slopes, etc., of a low range of volcanic mts. from N of the lake around to the SE side area—*Balmorhea blue agates*.

SAN PATRICIO COUNTY

MATHIS, area rd. cuts, breaks, banks, gravels, etc.—**moss agate**.

SAN SABA COUNTY

BARTON, NE, in gravels and banks of Hinton Cr.—**chalcedony, chert**.

SAN SABA, W on US 190 for 2.2 mi., turn S on Co. rd. 1030 for 6.9 mi. to a red barn and E trending rd., then 2 mi. on the side rd. to the Lambert ranch—**fossils**.

STARR COUNTY

RIO GRANDE CITY, all gravels of the Rio Grande both E and W to Co. boundaries—*Rio Grande agates, chalcedony, jasper*, etc.

TARRANT COUNTY

FORT WORTH, in bluff at NE corner of jct. of West Freeway and Rte. 183 (in town, across hwy. From the Carswell runway) —**fossils**.

TAYLOR COUNTY

BUFFALO GAP, area exposures of red shales (22 mi. SW of Abilene), as thin veins running vertically—**Barite**.

TRAVIS COUNTY

AUSTIN: ① W 5 mi., on Mt. Bonnell (near Colorado R.), area mines—**Celestite, Strontianite**; ② E a few mi., large area, in cuts, draws, washes, fields, etc.—**agatized wood, petrified palm wood**, etc.

TRINITY COUNTY

CARLISLE, large surrounding area N of lake Livingston—**petrified palm wood**.

GROVETON, TRINITY, all surrounding areas in cut banks, draws, washes, slopes, etc.—**agate, chalcedony, jasper, petrified wood**, etc.

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TYLER COUNTY

CHESTER, W along US 287 into Polk Co. (and along Polk Co. rd. 1745) to Camden in Polk Co., broad region along both sides of rds. —**petrified palm wood**.

VAL VERDE COUNTY

AREA, valley of the Pecos R., numerous mined deposits—**Manganese** minerals.

COMSTOCK, W on US 90 to the Pecos R., under E end of bridge, in limestone outcrop—*turritella* **fossils**.

LANGTRY, NW 26 mi. on US 90 to Cedar Sta. (Terral Co.) the Kothman ranch (fee), area—**agate, petrified wood**.

PANDALE, W 1¼ mi., on W slope of a divide separating Howard Draw from the Pecos R., mine—**Barite**.

WEBB COUNTY

LAREDO: ① within city limits: (a) the Laredo Gravel Pit (on the Rio Grande bank off Santa Maria St.) —*Rio Grande* **agate, chalcedony, jasper, agatized wood**; (b) river bars at low water and in gravels of islands—**agates, agatized wood**, etc.; ② all stream beds and bars of the Rio Grande and tributaries—**agates, chalcedony, jasper, agatized wood**; ③ N on US 81 to jct. with Rte. 1472, then NW 7½ mi. to the Pico ranch, turn in for 2.2 mi. to ranch house (fee) —**agate (moss), agatized wood, jasper**.

WEBB, ZAPATA & STARR COUNTIES

AREA, all regional gravels of the Rio Grande and its tributaries SE from Eagle Pass in Maverick Co. to Rio Grande City in Starr Co. (more than 150 mi. along the Rio Grande) —*Rio Grande* **agate, chalcedony, jasper, petrified wood**.

WILSON COUNTY

POTH, SW 7 mi. on Rte. 541 to jct. with Rte. 1344, then 6¼ mi. SE to entrance to the Tessman farm (fee) —golden **agatized palm wood**.

WISE COUNTY

ALVOND, SE 1.8 mi. to old iron bridge crossing a cr. bed, in gravel bars and banks—**Pyrite** cubes.

BRIDGEPORT, on NE side of Lake Bridgeport 2.6 mi. N of Rte. 24 (on Rte. 1658), area—**fossil** crinoids, trilobites.

ZAPATA COUNTY

LOPEN, W of US 83, area surfaces, draws, etc., of low hills—**agates, agatized wood, chalcedony, jasper**, etc.

ZAPATA: ① the Ramirez ranch, via N on US 83 past a roadside park to gate on W side of hwy., area—**agate, agatized wood, jasper**, etc.; ② S 12 mi. on US 83 to Rte. 2687, turn W 8 mi. on rd. to Falcon Lake to Bob's Nob, area—**agate, agatized wood, jasper**, etc.

UTAH

Although Utah has an overall average altitude of one mile above sea level, the topography is dramatically halved into a relatively low-lying (4,000') western desert region and an extremely rugged mountain and plateau eastern half, spectacularly bound on the north by the Uinta Mts. along Wyoming's southern border. The Uinta Range, capped by snowy 13,498' Kings peak, is the only major east-west mountain system in North America south of the transverse Brooks Range in northern Alaska. These wild boundary mountains descend sharply southward to uninhabitable pine graced plateaus that break sheer in enormous exposures of red and white sandstone cliffs. The Jurassic aged formations were formed primarily by the consolidation of the sand dunes of truly large magnitude, clearly revealed in the wind-rippled and cross-bedded layers of Zion National Park in Washington Co.

The southeastern one-third of Utah comprises the major portions of the sandstone *plateau and canyon region*, nearly waterless and almost roadless. Here **agate** occurs in many varieties, with literally thousands of unmarked localities far from what few roads penetrate the region. There is also an abundance of gem **jasper** and **septarian nodules**, colorful fossil wood petrified by **Uranium** and **Vanadium** minerals, especially the canary yellow **Carnotite**, and **Radium** derivative minerals. Moreover, the almost ubiquitous **jasperized dinosaur bone**, blood red and revealing every microscopic detail of bone cellular structure, might truly be denominated the *Utah state stone*.

The two mile high wall of the Wasatch Range bisects the state from the Idaho boundary south, making an abrupt transition between the mountain and Plateau region to the east and the arid desert playas and saline lakes of the western half. The level, gravely deserts are bottom lands of awesome Pleistocene Lake Bonneville. Wave cut fossil beach lines mark the regional mountain sides as if the white calcareous residues has been deposited only yesterday, showing that at its maximum size some 64,000 years ago, Lake Bonneville's waters were not only 1,500 feet deeper than present day Great Salt Lake, but that the lake extended all the way westward to the California Sierra Nevada. The barren peaks and higher rises above the present bare desert floor were then islands. As one drives through any of the Great Basin states, the fossil beach lines and their absolute parallel levelness can be seen. The beach lines were repeated in descending order as the lake waters drained or evaporated away, level by level down the mountain sides, following the retreat of the continental glaciers far to the north and east.

The rock strata exposed everywhere throughout this essentially barren state range from Cambrian crystalline to Pleistocene debris. Thick layers of Mississippian and Pennsylvanian age limestones characterize the rugged Wasatch Mts. and the lesser Oquirrh Range southwest of Salt Lake City. Utah's great concentrations of mineral wealth lie in this central zone of transitional mountains, with **Copper** from the Oquirrh Range being the chief metal mined and smelted. Bingham Canyon, within sight of Salt Lake City, contains the world's largest open pit Copper mine.

The proximity of high grade **Iron** ores, coal, and limestone brought huge steel plants to Provo, Utah Co. In the Wasatch Mts. immediately to the east of the state capital city many rich mines also produce spectacular amounts of **Gold**, **Lead** and **Silver**.

Discoveries of very rich Lead-Silver ores were made in the Cottonwood, Park City and Tintic dists. Quantities of **Uranium** were found as **Carnotite**, along with **Vanadium** minerals, in the sandstones of the Chinle and Morrison formations in the southeastern counties. In the Topaz Mts. 90 mi. south and southwest of Salt Lake City, in Juab Co., unusually rich **Beryllium** deposits comprise the largest known source of this metal.

Of major interest to gem and mineral collectors, the state of Utah is almost 70% public domain, mostly unexplored and roadless but abounding in gemstone species.

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BEAVER COUNTY

AREA, numerous mines in Co.—**Plumbo-jarosite**, **Copper** minerals, etc.

BEAVER: ① area mines **Aragonite**, **Calcite**, **Hydrozincite** (all fluorescent), and **Bismuthinite**; ② S, in Blue Valley, area Washes, draws, surfaces, etc.—black **agate**.

MILFORD: ① in the Mineral Mts., area mines—**Azurite**, **Malachite**, **opal**, **Smoky Quartz**, **Scheelite** crystals (fluorescent); ② W $\approx$ 13 mi. on Rte. 21: (a) old ghost mining town of Frisco, area mines, especially the Old Horn Silver Mine in the San Francisco Mts.—**Beaverite**, **Kasolite**, **Sphalerite** (fluorescent); (b) regional draws, washes, surfaces, etc.—**Garnets**; (c) Copper Gulch, area—**Garnets**.

MINERSVILLE (and Minersville State Park), area mines—**Copper** Minerals, etc.

SULPHURDALE (1 mi. E of I-15 immediately S of the Millard Co. line), area mines—**Sulfur**.

BOX ELDER COUNTY

AREA, the Copper Mt. Mine—**Copper** Minerals, **Chrysocolla**.

LUCIN, NW 5 mi., on N side of Utahlite Hill—**Variscite** (a notable locality).

PARK VALLEY (Dist.), area lode mines—**Gold**.

PROMONTORY POINT, area surfaces, draws, etc.—**obsidian**.

CACHE COUNTY

NEWTON, area lode mines—**Gold**.

DAVIS COUNTY

KAYSVILLE, area Co., mines—**Azurite**, **Malachite**, etc.

EMERY COUNTY

AREA: ① Castle Valley, area mines—**Azurite**, **Malachite**, etc.; ② Wild Horse Canyon, many area mines and prospects—**Carnotite**, **Vanadium** minerals.

CASTLE DALE: ① SE, along the San Rafael R., area mines—**Sulfur**; ② E, all region to the Green R. (few rds.), draws, washes, etc.—**agate**, **agatized dinosaur bone**, **petrified wood**.

EMERY, SW 15 mi. on Rte. 10 to near Co. line, huge fossil reef along N side of hwy.—**agate**, **jasperized dinosaur bone**.

GREEN RIVER: ① W 18 mi., on E flank of the San Rafael Swell, many regional mines and prospects reached via jeep rds.—**Carnotite**; ② SW 30 mi. along Rte. 24, in the San Rafael Valley: (a) regional mines and prospects—**Carnotite**, **petrified wood**; (b) regional surfaces, draws, washes, etc.—**agate**, **chalcedony**, **chert**, **petrified dinosaur bones**, **jasper**, **petrified wood**.

SUMMERVILLE, area mines—**Azurite**, **Malachite**, etc.;

WOODSIDE: ① S $4\frac{1}{2}$ mi., in Morrison formation exposures—**agate**, **Carnotite**, **chalcedony**, **chert**, **petrified dinosaur bone**, **jasper**, **silicified wood**; ② SW 10 air mi., Point of Cedar Mt., area mines—**Sulfur**.

Utah

GARFIELD COUNTY

AREA: ① E part of Co.: (a) Circle Cliffs (reached via dirt rd. S from Caineville in Wayne Co.), area—**agate, chalcedony, jasper, petrified wood**; (b) Henry Mts. (reached via improved rd. S from Hanksville in Wayne Co. plus regional jeep rds.; numerous peaks over 11,000' high), many regional mines and prospects, particularly along Crescent and Trachyte creeks—**Carnotite, Bentorite** (upper part along Crescent Cr.); ② Coyote Cr. Valley, mines and prospects in shale—**Antimony** oxides, **Orpiment, Stibnite**; ③ White Canyon Dist., area placer mines—**Gold**.

Boulder, E on dirt rd. 12 mi. to crossroad, follow sign 9 mi. to Horse Canyon, area—**petrified wood**.

ESCALANTE, area draws, washes, sandstone outcrops, etc.—**petrified dinosaur bone**.

HATCH, S 1½ mi. along mammoth Cr., area quarries—**onyx**.

GRAND COUNTY

AREA, Wilson Mesa, regional lode and placer claims—**Gold**.

AGATE SWITH—**agate, chalcedony, chert, jasper, opal, opalized wood, Quartz** crystals.

CASTLETON, in the La Sal Mts., especially on Pack Cr., many regional mines—**Uranium** minerals.

CISCO: ① in hills along the Colorado R., draws, washes—**agatized clams, agatized and jasperized dinosaur bone, jasper**; ② NE, in the Grand R. Valley, regional deposits —black **Gypsum**; ③ S 20 mi. and, in general, all exposures throughout eastern Utah of the Morrison and Dakota sandstones, very many regional mines and prospects—minerals of **Uranium, Vanadium** and **Radium**.

MOAB: ① gravel bars of the Colorado R. across entire SE corner of Co., along with adjoining tributary canyons, slopes, washes, etc.—**agate, chalcedony, chert, jasper, opal, opalized wood, Quartz** crystals; ② N 5 mi., in outcrops of the Cutler formation—**agate, chalcedony, chert, silicified dinosaur bone, petrified wood**; ③ the Monti Cristo Mine—**Andersonite** (fluorescent).

THOMPSON: ① entire area, especially to S all way to the Arches national Monument, in draws, washes, breaks (all exposures of the widespread Morrison and Dakota sandstones) —**agate, agatized clams, Carnotite** (regional mines usually in lens deposits), **Carnotite wood, jasper, jasperized dinosaur bones, petrified wood**. (N boundary of general region is US 6 / 50, W boundary is US 160, and E boundary is Rte. 128, a completely barren landscape exposing almost continuously the sandstones fms.) ② S 9 to 12 mi. on dirt rds., the Cactus Rat and Yellow Cat mines, and many other regional prospects and mines—**agate, agatized clams, Carnotite** (regional mines usually in lens deposits), **Carnotite wood, jasper, jasperized dinosaur bones, petrified wood**; ③ SE 22 mi., many regional mines—**Andersonite** (Skinny No. 1 Mine, fluorescent), **Liebigite** (Black Ape mine, fluorescent), **Calcium Vanadates, Carnotite**, other **Uranium-Vanadium** minerals, **petrified dinosaur bone, jasper, petrified wood**.

IRON COUNTY

AREA: ① Gold Springs and Stateline, area lode mines—**Gold**; ② Sand Springs, area placer mines—**Gold**.

CEDAR CITY, E, along Rte. 14 to Cedar Breaks National Monument, all regional draws, washes, breaks, etc. outside monument boundary—**agate** (common, moss), **chalcedony, jasper, petrified wood**.

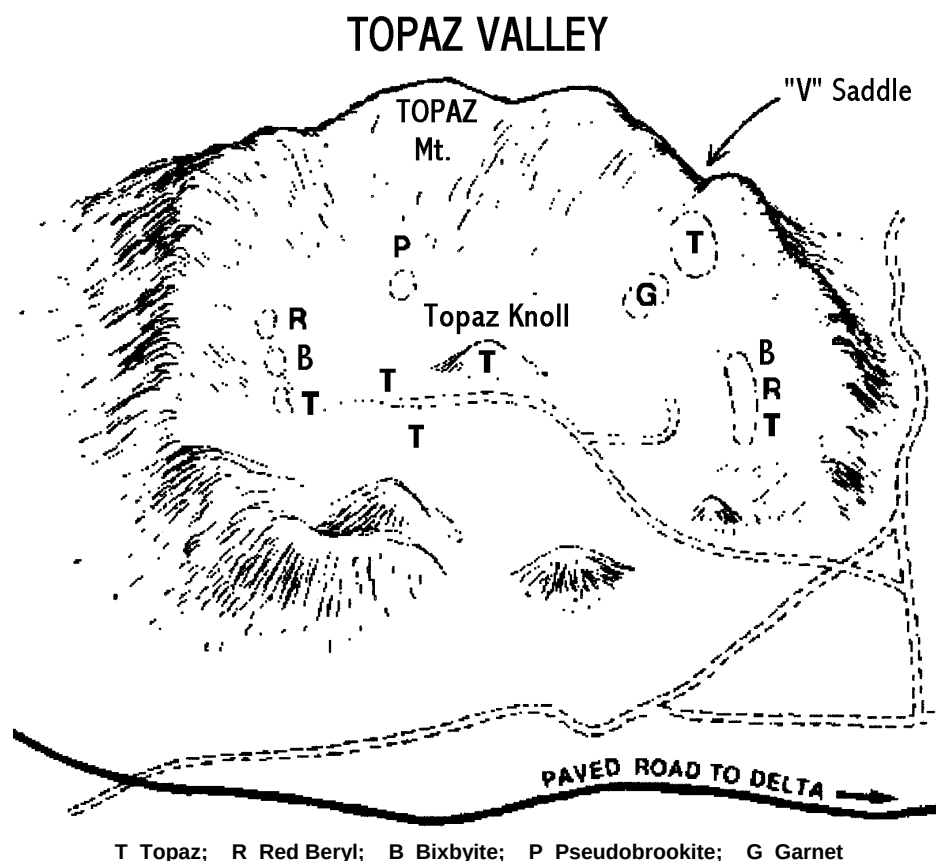
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NEWCASTLE: ① all regional washes, draws, flats, hillsides—chalcedony **geodes** (to 24" dia.); ② ESE on Rte. 56, old Iron Town, extensive mineralized dist. Reaching S into Washington Co., regional mines—**Magnetite**.

JUAB COUNTY

CALICO, in the Honeycomb Hills—**Soddyite** (fluorescent).

FISH SPRINGS, area mines—**Gold**, **Lead**, **Silver** minerals.



JERICO: ① area draws, washes, surfaces—**plume agate**; ② W $\approx$ 40 air mi., to the Thomas Mts.: (a) N end of mts. at Topaz Cove (just N of Thomas Pass on Rte. 148), area; and (b) NE part of range and 3 to 4 mi. S of Dugway rd.; (c) the Brush Beryllium Mine—**Bertrandite** (Brush Mine, fluorescent), **Beryl**, **Bixbyite**, **Calcite**, **Fluorite**, **Garnet**, **Hematite**, **Pseudobrookite**, **Quartz** crystals, **Topaz** ③ NE on dirt rd. to Paria, area mines (small) —**Gold**, **Silver**; ④ E 28 mi. on US 89, due S about 6 mi. in roadless territory, an area of petrified forest—**petrified wood**.

MT. CARMEL-ORDERVILLE, regional washes, draws, hillsides—**septarian nodules** (to 12" dia, with calcite centers).

PAHREAH, S 9 mi., area mines of the Uranium boom—**Autunite**, **Uranospinite**.

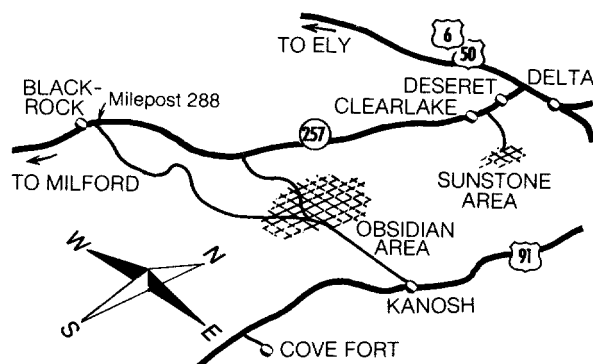
MILLARD COUNTY

AREA, the White Mts., vast deposits—**Gypsum**.

Utah

BLACK ROCK (on Rte. 257 about 30 mi. N of Milford in Beaver Co.), area draws, washes, surfaces—*snowflake* **obsidian**.

CLEAR LAKE (RR Sta.), NE $\frac{1}{2}$ mi., in lava upthrust in center of an alkali flat—**Labradorite**.



SUGARVILLE, NW 20 mi. to the Topaz Mts., area outcrops—**Topaz**, etc.

PIUTE COUNTY

AREA: ① the Annie Laurie Mine—**Argentite**; ② Kimberley and Ohio mines—**Iode Gold**, ③ in the Tushar Mts.—**Calcite** (fluorescent).

MARYSVALE: ① area large deposit—**Alunite**, **Tiemannite**; ② SE 5 mi., area mines—**Onofrite**, **Cinnabar**, native **Mercury**, **Tiemannite**, **Uranophane** (fluorescent); ③ the Big Star Deposit—**Natroalunite**, **Schröckingerite** (fluorescent).

SALT LAKE COUNTY

ALTA (Dist.), area old mines—**Barite**, **Galena**, **Gold**, **Silver**, **Wulfenite**.

BINGHAM (in Bingham Canyon in the Oquirrh Range SW of Salt Lake City): ① area great open pit mines—**Barite**, **Bornite**, **Chalcocite**, **Chalcopyrite**, **Covellite**, **Galena**, **Tenorite**, **Tetrahedrite**; ② placer sands of Bingham Canyon—**Gold**; ③ the old Jordan Mine, on dumps—**opal**; ④ Bingham Jct., from smelter bullion—**Bismuth**.

BRIGHTON, area old mines—**Copper** minerals, **Gold**, **Silver**.

COPPERTON, area mines—**Copper** minerals, **Chrysocolla**, **Gold**.

MURRAY, area quarries—**onyx**.

SALT LAKE CITY: ① E, in Big Cottonwood Canyon, area mines—**Azurite**, **Malachite**; ② E, in Little Cottonwood Canyon: (a) area mines—**Azurite**, **Malachite**; (b) mine on S side—**Molybdenite**.

SAN JUAN COUNTY

AREA: ① SE corner of Co., reached from Mexican Water, AZ, on US 164 halfway between Kayenta and Teec Nos Pos (both in the heart of the Navajo Indian Reservation): (a) N 10 mi. into Utah, at Moses Rock, all area sandstones; and (b) 2 mi. N of the Moses Rock field, along the W edge of Comb Ridge, in wind blown sand deposits—**Pyrope** garnets (*Arizona Rubies*); ② the Blue Mts., area mines—**Gold**; ③ the Posey Mine—**Phurcalite** (fluorescent).

BLUFF, area stream sands—**Gold**.

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HITE (S of Hanksville in Wayne Co.): ① broad area of mines and prospects—**Uranium** minerals; ② SE 8 mi., in White Canyon: (a) area mines and prospects, and (b) mines and prospects outside the canyon itself—**Uranium** minerals.

LA SAL (Dist.), area mines—**Azurite, Malachite**.

MEXICAN HAT, broad surrounding region of mines and prospects—**Uranium** minerals.

MONTICELLO, N, in Dry, Big Indian and Lisburne valley, many regional mines and prospects—**Uranium** minerals. This country in the extreme SE corner of Utah fronts visually into Colorado, very rugged, dissected with deep canyons separated by high mesas. Sandstone exposures everywhere show radioactivity. *Car travel throughout the region requires great caution, and all travelers should carry ample supplies of water and provisions.*

SANPETE COUNTY

GUNNISON, area deposits, some mined—**Gypsum**.

SEVIER COUNTY

AREA, the Ball Mine—**Azurite, Malachite**, etc.

SALINA: ① on Rte. 4 toward Emery in Emery Co., to N is a large fossil reef, area draws, washes, etc., and ② and on ridges—**agatized dinosaur bone**.

SUMMIT COUNTY

PARK CITY (a considerable mountainous area at the end of Rte. 248 off US 40, laced together by numerous very steep jeep rds.), many great mines and dumps—**Anglesite, Galena, Sphalerite, Tetrahedrite**.

TOOELE COUNTY

AREA: ① the Drum Mts., N side, regional draws, washes, surfaces—**agate, Amethysts, jasper, Quartz** crystals; ② SW part of Co., the Dugway Range (rough dirt rds. and entry barred to the Dugway Proving Grounds between the Dugway Range and the Cedar mts. farther N), Dugway Pass, area surfaces, draws, etc.—**Amethysts, Quartz** crystals.

CLIFTON (old mining dist.) in SW corner of Co. no longer shown on most maps): ① area mines—**Azurite, Malachite, Pyrope** garnets; ② Deep Creek Dist., area mines—**Bismuthinite, Copper** minerals, **Gold, Galena, Huebnerite, Silver, Scheelite** (fluorescent).

GOLD HILL (far SW corner of Co.), the Gold Hill Mine—**Scorodite, Gold**.

IBAPAH (extreme SW corner of Co. about 35 mi. WSW of Simpson Springs), on Ibapah Mt., area pegmatite outcrops—**Aquamarine, Beryl**.

MERCUR (no longer shown on maps but reached from Rte. 36 S of Tooele a short distance S of the Rte. 73 turnoff E to Ophir, a rather rough access rd.): ① area mines—**Cinnabar, Orpiment** (good crystals), **Gold**; ② Adjoining Mercur, area mines: (a) Sunshine (4 mi. S, in Sunshine Canyon), and (b) West Dip (on the W extremity of the Oquirrh Range)—**Galena, Gold, Pyrite**, etc.

OPHIR (adjoining the Mercur, or Camp Floyd Dist., on the N), area mines—**Galena, Gold, Pyrite, Silver, Sphalerite**. This is a rather scenic steep canyon facing W across the Great Salt Lake Desert; the dumps are usually prolific in excellent **Pyrite** crystals and **Quartz** crystals.

Utah

RUSH VALLEY, WILLOW SPRINGS, regional mines—**Galena, Gold, Pyrite, Silver.**

SIMPSON SPRINGS (on W side of the Camel Back Range in the far S central part of Co.), area draws, washes, etc.—**geodes, nodules, Morganite.**

STOCKTON (7 mi. S of Tooele), W 9 mi. (or 10 mi. S 65° W of Tooele), the Amatrice Mine—**quartzite, Variscite, Copper, Gold.**

WENDOVER, E 10 mi. on US 40/50A, the Crystalline Salt Beds—**Halide** minerals (hygroscopic).

UINTAH COUNTY

AREA, the Dyer Mine—**Azurite, Malachite, etc.**

BONANZA: ① area prospects and claims—**Gilsonite** (*Uintaites*); ② S and W, via Rte. 45 and Rte. 207, into Sweet Water Canyon, regional flats, draws, washes—**agate, chalcedony, jasper, petrified wood.**

BROWNS PARK, area mines—**Carnotite, Copper** minerals.

CARBONATE, area lode mines—**Gold.**

DRAGON, area deposits—**Gilsonite** (*Uintaites*).

FORT DUQUESNE: ① the Uinta Basin, many area; and ② the Cowboy claims **Gilsonite.**

JENSEN-OURAY, gravels and sands of the Green R., placer—**Gold.**

RED WASH (SW of jct. of US 40 with Rte. 45), in exposures of Precambrian quartzites, as small occurrences—**Carnotite.**

UTAH COUNTY

AMERICAN FORK, area mines—**Gold, Lead, Silver** minerals.

COLTON, area mines—**Ozokerite** (mineral wax).

FAIRFIELD: ① area draws, washes, surfaces—**chalcedony, chert, Limonite, Pyrite** in **Variscite**, white **Quartz**; ② W 1½ mi., in Clay Canyon, area—**Variscite**; ③ W 5½ mi.: (a) the Utahlite Mine; and (b) a nearby low pass with dirt rd. running N past a series of open cut mines and prospects—**Calcite, Crandallite, Dehrnite, Deltaite, Dennisonite, Lewistonite, Variscite**, with other rare phosphates: **Englishite, Gordonite** (colorless), **Millisite, Montgomeryite, Overite, Sterrettite.** The regional exposures of soft rock disgorge **Variscite** as round nodules to 12" in dia., the cores varying from dark to pale green and framed with rims of other phosphate minerals. The side rd. through the low pass should be a must for all who head for Mercur, Tooele Co., via this rte. All the regional foothill gulches contain many species of Mississippian aged fossils weathering out of the limestone clearly exposed across the S end of the Oquirrh Range.

LEHI, Pelican Point, area—**onyx.**

SANTAQUIN & SILVER LAKE Dists. Regional mines—**Galena, Gold, Silver.**

SOLDIER SUMMIT, area deposits—**Nigrite, Ozokerite.**

WASATCH COUNTY

HEBER CITY: ① county area: (a) North Fork and (b) Snake Cr., area mines—**Gold**; ② Grey Head Mt., NE (an area of about 100 sq. mi., lying about 50 mi. W of Duchesne in Duchesne Co., via US 40): (a) Indian Lake, (b) Avintequin, (c) Sams Canyons, many mines and prospects—lode **Gold.**

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WASHINGTON COUNTY

AREA, the Lucern claims—**Garnets**.

CASTLE CLIFF, NW, in Beaver Dam Wash, area—**agate, jasper**, etc.

CENTRAL (24 mi. N of St. George on Rte. 18), area basalt exposures, as blue-banded nodules to 60 lbs.—chalcedony **geodes**.

HURRICAN: ① area mines—**Aragonite, Calcite, Hydrozincite** (all fluorescent); ② limestone outcrops—**fossils** in limestone (fluorescent).

LEEDS, W 1 mi., old ghost town of Silver Reef, area mines—**Lead** and **Silver** minerals.

ST. GEORGE, the Dixie Apex Mine—**Azurite, Malachite**, etc.

WAYNE COUNTY

HANKSVILLE: ① broad surrounding area—**agate, jasper, petrified wood**; ② W 3 mi., scattered over broad area—**agate, jasper, petrified wood**; ③ S 10 mi., Coaly Basin (in Coaly Wash 5 mi. W of the Fairview ranch), area coal mines—**jet**; ④ SW, in N end of the Henry Mts. (main range in Garfield Co.), many area mines and prospects—**Carnotite**.

TORREY, regional draws, washes, breaks, surfaces—**agate, jasper, jasp-agate, dinosaur bone** (petrified, jasperized).

WEBER COUNTY

OGDEN: ① numerous mines in Co.—**Azurite, Malachite**, etc.; ② Strongs Canyon, area—**Garnets**.



VERMONT

Although not blessed with many gem and mineral localities, the Green Mountain State appeals to visitors because of its majestic mountain ranges, deep river valleys, quiet lakes, and rushing mountain streams. All 9,564 square miles (including lake waters) are readily accessible via an excellent highway system that includes well maintained backcountry byways. Probably far more gemstone localities exist than have been recorded, since the basal formation of Vermont is granite, but the rock collecting pastime has so far not been particularly notable within the state.

While several mountain systems characterize Vermont, it is the Green Mountains—really a collection of several mountain systems—that more or less divide the state into two halves. Toward the north end in the far east side of Chittenden Co., Mt. Mansfield rises to the highest point in the state at 4,393 ft. Four other peaks spaced along the Long Trail, a wilderness hiking trail that follows the crests of the Green Mountains, rise above 4,000 ft. East of the Green Mountain system lie the Granite Hills, well named because of the excellent monument granite and building stone quarried in many places. The granite industry is centered at Barre in Washington Co., while Rutland at the south end of the Green Mountains in Rutland Co. is famed for its production of fine marble.

In the southwest corner of Vermont, the geologically famed Taconic Mountains stretch from northwest of Rutland, west of the Green Mountains, for 150 miles along the New York State boundary into Massachusetts to include the Berkshire Hills. The mountains lend their name to a very ancient mountain building period, the *Taconic Orogeny*, and afford a good illustration of metamorphism during which widespread limestone sediments were converted into high grade marble. The rocks are least crystalline in the northern and western sections of the Taconic region. Additionally, Cambrian rock exposures occur most notably in the extreme northwest corner of the state, especially around Highgate Springs in northwestern Franklin Co.

Other than fine marble, there are few gems or minerals to be found in Vermont. However, the Rochester Valley in Windsor Co., the Warren Valley in Washington Co. and the Windham Valley in Windham Co. have numerous deposits and quarries which yield highly prized Verde Antique serpentine, another product of metamorphism. Other commercial mineral products are asbestos, lime, slate and talc.

You're probably familiar with the famous California Gold Rush, but how many know that one occurred in Vermont? Plymouth (VT) farmers discovered placer gold in Broad Brook and for a time gave up their farming to pan for gold. Canny Yankees that they were, they soon calculated that they weren't really earning more money than they had from farming, and the Vermont Gold Rush was over. Gold can still be panned from Broad Brook today. In fact, many other Vermont streams offer the energetic collector a chance to find some placer gold as a return for a hard day's work. The locations include: Rock River in Newfane and Dover; Williams River in Ludlow; Ottauquechee River in Bridgewater; White River in Stockbridge and Rochester; Third Branch of the White River in Braintree; Mad River in Warren, Waitsfield and Moretown; Shady Rill Brook in Wrightsville; Minister Brook in Worcester; Little River in Stowe and Waterbury; Gold Brook in Stowe; Lamoille River in Johnson; Gihon River in Eden; and the Missisquoi River in Lowell and Troy.

ADDISON COUNTY

LEICESTER JUNCTION, Huntley Quarry. Turn W. from Rte. 7 at Leicester, continue to Leicester Junction. Cross Otter Creek and railroad tracks. Quarry and old lime kilns are visible south of the road—**Calcite** and **Tremolite**. Best examples of hydrothermally

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deposited calcite crystals are found at the north end of the quarry. The marble in the quarry is pink, gray and white. Some make attractively banded cutting material.

BENNINGTON COUNTY

BENNINGTON: area deposits—**ocher**; ② In road-cut north side of Rte. 9, 6 mi. E of Bennington—blue **Quartz** (cabochon material), **Garnet**, **Orthoclase** and **Plagioclase** feldspar, **Biotite** and **Hornblende**.

NORTH DORSET, some area deposits—**ocher**.

READSBORO, area mines (lode) —**Gold**.

CHITTENDEN COUNTY

AREA, in the road-cut leading to the bridge across the Lamoille River. In dolomite rock on the left side as you go north on Rte. 2 (towards the islands) —**Dolomite** crystals and **Chalcopyrite** specimens. There is also some interesting rose-colored dolomite with white orbicules of dolomite making interesting patterns for cutting.

BURLINGTON, N 9 mi. on US 2, fields and outcrops, etc. on the Eugene Parrott farm—**agate**, **chert**, **jasp-agate** and **jasper**.

MILTON, at Parrott Quarry 6 mi. SW on US 2—**jasper**, **Durham dolomite** is banded red, white, gray, orange, fine-grained. Interesting cutting material.

WEST MILTON, near Lake Champlain, area mines—**Hematite** and **Manganese** minerals.

ESSEX COUNTY

AREA, in the road-cut on Route 102, 0.6 miles south of Bloomfield opposite a small cemetery. In a dark to light gray phyllite schist—pink **Andalusite** crystals or darker crystals with oriented inclusions that resemble a cross or flower (*var. Chiasolite*). Some are white partially altered to **Muscovite**. Small **Garnet** crystals are also visible in some specimens.

FRANKLIN COUNTY

AREA: occurs in outcrops along Rte. 108 for several miles between East Fletcher and Bakersfield. Best locality is N. of town line between Fletcher and Bakersfield. Large outcrops are 0.2 mi. N. of town line just E. of the road where a small stream crosses—**Pyrite**; ② off Rte. 7 about 0.7 mi. S of Missisquoi River Bridge. Turn east on narrow road passing under interstate, go 0.3 miles to small quarry and Vermont Marble Company dump—**Swanton “red marble” (dolomite)**, **Dunham dolomite**. Good cutting material.

RITCHFORD: Follow Rte. 105 east of Richford to the Rte. 105A junction. Continue on 105 for 2.7 mi. Park where powerline crosses road. Walk down dirt road 0.3 mi. to Lucas Brook. Follow brook downstream about 0.2 mi. Boulders in stream bed along sides—**Actinolite** with **Talc**, **Fuchsite** and **Magnetite**; ② a small manganese prospect between Richford and Berk-shire. From intersection 2½ mi. W of Richford, follow gravel road north for 1 mi. Just to the E of the road is a small pit and a dump that has been filled with tree stumps—**Specular Hematite**, **Rhodonite**, **Pyrolusite**, and **Calcite**.

SOUTH ALBURG, on shore of Lake Champlain—**Quartz**.

Vermont

GRAND ISLE COUNTY

ISLE LA MOTTE, take Rte. 129 from Rte. 2 at South Alburg about 2 mi. Just before the road turns to cross bridge to Isle La Motte, a quarry can be seen to the right of the road—**Marcasite, maclurites magnus (fossil gastropod)**. This is the Crown Point limestone. Nautiloids have also been found in rocks from this formation.

NORTH HERO: found in the rock used as road fill where Rte. 2 crosses from Grand Isle to North Hero—Good sized **Quartz** and **Calcite** crystals in veins in calcareous black shale. **Pyrite** concretions (*suns*) are also found in this black shale; ② alternate site is in the quarry on the south side of Rte. 2, just off the west end of Sand Bar Bridge. Contains similar material.

SOUTH HERO, take road south towards southernmost point of South Hero off Rte 2. Park and walk along old railroad right-of-way towards shore. Formation is also visible at Shelburne Point. Stoney Point formation, fine-grained calcareous black shale with white calcite veins—“**Zebra marble**” Cutting material can find “pictures.” This outcrops in several locations along the lake.

LAMOILLE COUNTY

AREA, Placer **Gold**—many streams in Vermont will yield some gold when the heavy sediment at the bottom is panned. In Lamoille County, try Little River and Gold Brook in Stowe, Lamoille River in Johnson, and Gihon River in Eden.

EDEN: ① area mines and quarries—**asbestos**; ② at Belvidere Mine of Vermont Asbestos Company on Belvidere Mt.—**Vesuvianite** and **serpentine**; ③ just beyond the general store take rd. that forks off to the left up hill for ≈ 2.5 mi., VAG Asbestos Mine—**Garnet, Vesuvianite** and **serpentine**; ④ Former GAF-owned asbestos mine closed in 1993. Take Route 100 to Eden Mills. At intersection, take a half-left turn and follow to mine—**Garnet, serpentine, asbestos, Epidote, Diopside, Calcite**. Over 30 different minerals have been reported from this location. Collectors may call 802-635-2508 for permission to collect.

MORRISTOWN, area Talcose slate exposures—**Galena**.

ORANGE COUNTY

AREA: some scattered copper mines in Co.—**Copper** minerals; ② Placer **Gold**— the Third Branch of the White River near Braintree. Braintree Center is 6 mi. N of Randolph on Rte. 12A.

COPPERFIELD, the Ely Mine, between West Fairlee and South Vershire. Take Route 113A to West Fairlee, go west $1\frac{1}{2}$ miles towards South Vershire. Old smelter and ruins of former village of Copperfield can be seen on both sides of the road. Park and follow dirt road 0.75 mi. to mine dumps. have also been found here—**Chalcoppyrite** and **Pyrrhotite.**, **Pyrite, Sphalerite, Tourmaline, Actinolite, Calcite, Garnet, Hornblende** and **Malachite**.

CORINTH (P.O. or Cookville), area mines—**Chalcoppyrite**.

EAST BRAINTREE, follow Rte. 12 south $\frac{1}{2}$ mi. to bridge. At south end of bridge, turn east onto gravel road. Continue 0.3 mi. to fork, stay right. Park past fork to left of road. Walk to small stream (intermittent in summer). Past stream on right is a trail. Follow for $\frac{1}{4}$ mi. Continue past a sharp left turn to old chimney, pits and dump—Good **Arsenoppyrite** crystals, **Pyrite** and **Quartz** have been found here.

SOUTH STRAFFORD, the Elizabeth Mine e—**Chalcoppyrite** and **Pyrrhotite**.

STRAFFORD, the Copperas Hill area mines—**Chalcoppyrite** and **Pyrite**. (a large mineralized deposit)

THETFORD CENTER, quartz vein in Talcose slate—**Galena**.

ORLEANS COUNTY

AREA: Placer **Gold**—panned from the Missisquoi River in both Lowell and Troy; ② hike up Long Trail to near summit of Jay Peak, in the rubble from ski lift construction—**Malachite** and other **Copper minerals**, **Chlorite** and **Feldspar**; ③ outcrops just in outcrops in the road-cuts along Rte. 5A east side of Lake Willoughby. Park at turn-off where pipe brings spring water down from side of cliff to road. Best outcrops are north of here along 5A. Watch out for fast traffic and falling rocks from steep road-cut—Granite pegmatites, “plumose” **Muscovite**, **Beryl**, **Garnet**, and **Idocrase** crystals

LOWELL: ① (and Chrysotile), area mines and quarries—**asbestos**; ② in dumps at gate of Ruberoid Asbestos Mine—**Garnet** and **Diopside**.

TROY, as ore mined in small beds—titaniferous **Magnetite**.

RUTLAND COUNTY

BRANDON, area mines—**Psilomelane** and **Pyrolusite**.

CHITTENDEN, area mines—**Galena**.

DANBY, Take Mt. Tabor Road from Danby, park at Devil's Den picnic area, walk north along road to outcrops on east side of road. Excellent smoky quartz and other minerals are found in pockets in the local schist—Smokey and clear **Quartz crystals**, **Pyrite**, and **Ilmenite**.

EAST WALLINGFORD, Outcrops along Route 155 road-cut about 6-8 miles south of East Wallingford contain these minerals. Many are in large crystals, or large crystal aggregates—**Tourmaline**, **Albite**, **Actinolite**, **Calcite**, **Epidote**, **Phlogopite**, **Pyrite**, **Sphene**, and **Diopside**.

FAIRHAVEN, Many quarries are south of Fair Haven along the west side of the Delaware and Hudson Railroad right-of-way, both north and south of Lewis Brook. They are located in the green and purple Cambrian Metawee Slate—**Pyrite**, **Bornite**, **Chalcopyrite**, **Quartz**, and **Calcite**.

PROCTOR, area quarries—**marble**.

RUTLAND (Sta.), SE 3¼ mi., in saddle on N side of Round Hill (on W flank of the Green Mts.), area—green **aventurine**.

SHERBURNE, area pegmatite exposures—**Muscovite**.

SOUTH WALLINGFORD, area mines—**Psilomelane** and **Pyrolusite**.

WASHINGTON COUNTY

AREA: Placer **Gold**—panned has been recovered from the Mad River in Warren, Waitsfield and Moretown, as well as other previously mentioned locations.

BARRE, Wheaton Granite Quarry in Cobble Hill quarry group—rutilated **Quartz**.

WATERBURY, Duxbury serpentine quarry. From Waterbury, go S. on Rte. 100 for 8 mi. to Harwood Union High School. 0.3 past school cross a small bridge, turn right onto uphill dirt road. Continue 0.3 mi., pass auto graveyard on right to a trail heading left, and park. Walk up trail past a tailings pile and turn right where path meets another trail that leads to the quarry—**Serpentine**, **Talc**, **Tremolite** and **Actinolite**. “Verde Antique” was quarried here. **Magnetite** octahedra (up to ½" in diameter in chlorite schist), well-formed **Dolomite** crystals, and **Calcite** that fluoresces pink have been found here.

Vermont

WINDHAM COUNTY

GRAFTON, area quarries—**Kyanite** and **serpentine**.

READS-BORO, Park at the New England Power Plant in Reads-boro. Walk south about a mile along the railroad tracks to an old lime quarry—**Phlogopite**, **Diopside**, **Calcite**, **Graphite**, and **Hematite**. The large dump of rock from the water tunnel east of the plant has **Pyrite** and **Garnet** specimens.

WILLIAMSVILLE: ① in road cut E of bridge over Adams Brook on way to East Dover; and ② 1 mile N of Bridge just above where Bemis Brook empties into Adams Brook—**agate**; ③ take Rte. 30 past Newfane, turn right just before West Dummerston onto the road to South Newfane. About 8 mi. from Rte. 30, the road crosses Adam's Brook. Collect in the outcrops north of the roadcut and north along Adam's Brook—**Serpentine** (varicolored), **Quartz**, **agate**, and **Garnierite**. Serpentine boulders are in the stream, as are boulders with green, yellow, red and orange agate and quartz crystals. Some green surface coatings that may be garnierite have been reported; ④ in the brook, and also in the Rock River between Newfane and Dover—**Placer Gold** and **Garnets**.

WINDSOR COUNTY

AREA: ① Placer **Gold**— From Route 100A, 1.4 mi. S. of intersection with Rte. 100, take dirt road along Hale Hollow to the remains of the former village of Plymouth Five Corners. Any location along Broad Brook should yield some gold. Also **Magnetite** and **Garnet** can be recovered from the heavy sediments of the stream. Other sites include the Ottauquechee River in Bridgewater, and White River between Stockbridge and Rochester; ② Several interesting outcrops in the Gassetts road-cut where Route 103 crosses the Williams River. South of the river, a muscovite schist contains—**Quartz**, **Garnet**, **Tourmaline**, **Staurolite**, and **Kyanite** crystals. This was once mined for the Garnet. ③ A smaller outcrop northwest of the bridge across the river contains—**Actinolite**, **Diopside**, **Calcite**, **Sphene** and **Pyrite**.

BRIDGEWATER, area old prospects—**Gold** and **Galena**.

CHESTER: ① area pegmatite outcrops—**Muscovite**; ② area quarries—**Kyanite** and **Staurolite**.

LUDLOW, On Route 103 one mile east of junction of Rtes. 103 and 100 N. of Ludlow, outcrops in the long road-cut contain a number of different rock types. Good specimens of—**Tourmaline** (black), **Pyrite**, **Talc**, **Calcite**, **Diopside**. Marbles, pegmatites, mica-schists, quartzites, calcsilicates and several gneisses can be found here.

PERKINSVILLE, Pine Hill quarry. From Route 106 in Perkinsville, take road to Springfield Dam recreation area. Collect in the quarry just east of the dam—**Pyrite**, **Pyrrhotite**, **Chlorite**, **Ilmenite**, **Smoky Quartz**, **Calcite**, **Actinolite**, and **Biotite**.

PLYMOUTH, area prospects and Talcose slate exposures—**Galena**, **Magnetite**, **Pyrite** and **Siderite**.

TALCVILLE, area mines and quarries—**Talc**.

TYSON, Near Kingdom Brook, continue east one mile on Rte. 100 towards South Reading. Mineral collecting area is along both sides of the road—unusually large **Chloritoid** crystals make this quartz-muscovite-biotite-chlorite schist atypical, because this mineral normally occurs in microscopic size; also **Garnet** and **Magnetite**.

VIRGINIA

Like other eastern states tied into the mineral rich Appalachian Mt. granites, Virginia manifests an abundance of gemstone and mineral localities. The state divides topographically into three main regions: the Tidewater or Eastern Section, more noted for fossiliferous formations than mineralized rocks; the rolling Piedmont Plateau west of the coastal flats; and the Blue Ridge Mts. and Appalachian Plateau in the west. The far western counties show evidence of being part of the vast thrust mass along the Appalachian fault which inverted the stratigraphic order. It is in the plateau and mt. counties where the gem and mineral collector can best prospect for lapidary and cabinet specimen materials, especially for **Apatite**, **Epidote**, **Garnet**, clear and smoky **Quartz** crystals, **Tourmaline**, **Unakite** and many typical pegmatite gems.

Western Virginia comprises a good portion of the Valley and Ridge Province that crosses into West Virginia, covers all of central Tennessee, and reaches into northeastern Alabama. The far southwestern corner of the State is part of the Appalachian Plateau, marked by steep-sided ridges, scenic gorges and swift sparkling streams. Carboniferous age coal seams are extensively mined throughout this area. Adjoining the province are the Blue Ridge Mts., climaxed by 5,929' Mount Rogers in western Grayson and Smyth counties just above the North Carolina boundary. Following the crest of the Blue Ridge is the spectacularly scenic Blue Ridge parkway, affectionately called the Skyline Drive by Virginians, which provides access to many gem localities on both sides.

The granitoid nature of the Virginia's Precambrian and Cambrian structures, especially throughout the Piedmont and Plateau regions, has produced numberless pegmatite formations; approximately 150 gem and mineral species appear in the exposures or erosional debris. The Piedmont region was strongly folded, faulted, metamorphosed and the rock exposures include Biotite-Hornblende gneiss, marble, quartzite, greenstone and a long belt of phyllite. The phyllite belt, known as the *Martic line* crosses the state diagonally and parallel to the mts. on the west.

Early 19th century Gold prospecting literally started the search for commercially valuable minerals. Today the annual mineral contribution to the Virginia economy comes mainly from coal, followed by sand, gravel, limestone, Tin and Zinc, with smaller amounts of Feldspar, Gypsum, Iron Kyanite, Rutile and Salt. The gems and gemstones for which Virginia is becoming increasing well known were originally found as by-products of the early prospecting and mining of commercial minerals and, except for Diamonds, almost entirely by-passed by their finders. The first faceting **Feldspar** crystals were reportedly gathered in 1887, with high grade gem **Amethyst** appearing around 1902. Rose Quartz and rock crystal were found, and by-passed during the Gold prospecting era. **Tourmaline** was not particularly remarked until it appeared in the Lead and Zinc mines that were opened before W W I, with **Malachite** and **Chrysocolla** showing up in Copper deposits. later discoveries brought other gem materials to the forefront, and many of the old commercial mines are now being reworked for such sought-after gemstones as **Apatite**, **Epidote**, **Moonstone** feldspar, apple-green **Prehnite**, clear and smoky **Quartz** crystals, **Rhodonite**, comparatively rare **Turquoise** crystals, and many others.

Extensive Iron ore deposits have long been mined in the western counties. Of interest to specialists are deposits of Titanium minerals that occur near the northwest margin of the Piedmont Plateau in a zone that trends northeasterly across Anherst and Nelson counties. The latter county lends its name to dike-like ore deposits of Nelsonite, outcropping particularly around Piney River in Nelson Co. These dikes may be relatable to a large Anorthosite type intrusion $\approx$ 19 miles long and 2 to 6 miles wide. The Nelsonite is peculiar in that it is characterized by the presence of **Apatite** with **Rutile**, or by **Apatite** with **Ilmenite**, or both.

Virginia

ALBEMARLE COUNTY

AREA, the Green Mts., paralleling the Blue Ridge SW into Campbell, Bedford and Franklin counties, a belt of micaceous schists—**soapstone**.

CHARLOTTESVILLE: ① area: (a) Buck Mt. Creek—gray **agate**; (b) Sugar Hollow Cr.—red **jasper**; (c) N and W, in gravels of the Moorman R., as float—**Epidote, jasper**; (d) NE, on W foothills of Southwest Mt., a vein cutting micaceous schists once worked for Iron—**Chalcopyrite**; ② S of city along Rte. 795, in cuts and rd. banks—**Amethyst** (color-zoned, some with Goethite inclusions); ③ SW 3½ mi., area boulders—**Epidote, Microcline, Unakite**; ④ SW 6 mi. on US 29, the Red Hill Quarry—green **Epidote** crystals, pink **Microcline, Unakite**.

COVESVILLE: ① area quarries—**serpentine, soapstone**; ② a quarry at Boyd Tavern—**Quartz** crystals; ③ S 1 mi. on US 291, area cut banks, etc.—**Amethyst** (color-zoned, some with Goethite inclusions).

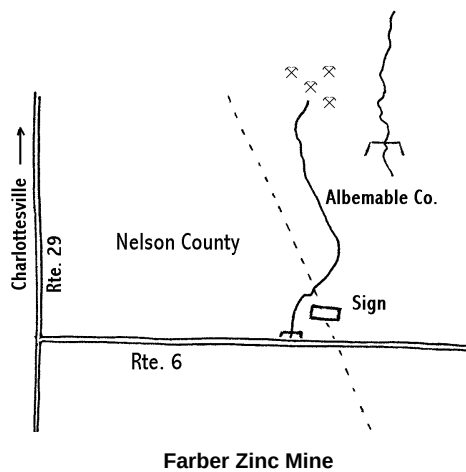
CROZET: ① N, in gravels of the Moorman R.—**Amethyst, Epidote**; ② Stockton Ford, S, in river gravels—**Amethyst**.

FABER: ① 2 mi. slightly N, in E part of the Blue Ridge foothills, the Faber Mine—**Azurite, Chalcantite, Cerussite, Chalcopyrite, Fluorite, Galena, Pyromorphite, Smithsonite, Sphalerite, Stibnite**; ② NE 3 mi., old Civil War Lead-Zinc mine—**Fluorspar** (gangue mineral), **Galena, Quartz** crystals, **Silver** (some), **Smithsonite, Stibnite**.

NORTH GARDEN, area abandoned Revolutionary War Iron mine—**Iron** minerals, **Quartz** crystals (clear, smoky).

SHADWELL: ① area cuts, banks, stream gravels—gemmy green **quartzite** (spangled with Chlorite), **Unakite** with **Epidote** (in massive exposures of the Catoctin Greenstone).

STONY POINT, area old Copper mine, productive dumps—**Copper** minerals.



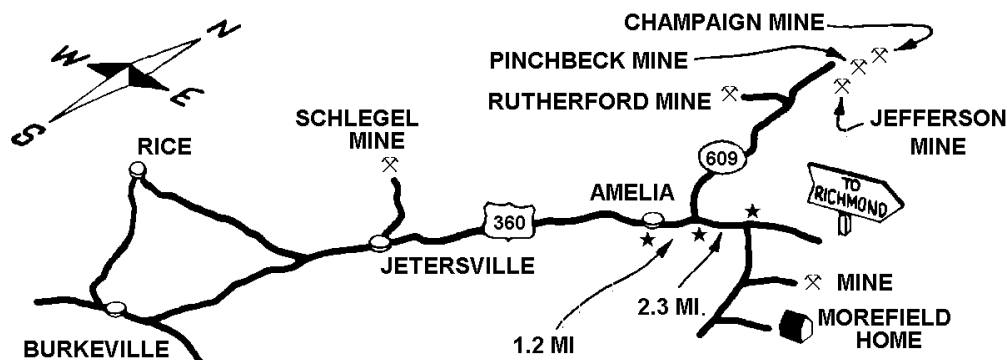
AMELIA COUNTY

AREA, many regional mica mines—**Fluorite** (Chlorophane). This mineral fluoresces from the heat of the hand, thus affording a fluorescent gemstone which is not hard enough to resist wear.

AMELIA COURT HOUSE: ① area: (a) various exposures—**soapstone**; (b) the James Anderson Mica prospect—**Aquamarine**; ② S, on Rte. 627 from US 360, cross Smacks Cr., then uphill to right, the Winfree prospect (pay fee) —massive **Quartz, Quartz** crystals (clear, rose, smoky); ③ N of jct. of rtes. 651 and 616 for 1½ mi. the Ligon Mine(\$2 fee) —**Beryl** (golden, green), **Garnet, Quartz** crystals (asteriated, smoky, opalescent), **Tourmaline**; ④ NE 1½ mi. on Hwy. 360 and then N on 609 (fee), the Rutherford Mine—**Amazonite, Amethyst, Circrolite, Cleavelandite, Feldspar, Microlite, Muscovite, Quartz** crystals, blue **Topaz**; ⑤ N 35° E 1¼ mi., the Richeson Mica Mine—**Amazonite, Muscovite**; ⑥ N 2 min., at the Truehart place on Nibbs Cr.—**Beryl, Quartz** crystals, black **Tourmaline**; ⑦ N 60° E 4 mi. (S of Chula), as a belt of exposures—**soapstone**; ⑧ ENE 4 mi., off Rte. 628, the Morefield Mine (\$1 fee) —**Amazonite, Apatite, Aquamarine, Amethyst, green Beryl, Bertrandite, Cassiterite, Chalcopyrite, Chalcocite, Cleavelandite, Columbite, feldspars, Fluorite, Galena,**

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Marcasite, **Spessartite** garnets (brilliant), **Microlite**, **Quartz** crystals (clear, smoky), **Phenakite**, blue **Topaz** crystals, **Zinnwaldite**, **Zircons**; ⑨ NW, off Rte. 632, the Champion Mine—**Quartz** crystals (blue, some with Chlorite inclusions); ⑩ via Hwy. 638 to SE on Duncan farm—**Amethyst**.



JETERSVILLE: ① many important area Mica mines in pegmatite dikes (Jefferson, Berry, Winston, Pinchback, Schlegel mines)—**Allanite**, **Apatite**, **Beryl**, **Columbite**, **feldspars**, **Fluorite**, **Spessartite** garnets, **Helvite**, **Microlite**, **Monazite**, **Muscovite**, **Quartz** crystals, **Tourmaline**, **Zircon**; ② N $4\frac{1}{2}$ mi., area mines—**soapstone**.

AMHERST COUNTY

AMHERST: ① E about 3 mi. to the Schaar farm (drive to abandoned buildings of an old service sta., take farm rd 659, then E to next crossroad and follow signs to the farm for permission), in Cr. bed about $\frac{1}{4}$ from house—gem **Amethyst**; ② E several mi. to marked *fee site*—**Amethyst**; ③ E 7 mi. from center of town via farm rds. 604 and 624 to the Early farm, then 0.9 mi. beyond a red house on the left, park at first two woods rds. and walk down second rd. a few hundred yds. to the abandoned Folley Mine—**Malachite** (gemmy); ④ NNW 7 mi.: (a) 0.3 mi. N of old Sandiges post office, in diggings; and (b) at scattered spots in soils of the Fancy Hill ridge—**Amethyst**, **Quartz** crystals; (c) in area outcrops of granite, gneiss and granodiorite—**Apatite**, **Epidote**.

PINEY RIVER, E 2 mi., area mine dumps—**Ilmenite**, **Rutile**.

SWEET BRIAR, E 2 mi., area prospects—**Chrysocolla**.

APPOMATTOX COUNTY

AREA, 2 mi. upstream from mouth of Wreck Island Cr., old mine—**Chrysocolla**.

BECKHAM: ① area manganese mines, and ② SW 8 mi., on Bent Cr. (just beyond jct. with Rte. 623), mines of the Enterprise Mining Co.—**Cryptomelane** (*Black Malachite*), **Manganite** (crystals, nodules), gemmy **quartzite**.

BENT CREEK, 8 mi. out at the old Enterprise Mine—**Psilomelane**, **Cryptomelane**.

CONCORD, vicinity SE of the Mt. Athos, deposits—**Manganese** minerals.

ARLINGTON COUNTY

ARLINGTON, along Kirkwood Rd., in banks of Spout Run—**jasper**.

Virginia

AUGUSTA COUNTY

CRIMORA, SW 2½ mi., the Crimora Mine and other area mines—**Psilomelane**, **Pyrolusite**, **wad**.

SPOTTSWOOD, area gravels—**Quartz** crystals.

WAYNESBORO: ① NW 2½ mi., deposit—**ocher**; ② the South River Mine (on Rte. 702 toward Vesuvius in Rockbridge Co.) —**chert**, **Goethite**, **Hematite**, **Psilomelane**, **Quartz** crystals; ③ the Cold Springs Clay Mine (on Rte. 608) —gem **chert**, impure **chalcedony**; ④ S 27 mi. on the Blue Ridge Parkway to Tye River Gap (on W side just inside Co. line and near the Rockbridge Co. sites), NE ½ mi., area outcrops—**Epidote**, **Unakite**.

BATH COUNTY

MILBORO SPRINGS, N on Rte. 629 to Rte. 640, turn E to the third farm (fee), noted locality on Chestnut Ridge—**Quartz** crystal.

BEDFORD COUNTY

BEDFORD: ① area of Otter Hill, in nearby Craighead Mine (feldspar-mica) —**Beryl**, **Columbite**, red **Garnets**, **moonstone**, **Quartz** crystals, **Tantalite**, **Tourmaline**; ② N on Rte. 43 to first side rd. to E and the Rosa Arrington store: (a) take rd. uphill to W, an old mine—**Feldspar**; (b) at church, turn left onto bad rd. into mts. to old Quartz mine, on dumps—gem **Quartz** crystals (red, green); (c) at store, turn N on good rd. about 1 mi. to W trending rd. to old mine—**Feldspar**; ③ NW 5 mi., the Peaksville Mine—**Quartz** crystals (some phantom, some with green Fluorite inclusions); ④ N about 11 mi., the Peaks of Otter region (state park), many area old mines and prospects, in Feldspar and Quartz veins—gem **Feldspar**, **Amethyst**, **Quartz** crystals, etc.; ⑤ SE 6½ mi. on Rte. 54, the Mitchell Mine—**Feldspars**, bluish **Apatite**; ⑥ SE 6½ mi. on Co. rd. 714, area —**moonstone**; ⑦ E 7 mi. (and 300 yds. SW of the Little Otter R.), the Hottinger Mine—**Amazonite**, **Garnets**, **Smoky Quartz** crystals; ⑧ at quarry on W bank of Falling Cr. 4 mi. SE and ½ N of Hwy. 714—**Garnet**.

BELLS: ① S 1 mi. (and E of the Otter R.), the Bells Mine—**Amazonite**, **Garnets**, **Smoky Quartz** crystals; ② halfway between town and Otter Hill, on NE side of small NE flowing stream, the Otter Hill Mine—**Feldspar**, **Spessartite** garnets, **Smoky Quartz** crystals.

FOREST: ① area pegmatites—**Rutile**; ② 2½ mi. out, the Everett prospect (on NE side of small stream), abundant—**Spessartite** garnets.

MONETA: ① SE 1 mi., the Moneta Mine—**Amazonite**, **Spessartite** garnet, **Feldspar**, **Smoky Quartz** crystals, **Vesuvianite**; ② S, on S slope of a hill, the Yong Mine —**Amazonite**, **Perthite** crystals (white, flesh colored), **Spessartite** garnets, **Pyrite**, **Quartz** crystals, **Rutile**; ③ area from town to the Big Otter R. (30 mi. long and 2 to 5 mi. wide), very many pegmatite exposures, mines, prospects—**Garnets**, **Pyrite**, **Quartz** crystals, **Rutile**, **Perthite**, **Tantalite**, **Tourmaline**, **Zoisite**, etc.

THAXTON: ① area prospects—**Sphalerite** crystals; ② NW 3 mi. (between Bedford and Roanoke), an interesting deposit—**Barite**, **Galena**, some **Sphalerite**.

BLAND COUNTY

POINT PLEASANT, N side of Walker Mt., area—**Quartz** crystals, **agate**.

BOTETOURT COUNTY

HOUSTON, 1 mi. out at the Houston Mine—**Manganese** minerals.

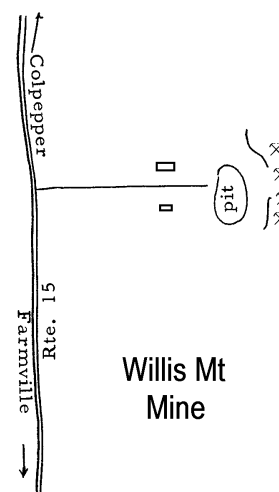
BUCKINGHAM COUNTY

AREA: ① Spiers Mt., and ② Willis Mt., area mines and prospects—gem **Kyanite**, **Manganese** minerals: (a) the Willis Mt. Mine (off Rte. 15, active mine)—**Apatite**, **Barite**, **Corundum**, **Feldspar**, **Garnet**, **Hematite**, **Limonite**, **Magnetite**, **Pyrite**, **Rutile**, **Sphalerite**, **Spinel**, **Staurolite**, **Topaz**, **Zircon**.

ARVONIA, GOLD HILL, JOHNSTON, NEW CANTON, many regional old mines—Copper minerals, **Gold**.

DILLWYN: ① S side of town at the historical marker, area hillsides, mines—**Gold**; ② SW 4 mi., the Booker Mine—**Gold**.

SPROUSE'S CORNER, area mines—gem **Kyanite**.



CAMPBELL COUNTY

AREA: ① central part of Co.; and ② Ne part of Co., Mt. Athos, regional mines—**Manganese** minerals.

BROOKNEAL: ① NE, on the Rush farm; and ② NE 10 mi., on the Clay farm—**Amethyst**.

EVINGTON, E and SE a few mi., several mines, such as the Hewitt, Saunders, Anthony, etc.—**Barite**.

LYNCH (Station): ① area Copper mines and prospects—**Copper** minerals, **Turquoise**; ② SW of confluence of Old Woman Cr. with the Staunton R., in exposures of **Kyanite** and **Quartz** veins—**Paragonite**; ③ the Bishop Mine (park at the Rock Service Sta., pay small fee) —**Chalcosiderite**, **Turquoise** crystals (only generally know locality on earth).

LYNCHBURG: ① area quarries—**Virginia Greenstone** (gemmy Actinolite-Chlorite and Chlorite-Tremolite schist), **Ankerite**, **Calcite**, **Kyanite**, **Pyrite**, **Magnetite**, **Rutile**, **Steatite**; ② SW 1 mi., and at the Leesville dam, area excavations, quarries—**Epidote**; ③ E and S, large mined deposit—**Manganese** minerals; ④ S 6 mi., the old Bell Mine—gem **Epidote** crystals; ⑤ SE 6 mi.: (a) area quarries—gem **Epidote** crystals; (b) on the Graves farm, in pegmatite mass—**Amazonite**; ⑥ S 7 mi., area quarries—**Epidote**; ⑦ S 9 mi., area quarries—**Epidote** crystals.

RED HOUSE, W 3 mi., area—**Amethyst**.

CAROLINE COUNTY

LADYSMITH, SW 6 mi. (via 4½ mi. on Rte. 229, 1 mi. on Rte. 603, and 1 mi. on dirt rd.), the Last Chance Mine—**Beryl** (green, to 5" dia. crystals), **Feldspar**, **Quartz** and black **Tourmaline**.

CARROLL COUNTY

GALAX (straddles boundary with Grayson Co.): ① area mines—**Marcasite**, **Pyrite**, **Lead**, **Zinc** and **Silver** minerals; ② E, at Pipers Gap, on W side of Rte. 97, area—**Hornblende**, **serpentine**, **Talc**; ③ N 3 mi., on W side of Co. rd. 607, area old mine

Virginia

dumps—**Apatite** (gemmy green crystals), **Chalcopyrite**, **Pyrite**, **Rutile** crystals (single and twins, to 1" in dia.), **Selenite**, **Calcite**, **Siderite**, **Vivianite** (dark blue, bladed crystals).

HILLSVILLE: ① area mine dumps (an Iron mining region stretching from 6½ mi. N for more than 20 mi. to the SW of Oldtown in Grayson Co.); ② the Iron Ridge Mine (near Gossan); ③ the Betty Baker Mine (northernmost mine), on all dumps—**Arsenopyrite**, **Azurite**, **Barite**, **Chalcocite**, **Chalcopyrite**, **Chrysocolla**, **Coquimbite**, **Cuprite**, **Galena**, **Halotrichite**, **Pyrite**, **Pyrrhotite**, **Siderite**, **Sphalerite**, etc.

LAUREL FORK: ① NW 1 mi.: (a) on the Marshall farm—gem **Quartz** crystals; (b) the Hall farm just NE—**Quartz** crystals (to 3 lbs.); ② SW 1 mi.: (a) on the Jackson farm—**Quartz** crystals (clear, milky, smoky; to 6 lbs.); (b) ¼ mi. SE, at the Bowman farm—giant gem **Quartz** crystals (to 15" long).

CHARLOTTE COUNTY

CHARLOTTE COURTHOUSE: ① many regional old mines (belt extends 10 mi. from Cullen to jct. of Ward's Fork with Roanoke Cr.), on dumps—**Corundum**, **Spessartite** garnet, **Muscovite**, **Rutile**, **Spinel**, **Tourmaline**; ② W 1.2 mi. (and ½ mi. N of Rte. 645), at the Vasser farm, pits, excavations—gem **Beryl**; ③ near Rte. 647 and 0.6 mi. S of its jct. with Rte. 40, at the Moore prospect in pegmatite—gem **Beryl**, **Perthite** crystals, **Quartz** crystals (blue, pale gray); ④ W about 2½ mi. on Rte. 40, to abandoned dirt rd. (crossing both sides of Rte. 40), park on S side, walk over bridge remnants and up trail about 200 yds.: (a) well short of an abandoned brick mansion, in area diggings—gem **Amethyst**, **Quartz** crystals; (b) area of the old brick mansion, buried in soil (to depth of 6 to 8 ft.—gem **Amethyst**; ⑤ WNW 2¼ mi., area fields—**Amethyst**; ⑥ NW 2½ mi., the Donald Plantation, area mines and prospects—gem **Amethyst**, **Smoky Quartz** crystals; ⑦ W 4 mi., in 200' long quartz vein—**Smoky Quartz** crystals; ⑧ S several mi., area mine dumps—gem **Amethyst**.

CULLEN: ① N 1 mi., the Crews No. 1 Mine; and ② in Mica mines to S—**Aquamarine**, **Beryl** (green, yellow), **Garnet**, **Quartz**.

PHENIX, W on Rte. 40 to area of Campbell Co. line: ① 0.3 mi. NNE of Brookneal in Campbell Co., and ② NE 10 mi. from Brookneal, area diggings—gem **Amethyst**.

CHESTERFIELD COUNTY

BERMUDA, HUNDRED, nearby, deposit on the Appamattox R.—yellow **ocher**.

ITTERDALE, area fields, gravels, excavations—**petrified** and **opalized wood**.

SKINQUARTER, area fields, gravels, etc.—**petrified** and **opalized wood**.

CULPEPER COUNTY

DRAKESVILLE, area mines—**Azurite**, **Malachite**, etc.

WILDERNESS, W 3 mi., the Culpeper Mine—**Gold**.

DINWIDDIE COUNTY

DINWIDDIE, area hills, pastures, Cr. beds and banks, etc.—Indian artifacts.

FAIRFAX COUNTY

AREA, N part of Co., along the Potomac R., a Quartz outcrop near Difficult Run—**Apatite**, **Specularite**, **Tourmaline**.

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ANNANDALE, E 2 mi., largest deposit in Co., quarry—**soapstone**.

CENTREVILLE: ① area rd. cuts, banks, etc.—some **Amethyst**; ② the Fairfax courthouse, area cuts—**agate**; ③ stream gravels of Doctor's Run and Four Mile Run, S of the Columbia Turnpike—**Quartz** (pebbles, blue, chatoyant); ④ Camp Washington, area exposures—**Hyalite** opal; ⑤ W, at the Centreville (Bull Run) Quarry (on S side of US 29/211)—**Apophyllite**, **moss agate**, **Byssolite**, **Prehnite**, **Thaumasite**; ⑥ the nearby Chantilly Quarry—gem **Prehnite**; ⑦ E 4 mi. on US 29/211, the Fairfax Quarry—**Sphene**, gem **Prehnite** (some with **Byssolite** inclusions).

FALLS CHURCH, E, a deposit—**soapstone**.

TENLEY, E 1 mi., second largest deposit in Co.—**soapstone**.

FAUQUIER COUNTY

MORRISVILLE, several area mines—**Gold**.

FLOYD COUNTY

AREA: ① Blue Ridge, general regional soils, draws, Cr. beds, etc.—**Staurolites**; ② SE headwaters of the South Fork and the Roanoke R., near confluence of Lick Fork and Flat Run, area mines—some **Arsenopyrite**, **Chalcopyrite**, **Pyrite**, **Pyrrhotite**.

BURKES FORK: ① area of the Carroll Co. line: (a) $\frac{1}{4}$ mi. E, and (b) $1\frac{1}{2}$ mi. E of line, on hillsides, in draws, etc.—**Garnets**; ② S, at the Vaughn farm ($6\frac{3}{4}$ mi. N and 1 mi. E of Laurel Fork in Carroll Co.), in loose soil—**Quartz** crystals (clear, smoky, to several inches long); ③ $5\frac{1}{2}$ mi. E of Laurel Fork—**Quartz** crystals (to 100 lbs.).

FLOYD: ① E 2 mi., on old mine dumps—**amphibolite**, **Prehnite**; ② NW 2 mi., area exposures—**Quartz** crystals (some rutiled).

INDIAN VALLEY, W, the Toncrae Mine (about $5\frac{1}{2}$ mi. NW of the SW corner of the jct. of Floyd and Carroll Co. line)—**Almandite** garnets, **Biotite**.

REWALD P.O. (about 17 mi. S of Christiansburg in Montgomery Co. on Rte. 8, near summit of the Blue Ridge at 3,200' elev.), area mines and prospects—**Arsenopyrite**.

WILLIS: ① SE 2.2 mi., exposure—giant **Quartz** crystals; ② ESE 2.2 mi., area soils, cuts, etc.—**Quartz** crystals; ③ SW 6 mi. and 1 mi. E of the Buffalo Mt. Church, on the Moles farm—**Quartz** crystals.

FLOYD, CARROLL, GRAYSON COUNTIES

REGION, the SW Virginia *Great Gossan Lead* area, very many mines—**Chalcopyrite**, **Pyrite**, **Pyrrhotite**, etc.

FLOYD & MONTGOMERY COUNTIES

REGION, W side of the Blue Ridge, at SE base of Pilot Mt., area placer deposits along Brush and Laurel creeks—**Gold**.

FLUVANNA COUNTY

AREA. A **Gold** belt traverses the boundary between Fluvanna and Goochland counties, crossing the James R. at Bremo Bluffs into Buckingham Co. This belt was extensively mined between 1830 and 1860, old mines including the Tellurium, Bowles, Payne, Page, Hughes, Moss, Fisher, Busby, Taugus, Gilmore and many others—**Gold**.

Virginia

CENTRAL PLAINS: ① area quarries, carving quality—**serpentine**; ② W 6 mi. to Kid's Store, turn N from Rte. 620 to ½ mi. NW of the store, old Manganese mines—gem **Rhodonite**; ③ W on Rte. 6 to extreme SW corner of Co. (with Scottsville just W of line in Albemarle Co.), area quarries, gravel pits, etc.—cuttable **Quartz**.

COLUMBIA 6 mi. out, the Tellurium Mine (active until 1886)—**Gold**.

DIXIE: ① at crossrds. of Rte. 6 and US 15, a rock shop (get permission and directions to an abandoned Manganese mine (see Central Plains ②)—gem **Rhodonite**; ② for way to mine, drive toward Scottsville on Rte. 6, then N on bad dirt rd. into bushy county to end of rd., park car and hike 1 mi. down steep hill, crossing a creek and up steeply to old mine dumps—gem **Rhodonite**.

FORT UNION, W on Rte. 6 to nearly ghost town of Esmont (not on most maps), site of old slate industry—fine **Pyrite** crystals.

NAHOR, area quarry—cuttable **Quartz**.

FRANKLIN COUNTY

AREA: ① regional Mica mines—**Apatite**, **Garnet**, **Mica**, **Staurolites**, **Tourmaline**; ② SE part of Co.: (a) between Chestnut and Snow creeks, on Chestnut MT. (via Rte. 619 and dirt rds.), numerous mica mines and prospects—**Beryl**, **Garnets**, **Tourmaline**; (b) top of Chestnut Mt., 1 mi. on dirt rd. from Rte. 619, the Chestnut Mine—**Garnets**, **Biotite**, **Quartz** crystals, **Tourmaline**; (c) on SE side of Chestnut Mt., 1½ mi. by rd. SW of Rte. 619, the Plant Mine—**Feldspar** crystals, **Garnets**, **Quartz** crystals, **Tourmaline**; (d) ½ mi. SW of Rte. 619 and 3.4 mi. NW of Rte. 108, the Chimney Mine—**Feldspar** and **Quartz** crystals, **Garnets**, **Tourmaline**; ③ extreme W side of Co., about ½ mi. from Huff's Store (near the Rocky Mount-Floyd courthouse rd.), a mine—**Chalcopyrite**, **Pyrrhotite**.

FERRUM, NW 5 mi., the Howell prospect, on dumps—**Calcite**, **Pyrite**, **Quartz** crystals, **Sphalerite**.

GLADE HILL, in schist 1.3 mi. S of Glade Hill school—yellow **Apatite** crystals.

PENHOOK, S on Rte. 890 to S corner of CO. (21 mi. N of Martinsville in Henry Co.), the Center Ridge Mine (best reached from Henry Co. via US 108, Rte. 619, and 3 mi. on a dirt rd.)—**Beryl**, abundant **Tourmaline**.

ROCKY MOUNT, jct. of Rte. 619 and Rte. 632: ① W 1.8 mi., the Klondike Mine—**Beryl** (gem crystals, massive blue); ② W 1.9 mi., the Simms Mine—pale blue gem **Beryl** (silky, opaque).

GILES COUNTY

NEWPORT, WSW 3½ mi., area gravels of Spruce Run—**Quartz** crystals (distorted).

GOOCHLAND COUNTY

AREA. A mineralized belt extends from the central part of Co. into E Powhatan Co. 30 mi. long by 15 mi. wide, very many old pegmatite mines—**Beryl**, **Columbite**, **Feldspar**, **Garnets**, **Mica**, **Quartz** crystals, **Rutile**, **Sillimanite**, **Tantalite**, **Tourmaline**, etc.

GOOCHLAND: ① NW 2 mi., on SW side of Rte. 6, the Irwin Mine—**Perthite** (flesh colored), **Smoky Quartz** crystals; ② gravels of Byrd Cr.—placer **Gold**, chatoyant **Quartz** phenocrysts; ③ NW from the courthouse via US 522 and Co. rd. 632, to a Texaco service sta., inquire way to old mine about 3 mi. out along area creek—**Beryl** (in Smoky Quartz crystals); ④ NE 3 mi., and ½ mi. W on Rte. 49, on W slope of a hill, the Salter prospect—**Garnets**, **Sillimanite**, etc.; ⑤ NE 3.9 mi. via farm rds. 612 and 634 (and less than 1 mi. from US 250), the Amber Queen Mine—**Spessartite** garnet, crystals of **Quartz** and **Felspar**.

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OLIVER, the O.W. Harris Mica Mine Farm (7.7 mi. W of Rte. 1 along Rte. 738), in area creek gravels—**Garnets, Kyanite, moonstone, Rutile** crystals.

PERKINSVILLE, S ½ mi., the Wiltshire prospect—**Garnets**.

GRAYSON COUNTY

AREA, various small hamlets not shown on many maps: ① Cox's Mill, Edmonds (N 1 mi.), Eona, Baywood (½ mi. S, at Five Forks), Hanks Knob, etc., in area cut banks, gravels, quarries around each community—**Garnets, Pyrite, Pyrrhotite, Quartz** crystals, **Rutile**, etc.; ② Adkins Church (2 mi. N of Rte. 95)—**Ilmenite** (massive), **Quartz** crystals, **Rutile** crystals, etc.

ELK CREEK, on slope of Iron Mt. 1¼ mi. E of US 21 (and ¾ mi. S of Wythe Co. line), area—**Chalcedony**.

GALAX: ① on W edge of town, at the J.C. Pierce prospect—**Corundum**, gem **Kyanite** (broad bladed crystals), violet **Garnets, Perthite, Quartz** crystals (clear, gray), **Rutile** crystals; ② SW 1.2 mi., on the Nichols farm—**Corundum**, gem **Kyanite** (broad bladed crystals, blue, to 18" long), **Garnets**; ③ a gneiss exposure belt extending from 2 mi. NE into Carroll Co., to 6 mi. SW of town, area exposures—**Spessartite** garnet (massive), **Staurolites**; ④ SW 6 mi., in gneiss exposures— **Spessartite** garnet; ⑤ SW 7 mi., area exposures—**Spessartite** garnet (massive).

GRANT: ① SW ½ mi., in vein exposure—marble, **Sphene**; ② S, at Mink Ridge, a good quality deposit—**soapstone**.

HAMPTON FORD, on N side of the New R., the Hampton Mine—**Garnets**, gem **Kyanite, Staurolites** (clear, yellow), **Tourmaline**.

INDEPENDENCE: ① just SW of Chestnut Yard, the Iron Ridge Mine, and ② SE 1½ mi., area exposures—**Epidote, Hornblende, Spessartite** garnet; ③ S 3 mi., near the old Greek Port Office, area—**Staurolites**; ④ E 5 mi., near the Appalachian Power Co. dam, veins in gneiss—gemmy green **Chlorite**; ⑤ NE 5 mi. (and ¼ mi. E of the New R.), the Poole prospect—**Barite, Fluorite, Gypsum**, etc.

NEW RIVER, N side of village and ¾ mi. from mouth of the Little R.: ① the Hampton Mine—**Garnets, Quartz** crystals, clear **Staurolites**; ② the Wingate Mines (E of Peach Bottom Cr.) on the Hendricks farm—massive **Epidote**.

OLDTOWN, N 0.6 mi. along Rte. 634, area—**Rutile** crystals.

TROUTDALE, SE 2½ mi. on Rte. 16, several outcrops along rd. and area side rds.—**Epidote**, red **jasper**, gemmy **Unakite**.

GREENE COUNTY

BACON HOLLOW (a hamlet on the E side of the Roach R. Valley): ① in a dike-like outcrop in area—gem **Unakite** (as veins); ② in area stream gravels, as pebbles and boulders, gemmy—**Unakite**.

ELKTON, E 7 mi., area mines—**Copper** minerals.

STANDARDSVILLE, N 5 mi., area mines—**Copper** minerals.

HALIFAX COUNTY

VIRGILINA (Dist.): ① area of many old mines and dumps—**Azurite, Bornite, Chalcocite**, native **Copper, Cuprite, Gold, Malachite**, etc.; ② N 6 mi., two mines—**Gold**. This dist. extends about 18 mi. N to S into North Carolina, very productive and with most mines located on a low, flat-topped ridge.

Virginia

HANOVER COUNTY

AREA, many pegmatite exposures in Co.—**Ilmenite**, **Rutile**, etc.

ASHLAND, area fields, gravels, etc.—**Staurolites**.

COATSVILLE, at Saunders No. 2 mine on S shore of Little R. 2½ mi. NE—**Kyanite**, **Garnet**.

GUM TREE, W 7½ mi. on Rte. 738, the Mica Mine Farm (fee), ¼ mi. to a creek: ① area of many old mines, on dumps and in cr. gravels—**Mica**, **Quartz**, **moonstone**; ② in area pastures—**Amazonite**, **Feldspar** and **Quartz** crystals, gem **Kyanite**, **Rutile**.

HEWLETT: ① area outcrops—**Garnets**; ② SE 3½ mi. (9 mi. NW of Ashland), the four Saunders Mines: (a) on dumps—**Garnets**, **Quartz**, **Mica**; (b) ½ mi. W, the Poteat Mine—**Garnets**, **moonstone**, **Quartz** crystals.

MONTPELIER, COATSVILLE, VERDON, area quarries in granite—**gem** minerals, **crystals**.

NEGRO FOOT, E 1.3 mi., near Rte. 671, the Rose Hill prospect on the Lanfford farm—**Epidote**, gem blue **Quartz**, **Unakite**.

OLIVER (a hamlet): ① area stream gravels, cuts, ditches, banks, excavations, old mine dumps, etc.—**moonstone**; ② Take Rte. 738 from US 1 for 7.7 mi. to the Harris Mine Farm—**Mica**, **Quartz**, **moonstone**.

HENRICO COUNTY

AREA, stream gravels and pits of Co.—**Unakite**, etc.

RICHMOND, downtown building excavations—**Vivianite** crystals (among the finest and most perfect on record).

HENRY COUNTY

AREA: ① countywide distribution of mica mines (see Ridgeway), also shown occasional—**Epidote**, **Ilmenite**, **Magnetite**, **Rutile**, **Sphene** and **Zircon** as accessory minerals; ② gravels of countywide streams, especially leatherwood Cr. and the Smith R.; and (3) regional fields, rd. cuts, excavations, pits, etc.—gem blue **Quartz**.

AXTON, area soils, gravels, etc.—**Garnets**.

BASSETT: ① W, around boundaries of Fairy Stone State Park (no collecting inside)—**Staurolites**; ② W about 1 mi. to the Clark's service sta. (brochure, permission to collect), in soils behind sta.—**Staurolites**.

HORSE PASTURE, at Wilson Quarries to N—**Garnet**.

MARTINSVILLE: ① SW 5.4 mi., in old placer grounds on SW side of Rte. 687—**Corundum**, **Garnets**, **Quartz** crystals, **Zircon**; ② SE 7.8 mi., in rd. cut in S bank of the Smith R.—gem **Kyanite**, **Staurolites**; ③ on Williams prospect 3 mi. SW and 0.3 mi. S of US 58—**Golden Beryl**.

RIDGEWAY: ① area gravels, soils, etc.—**Garnets**; ② N ¼ mi. from RR sta. on W side of US 220 in rock exposures, the Ridgeway Mines—**Feldspar**, **Garnet**, **Quartz** (smoky, white); ③ S 1.9 mi., E of US 220, the Eanes No. 2 Mine (and adjoining Garrett Mine), in pegmatites along both sides of a dirt rd. leading from Rte. 658—lavender **Garnets**, black **Tourmaline** (in Quartz); ④ SW 2½ mi. on US 220 and Rte. 689, the DeShazo Mine—**Feldspar**, **Garnets**, green **Hornblende**, **Quartz** crystals; ⑤ SW 6 mi., on US 220 and Rtes. 692 and 691, the Coleman Mines (in steep valley) and on the ridge above mines—**Garnets**, **Feldspar** and **Quartz** crystals, **Tourmaline**.

LOUDOUN COUNTY

AREA, many traprock quarries in Co.—**Calcite**, **Datolite**, **Heulandite**, **Epidote**, **Laumontite**, **Natrolite**, **Stilbite**, etc.

ARCOLA: ① area traprock quarries—**Calcite**, **Datolite**, **Heulandite**, **Epidote**, **Laumontite**, **Natrolite**, **Stilbite**, etc.; ② a quarry in SE corner of Co.—gem brown **Sphene**.

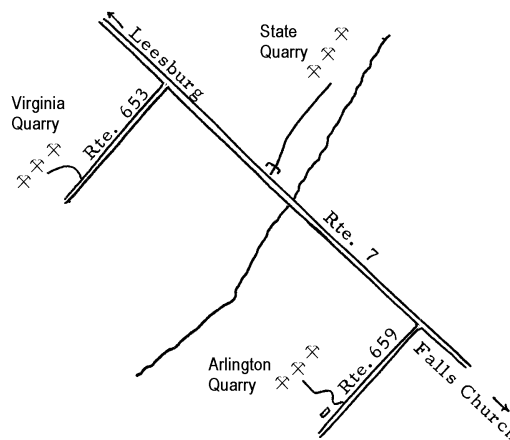
ASHBURN, from jct. of Rtes. 7 and 659, S 1 mi. on 659 to the Arlington Trap Rock Quarry (on Goose Cr.)—gemmy **Hornblende**, **Prehnite**.

HILLSBORO, area quarries—**Calcite**, **Datolite**, **Heulandite**, **Epidote**, **Laumontite**, **Natrolite**, **Stilbite**, etc.

LEESBURG: ① the Arlington Quarry, reached by Hwy. 659 S a mi. from Hwy. 7—**Apophyllite**, **Calcite**, **Chabazite**, **Datolite**, **Diopside**, **Epidote**, **Heulandite**, **Magnetite**, **Natrolite**, **Prehnite**, **Quartz** crystals, **Sphalerite**, **Stilbite** crystals;

② N 1 mi. (belt of exposures extends 3 mi. N), numerous deposits—**ocher**; ③ Virginia Quarry, off Rte. 653 just S of jct. with Rte. 7—**Apatite**, **Aragonite**, **Calcite**, **Epidote**, **Fluorite**, **Magnetite**, **Natrolite**, **Prehnite**, **Pyrite**, **Tremolite**; ④ SE 4 mi. on Goose Cr., the Belmont Traprock Quarry—some **Fluorite** (as gangue mineral), **Prehnite**, **Sphalerite**; ⑤ State Quarry NE off Rte. 7 between Rtes. 653 and 659—**Chalcocite**, **Chabazite**, **Epidote**, **Heulandite**, **Malachite**.

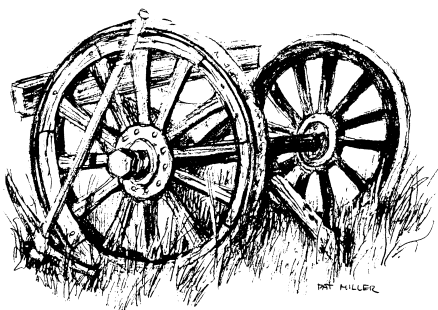
MOUNTVILLE: ① area lime and marble quarry—**Garnets** (**Andradite**, **Grossularite**), **Chlorite**, **Calcite**; ② the Virginia Lime and Stone Quarry—**Andradite** garnet, **serpentine** (waxy).



LOUISA COUNTY

LOUISA, an area quarry—gemmy green **granite**.

MINERAL: ① RR sta. on the Chesapeake and Ohio, three major mines within 3½ mi., the Arminius, Smith and Sulphur mines—**Calcite**, **Chalcopyrite**, **Galena**, **Limonite**, **Pyrite**, **Sphalerite**; ② N 5 mi., upstream on Contrary Cr., large mining area (reached via Rte. 618 to Rte 522 then shortly past bend, rd. to N to cr.)—**Almandite** garnet, **Azurite**, **Bornite**, **Calcite** (fluorescent), **Chalcopyrite**, **Galena**, **Gold**, **Hornblende**, **Kyanite**, **Malachite**, **Marcasite**, **Pyrite**, **Rose Quartz**, **serpentine**, **Siderite**, **Silver**, **Sphalerite**, **Staurolite**.: (a) on dumps—**Garnets** (in shale to walnut size), **Sulfur**; (b) outlying

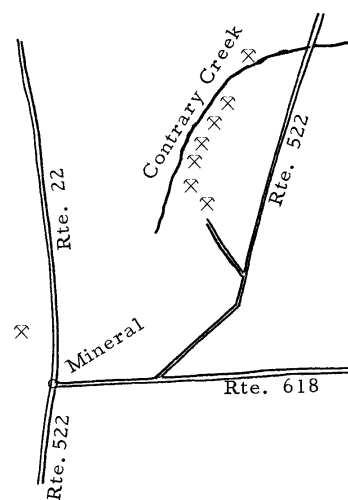


Virginia

mines—**Copper** minerals, **Gold**, **Mica**; ③ N, to near Co. line: (a) area around Contrary Cr.—**Actinolite**, **Garnets**, **Pyrite**, **serpentine**, **Tremolite**; (b) the Valcooper Mine—**Chalcopyrite**, **Galena**, **Pyrite** cubes, **Quartz** crystals, **Smithsonite**, **Sphalerite**, etc.

PENDLETON, S 1 mi., follow dirt rd. beginning just N of a farm pond to W, to dead end on the McPherson farm, take trail about 1 mi. into woods to old mine—**Gold** (obtained by crushing ore detritus and panning).

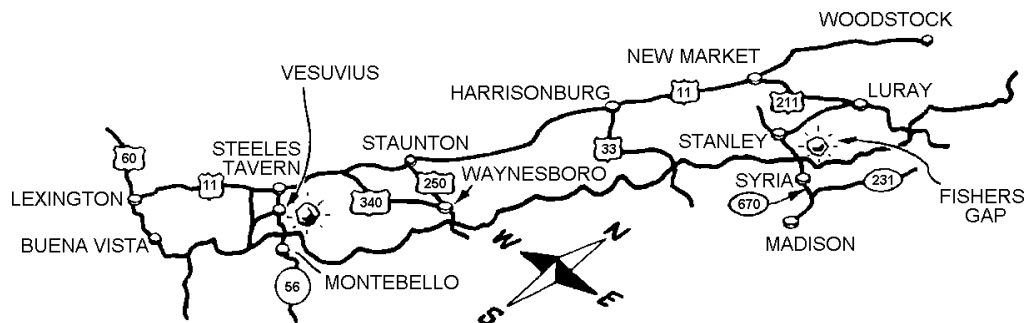
TREVILLIANS, SW 4 mi., in area gravels, pits, trenches, cuts, soils, etc.—**Amethyst**, **Quartz** crystals.



MADISON COUNTY

AREA, 1 mi. SE of Miliam's Gap, in Dark Hollow at head of the Robinson R., area mines—**Copper** minerals.

CRIGLERSVILLE: ① cross bridge and turn W on Rte. 670: (a) stream gravels of the Rose R., abundant—**Unakite**; (b) a rock mill at edge of town—**Quartz** (massive, star, clear); ② SW on Rte. 670 to Rte. 642 and the Blakey Ridge fire rd., up ridge to fire tower, collection area on the S—gem **Quartz** (blue, light to deep colors, chatoyant).



SYRIA: ① W, near town, area cut banks and stream gravels along Rtes. 670 and 648—gem **Epidote**, **jasper**, **Quartz** crystals (blue, asteriated); ② in gravels of Rose Run—**jasper**; ③ 8 mi. out on unpaved Rose R. rd. to picnic grounds: (a) in river gravels; (b) also in gravels of all regional streams—black **chert**, massive **Epidote**, **Quartz** (pebbles, smoky, clear); ④ take Rte. 600 N of Old Rag Mt., area—**gemstones**, **minerals**, etc.

MECKLENBURG COUNTY

FINCHLEY, area extension of the Halifax Co., VA mining dist., the Pontiac Mine—**Azurite**, **Bornite**, **Calcite**, **Malachite**, etc.

MONTGOMERY COUNTY

AREA, exposures of the Luster's Gate dolomites—**Quartz** crystals.

SHAWSVILLE, SW, at Bonys Run, area prospects—**Smithsonite**.

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NELSON COUNTY

ARRINGTON: ① NW 7 mi., area mines—**Ilmenite, Rutile**; ② NW 8½ mi.: (a) the old American Gem and Pearl Co. Mine; and (b) the Sauders farm—**Amethyst** (lavender).

JAMES RIVER, N 2 mi., in SE part of Co.: (a) area, and (b) around Warminster and Midway Mills, ore deposits—**Manganese** minerals.

LOWESVILLE, nearby, on the Saunders farm, pegmatite outcrop, high quality, lavender—**Amethyst**.

MONTEBELLO: ① SW: (a) area quarries and mines—**moonstone, Cassiterite**; (b) gravels of Irish Cr.—blue **moonstone, Cassiterite**; ② just E of jct. Of Rte. 56 with the Skyline Dr. (not far from Tye River Gap), in outcrop, high quality—**Unakite**.

ROSELAND: ① area mines—**Ilmenite, Rutile**; ② area stream gravels—**Quartz** (blue pebbles and crystals), **Ilmenite, Rutile** crystals.

SCHUYLER: ① area mines and quarries—carvable **Steatite**; ② a nearby soapstone quarry—some **Chrysotile, Talc**; ③ Alberene Quarries on Rte. 800 S of Rte. 6, just N of Schuyler (get permission from quarry office south of town on Rte. 800)—**Ankerite, Apatite, asbestos, Chalcopyrite, Chlorite, Magnesite, Sphalerite, Talc**.

WILLKIE, E, in outcrop—Gem **Unakite**.

ORANGE COUNTY

ORANGE, N, the Rapidan R. area, several old mines—**Copper** minerals, **Gold**.

SOMERSET, large area schist exposures—**Graphite, Pyrite**.

PAGE COUNTY

IDA: ① area mines—**Copper** minerals; ② NW about 1 mi.: (a) gravels of East Hawkbill Cr., and (b) mine dumps over 60 acres near Hoak Hill—**Azurite, Chrysolite, Cuprite, Epidote, jasper, Malachite, Hematite**.

MARKSVILLE, S 3 mi., near W base of the Blue Ridge where the Shenandoah Valley RR crosses Stony Run, area mines—**ocher**.

MAUCK, mines near Fisher's Gap—**Azurite** and other **Copper** minerals, **Unakite**.

STANLEY, S, near Jollett just off Skyline Dr., several exposures—gem **Unakite, Apatite, Chlorite, Iron** minerals, **Zircon**.

PATRICK COUNTY

AREA: ① NW part of Co., Hurricane Knob (1 mi. from tri-county corner of Patrick-Carroll-Floyd counties), area—gem **Kyanite**; ② Stone State Park (NE corner of Co.), area outside boundaries—**Staurolites**.

MEADOWS of DAN, W: ① the Barnard farm (3¾ mi. E and 1 mi. S of Laurel Fork in Floyd Co.)—**Quartz** crystals (clear to 100 lbs.); ② ½ mi. NW of Barnard's on the Robinson farm—giant clear **Quartz** crystals.

STUART (center of the Staurolite belt): ① area stream beds, rd. cuts, mica schist (from some mi. SW to about 20 mi. NE of town)—**Almandite** garnets, **Staurolites**; ② area exposures similar to those in Fairy Stone State Park in NE part of Co.—**Staurolites**; ③ S 2 mi., at Bull Mt., exposures—**Corundum**, gem **Kyanite, Margarite**.

WOOLWINE, S, in a lime quarry—**Almandite** garnets, **Sphene, Tourmaline**.

Virginia

PITTSYLVANIA COUNTY

ALTAVISTA, SW 6 mi. in a pegmatite along Hwy. 29—**Beryl**; in cliffs 8 mi. upstream in Roanoke R. near jet. With Old Woman Cr.—**Staurolite**.

AXTON: ① area pegmatite outcrops—**Feldspar**, **Garnet**, gem **Kyanite**, **Mica**, **Quartz** crystals, **Tourmaline**; ② NW, at the Holland Mine—**Beryl** (green, yellow), black **Tourmaline**; ③ N 3 mi.: (a) the L.P. Willis Mine—**Garnets**; and (b) just E on a hilltop, the Turner Mine—**Smoky Quartz** crystals; ④ NE 5½ mi., the Will Rogers Mine—pegmatite **gems** and **minerals**. (Most regional mines can be reached from US 58 via dirt rds.) ⑤ E 7½ mi., the Tyler Mine—pegmatite **gems** and **minerals**.

CHATHAM, SW 5 mi., the George Easley Mine, abundant—gem **Garnet**.

DANVILLE, area chlorite schist exposures—**Chlorite** and some **Platinum**.

GRETNA: ① area fields, rd. cuts, stream gravels and banks E of US 29—translucent blue **Quartz**; ② Skyline Estates: (a) area stream gravels and banks, and (b) in **Quartz** vein at crest of hill—**Mica**, gemmy blue **Quartz**.

HURT: ① area fields, rd. cuts, stream gravels and banks E of US 29—translucent blue **Quartz**; ② from NE corner (near Altavista in Campbell Co.), a 10 by 12 mi. **Mica** mining dist. Lies S of Roanoke R., many pegmatite exposures (mostly rugged back-country)—**Feldspar** crystals, **Garnets**, **Pyrite**, **Quartz** crystals, **Tourmaline**; ③ from Toshes a mining belt extends N to Lynchburg in Campbell Co.), many old Barite mine dumps—**Barite**, **Epidote**, blue **Quartz**, **Tourmaline**.

MOTLEY, S ½ mi., the Motley prospect—pink **Perthite**, white **Quartz**, **Tourmaline**.

SYCAMORE: ① E ¾ mi., dumps of the Sycamore Mine—**Quartz** (blue, milky, gray); ② W 4 mi., the Bloomfield prospect—**Perthite**, **Quartz**.

WHITTLES, area quarries, excavations, etc.—some **Corundum**.

POWHATAN COUNTY

FLAT ROCK: ① NE, at the White Peak Mica Mine—**Mica**, asteriated and **Smoky Quartz**; ② NE 3.6 mi. on Rte. 613, the Hebbe No. 2 Mine—**Beryl** (to 5" dia. Crystals), **Amazonite**, **Cleavelandite**, **Columbite-Tantalite**, **Garnets**, **Quartz** crystals.

MOSELEY, area fields, excavations, gravels—**petrified** and **opalized wood**.

PRINCE EDWARD COUNTY

AREA, extreme W part of Co. (5½ mi. S of Pamplin in Appomattox Co.), on Rte. 47 cross RR, turn sharp E on Co. rd. 681 for 2½ mi., turn N on Co. rd. 681, the Baker Mt. Kyanite Mine (permission needed) —gem **Kyanite** crystals, **Garnets**, **Fuschite**, **Pyrite**, **Turgite**, etc.

FARMVILLE, at Willis Mt.—gem **Kyanite** crystals.

PROSPECT, SE 1 mi., old Kyanite mine—**Garnets**, gem **Kyanite**, **Rutile**, **Staurolites**, **Topaz**.

RICE: ① many area mines and prospects, especially: (a) the Briery Mine, and (b) at Leigh Mt.—**Garnets**, gem **Kyanite**, **Rutile**, **Staurolites**, **Topaz**; ② N 1 mi., an old mine—**Garnets**, gem **Kyanite**, **Rutile**, **Staurolites**, **Topaz**; ③ N 3 mi. on Rte. 619, wide area of pegmatite outcrops around the Smith farm—**Amethyst** (color zoned to 6" long); ④ on both sides of Sayler's Cr. Area surfaces, outcrops, etc.—**Amethyst** and other **Quartz** crystals.

PRINCE WILLIAM COUNTY

CATLETT, area mines—**Barite**.

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DUMFRIES, NW 1½ mi., the Cabin Branch Mine—**Chalcopyrite**, **Garnets** (occasional on dumps), **Gold**, **Galena**, **Pyrrhotite**, **Sphalerite**.

MINNIEVILLE, W, area—**Amethyst** and other **Quartz** crystals.

PRINCESS ANNE COUNTY

VIRGINIA BEACH, 1 mi. NE of jct. Of I-64 and Rte. 58 (Virginia Beach Blvd.), just N of the Hollywood subdivision, in area pits—**Clam Geodes** (fossil clam shells packed with ivory and clear dogtooth Calcite crystals).

RAPPAHANNOCK COUNTY

AREA, extreme N corner of Co., about 6½ mi. S from Front Royal in Warren Co., area mines and prospects—**Copper** minerals.

ROANOKE COUNTY

AIR POINT, on edge of Bent Mt.: ① a rd. cut, as a fine grained deposit—**Unakite**; ② nearby exposures—**Apatite**, **Rutile**.

ROANOKE: ① S 9 mi. on US 220 and Rte. 921 to the shepherd farm, in **Epidote** exposure—**Anatase** (yellow pseudomorphs after Sphene), black **Zircon**; ② Mason Cove (via Rte. 311), in black shale exposure on W side of river—rock **crystal**.

SALEM: ① in a rd. cut behind the Dixie Caverns—smoky **agate**; ② N, at foot of Catawba Mt., in black shale exposure—**Barite** crystals (clear, tabular).

ROCKBRIDGE COUNTY

BUENA VISTA, N on US 60 to Cornwall: ① Irish Cr., and ② tributary Panther Cr., area Tin mines—**Amethyst**, **Apatite**, **Arsenopyrite**, **Beryl**, **Cassiterite** crystals (to ½" long translucent), **Chalcopyrite**, **Fluorite**, **Galena**, **Gold**, **Iolite**, **Marcasite**, **moonstone**, **Pyrite**, **Pyrrhotite**, **Scheelite**, **Siderite**, **Tourmaline**, **Vermiculite**, **Zircon**.

FAIRFIELD, ½ mi. out, large mined deposit—**ocher**.

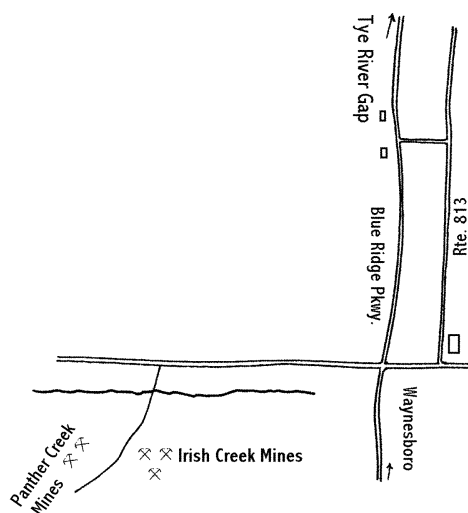
GLASGOW, the Lone Jack Quarry in town—**Calcite**, **Fluorite**, **Quartz** crystals (clear, smoky).

LEXINGTON, Barges Quarry, from just E of jct. Of Rte. 60 and Rte. 11A (collecting allowed after 5 PM on weekdays) —**Calcite**, **Chalcopyrite**, **Dolomite**, **Pyrite**.

VESUVIUS: ① S, in Big Mary's Cr., *in situ* and in gravels of area—gem **Unakite**; ② S on Rte. 56 a short distance: (a) rock quarry—gem **Unakite**; (b) on E across the Blue Ridge Parkway, then S by twisting dirt rd. and W back under the parkway to the Irish

Virginia

Creek Tin Mine (on left of trail a few hundred ft. above a forest service bldg.) —**Beryl**, some **Cassiterite** crystals, **Quartz** crystals, **Scheelite**; ③ SE $1\frac{1}{2}$ mi., exposed lenses—gem **Unakite** (with brilliant red Microcline crystals several inches long); ④ $\frac{1}{2}$ mi. farther S on same rd., exposed dikes—green **Unakite** (with Quarts and red Feldspar); ⑤ several mi. farther (to about $\frac{1}{2}$ mi. W of the Blue Ridge Parkway), an exposure—**Unakite** (with green quartz monazite and pink Feldspar); ⑥ W 2 mi., an old quarry—**Unakite** (with red-orange splotches in yellow green base color); ⑦ E, at Tye River Gap: (a) area gravels of Irish Cr.—**Beryl**, **Quartz** crystals; (b) mines along Irish Cr.—**Arsenopyrite**, **Cassiterite**, **Pyrite**, **Wolframite**; (c) on W side of the parkway just inside Co. line and near Rockbridge Co., sites—decorative **Unakite**.

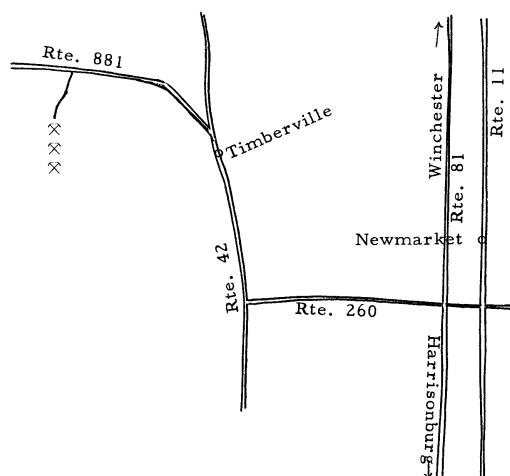


ROCKINGHAM COUNTY

ELKTON: ① W 1 mi., area—**Quartz** crystals; ② SE, at High Knob area outcrops and mines—**Azurite** and other **Copper** minerals; ③ N, toward Shenandoah Sta. (on Norfolk and Western RR in Page Co.), about 5 mi. SW of sta., area mines along Naked Cr.—**ocher**.

HARRISONBURG, nearby quarry—gemmy dark colored **marble**.

TIMBERVILLE, nearby Lead-Zinc mine—**Arsenopyrite**, **Calcite** crystals (cream color), **Chalcopryite**, **Galena**, **Hematite**, **Marcasite**, **Pyrite** crystals, **Smithsonite**, **Sphalerite**, **Tremolite**.



RUSSELL COUNTY

CASTLEWOOD, N 10 mi., area mines—**Smithsonite**.

LEBANON, a 30 mi. long region of many mined deposits, the S slope of Kent Ridge along the Clinch R. extending NE to North Tazewell in Tazewell Co.—**ocher**.

SMYTH COUNTY

CHATHAN HILL, immediately S on Rte. 16: ① area mines—**Smithsonite**, **Sphalerite**; ② just SW of this site, another mine—**Hemimorphite**.

MARION: ① E, and just off I-81, the Henderlite Quarry—**Barite**, **Calcite**, **Iron** minerals, **Limonite** (pseudomorphs after Chalcopryite), **Malachite**, **Pyrite**; ② a 3 mi. radius about town: (a) SW 2 mi., along a prominent ridge; (b) NW 2 mi.; (c) along the Middle Fork of the Holston R.; and (d) NE of McMillan in the Wassum Valley—**Barite**,

A Location Guide for Rock Hounds in the United States

Calcite, **Iron** minerals, **Limonite** (pseudomorphs after Chalcopyrite), **Malachite**, **Pyrite**; ③ S 6 mi., near Sugar Grove, along Comers Cr. (in the Glade Mt. Manganese dist.), area mines—**Cryptomelane**, **Psilomelane**, etc.

SALTVILLE, flats area—well preserved **fossils** (cavities filled with sparkling crystals of Apatite and Calcite).

SUGAR GROVE: ① area mines—**Rhodonite**; ② the Sugar Grove Mine (200 yds. N of the South Fork of the Holston R. and ½ mi. NW of the Holston Grove School) —**Calcite**, **Dolomite** crystals, **Fluorite**.

SPOTSYLVANIA COUNTY

BROKENBURG, in dumps of Edenton Mica mine ½ mi. E of town and Hwy. 208—**Beryl**, **Feldspar** and **Quartz** crystals.

CHANCELLORSVILLE: ① N 2 mi., area mines—gem **Kyanite**; ② WNW, into extreme NW corner of Co., near the Rappahannock R., oldest Gold mines in Co.—**Gold**.

POST OAK, SW on Rte. 208 to Co. line along the Anna R., the Edenton Mica Mine (reached also by 5½ mi. on US 522 and 5 mi. on Rte. 208 out of Mineral in Louisa Co.), on dumps—**Beryl**, **Feldspar** and **Quartz** crystals.

STAFFORD COUNTY

AREA, countywide excavations, pits, gravels, etc., occasionally found—gem **Vivianite**.

HARTWOOD: ① in area, the Eagle Mine (12 mi. NW of Fredericksburg in Spotsylvania Co.), extensively worked until 1894—**Gold**; ② mi. farther NW, the Rappahannock Mine operated before the Civil War—**Gold**.

MORRISVILLE, GOLDVEIN (on US 17 NW of Fredericksburg in Spotsylvania Co.), many area very old mines—**Gold**.

QUANTICO, area banks and gravels of the Potomac R. and area pits and excavations—**petrified** and **opalized wood**.

TAZEWELL COUNTY

NORTH TAZEWELL, a 30 mi. long area extending SW along the Clinch R. to region of Lebanon in Russell Co., deposits on S slope of Kent Ridge, many mines—**ocher**.

WARREN COUNTY

BENTONVILLE, just S, numerous old mines and prospect (oldest Copper exploration dist. in VA) —**Copper** minerals.

BROWNTOWN (village SW of Front Royal on the Skyline Dr.), huge outcrop (mineral rich, but collection not allowed from parkway) —**Biotite**, **Quartz** crystals (white smoky), gem **Unakite**.

FRONT ROYAL: ① area stream gravels (which drain the main outcrop area) —**Biotite**, **Quartz** crystals (white smoky), gem **Unakite**; ② E and S, many regional prospects and mines—**Copper** minerals.

RIVERTON, area outcrops—**Calcite** and **Quartz** crystals.

Virginia

WASHINGTON COUNTY

BRISTOL: ① on rd. through gap between White Top and Mt. Rogers, in rhyolite outcrop in vugs and pockets—**Calcite, Fluorite, Selenite, Siderite**; ② Hayters Gap area: (a) just N, in shale exposure—**pyritized fossils**; (b) 2 mi. distant on N bank of the North Fork of the Holston R., as crystals—**Calcite, Celestite**; ③ a rd. cut near jct. Of I-81 and Rte. 381, large sized crystals—**Calcite**.

GLADE SPRINGS, NW $4\frac{1}{2}$ mi., on N side of and about $\frac{1}{2}$ mi. from the Saltville branch of the Norfolk and Western RR, a mine—**Barite**.

HOLSTON, area extending NE from Plasterco to within 3 mi. of Chatham Hill in Smyth Co., many regional mine, quarries, pits—**Gypsum, Halite**.

WYTHE COUNTY

AUSTINVILLE: ① area, S part of Co., many active and inactive lead-Zinc mines over a broad region—**Aragonite, asbestos** (dumps only), **Calcite, Fluorite, Hemimorphite**, massive **Bornite, Marcasite, Smithsonite, Sphalerite**; ② the huge New Jersey Zinc Co. mines, on dumps—**Dolomite** crystals, **Marcasite**, gem **Pyrite** (massive), minerals of **Lead, Silver, Zinc** (most of the metallic minerals are sulfides); ③ E 10 mi., the Bertha Mine—**Barite, Calamine, Calcite, Cerussite, Fluorite, Galenite, Smithsonite**.

IVANHOE, area mines (both active and inactive) —massive **Bornite, Aragonite, Calcite, Fluorite, Hemimorphite, Marcasite, Smithsonite, Sphalerite**.

WYTHEVILLE, area sandstone Quarry—**Anatase**.



WASHINGTON

The Evergreen State in the far northwestern corner of continental America has a remarkable varied, bold and geologically interesting structure and topography. It resembles its neighbor Oregon to the south, but the general terrain is rougher and the climate moister, although the Coast Range is lower. As in Oregon, the Cascade Mts. divide the state into a timbered, wet, sea-grit western part and an eastern two-thirds that is arid, basaltic, and cut the great gorges of Columbia River and its tributaries.

Puget Sound, with its more than 300 forested islands, bisects the northern half of the western portion with its salt waters to create the Olympic Peninsula on the west. Here, in the Olympic National Park, one of the most rugged and inaccessible wilderness regions in America, Mt. Olympus rises 7,954'. It is sheathed in the lower regions with dense rain forests. To the south Grays and Willapa harbors reach far inland, surrounded by heavily timbered hills. Throughout the western portion, the gem and mineral collector will find road cuts and banks, stream beds and farmer's fields productive of highly prized **agateized clams** and **oysters**, along with other types of Miocene fossils. Gem locations too numerous to be listed are productive with **agate**, **carnelian**, **chalcedony** and **jasper**.

The Cascade Range stretches 230 mi. from the Canadian border to the Columbia Gorge that forms the Oregon state line. East of Tacoma, Mt. Rainier rises to 14,408', the highest point in Washington. Other glaciated volcanic cones crest the Cascade skyline, rising from sea level into the sky: Mt. Baker on the north (10,750'); and on the south Mt. Adams (12,307') and Mt. St. Helens (9,671'). These peaks are snow covered year-around. During the 30 million years of the Oligocene, Miocene and Pliocene epochs when the Cascades were rising, extremely fluid basic lavas poured from the volcanoes and from great fissures again and again to fill all preexisting valleys, lakes and swamps and bury residual granite knobs to depths of 500' to 3,700' under successive layers of basalt. The lavas covered much of the western parts of the state and almost all of eastern Washington, with overlap into Canada, Idaho and Oregon. The flows of basalt and the widespread holocausts of pulverized volcanic ash came in series, often separated by long geologic intervals of time during which soils formed great forests grow. Subsequently, the forests were buried under thick blankets of volcanic ash, rich in silica, or were destroyed by the fiery basalts. Eastern Washington is part of the 225,000 sq. mi. Columbia Plateau, one of the greatest expanses of raw lava in the world. Today's collectors find in the debris of the ash buried forest some of the best opalized and silicified woods in the world.

Throughout Oligocene and Miocene times, as the volcanoes poured out their own basalts along with suffocating clouds of ash, the Columbia River maintained its original westward course. The river carved the Columbia Gorge transversely through the rising formations of the Cascade Range, now many thousands of feet deep, while its principal tributary, the Wyoming Snake River, cut its own mighty chasm through the southwest corner of the state. Thus the sand and gravel bars of the Columbia River carry great quantities of gemstones, as well as prehistoric Indian artifacts. Tens of thousands of the finest arrowheads in America, chipped out of **agate**, **carnelian**, **jasper** and **obsidian** have been screened from the river sands. Notably rare fluorescent minerals pinkish **Sogdianite** and white hexagonal **Zektzerite** are found at Washington Pass.

There are so many mines scattered over the state that it is possible only to list the more important ones. A more complete reference is the *Inventory of Washington Minerals*, Parts I & II, by Marshall T. Hunting, Washington Div. of Mines and Geology, Bul. 37, 1956.

Washington

ASOTIN COUNTY

CLARKSTON: ① area sand and gravel exposures, and ② sand bars of the Snake R.—placer **Gold**.

BENTON COUNTY

COLD CREEK, NW 1 mi., area draws, washes, etc.—**opalized wood**.

PROSSER, all regional draws, washes, etc. of Horse Heaven Hills area—**opalized wood**.

CHELAN COUNTY

AREA: ① Horseshoe Basin and Railroad Creek dists., many mines—**Chalcopyrite, Galena**; ② mining dists. Of Bridge Creek, Lakeside and Pehastin, very many lode mines—**Gold**; ③ Negro Cr., N side, the Davenport property—**geodes, nodules**.

ENTIAT, LEAVENWORTH, many area mines—**Gold**.

PEHASTIN (Dist.), the Ivanhoe and Pole Pick mines—**Gold, Silver**.

WENATCHEE: ① regional lode mines—**Gold**; ② in Number One Canyon, area—**onyx**.

CLALLAM COUNTY

ARCH-A-WAT (W of Neah Bay on the coast), S along ocean beach to Shishi Beach (2 mi. NW of Point of Arches), placer sands—**Gold, Iridosmine, Platinum**.

DUNGENESS, gravels of the Dungeness R.—**agate, orbicular jasper**.

FAIRHOLM, 1 mi. NW of W end of Lake Crescent, area—**jasper**.

JOYCE, N: ① Agate Beach, and ② Crescent Beach, in beach gravels—**agate, chert, jasper**.

LA PUSH: ① area ocean beach gravels—**agate, jasper**; ② gravels of the Soleduck R. (extending NE to Sappho)—**agate, chert, jasper**.

OZETTE, gravels of the Ozette R. and Yellow Bank, placers—**Gold**.

SAPPHO, gravels of the upper Soleduck R.—**agate, orbicular jasper**.

CLARK COUNTY

AREA, the Bell Mt. Mine—**plasma agate, rock crystal**.

BRUSH PRAIRIE, area placer sands—**Gold**.

CAMAS, sandbars of the Columbia R.—placer **Gold**.

WASHOUGAL: ① area, and ② especially NE 2½ mi., area—**moss agate, Amethysts**.

COWLITZ COUNTY

CLOVERDALE, E 4 mi., area—fortification **agate, carnelian, chalcedony, geodes** (Amethyst lined).

GILMORE CORNERS, take Slightly rd. S until it turns E, continue E to first rd. S, take it to Walter Swift farmhouse, area to E—**bloodstone, carnelian**.

KALAMA, hills to E—fortification **agate, carnelian, chalcedony, geodes** (Amethyst lined).

KELSO, S, at base of cliffs along I-5—**agate** (containing water bubbles).

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ST. HELENS, area mines—**Copper** minerals, **Galena**, **Pyrite**.

DOUGLAS COUNTY

AREA, Columbia R. sands, placer—**Gold**.

BRIDGEPORT, area exposures—**Jadeite**.

WATERVILLE, area gravels. Pits, excavations, etc.—common **opal**.

FERRY COUNTY

AREA, the Belcher, Lone Star and Sanpoil dist., area mines—**Copper** minerals.

ARENEAS, Lyman Lake, the Crown Point Mine to W—**Gold**, **Quartz** crystals.

COVADA (Enterprise dist.), the Longtree and other mines and prospects, on dumps—**Stibnite**.

DANVILLE, area mines—**Gold**.

KELLER: ① area mines—**Cobalt** minerals; ② the Congress Mine—**Nickel** minerals.

NESPELEM, Columbia R. placer sands (between mouths of Nespelem and Kettle rivers) to S and E via Coulee Dam—**Gold**.

REPUBLIC: ① area mines, such as the Tom Thumb, Quilp, Lone Pine, Surprise, etc.—**Gold**, **Silver**; ② Granite Cr. area placer gravels—**Gold**.

WEST FORK, placer mines along Strawberry Cr. (tributary of the Sanpoil R.) — **Gold**.

FRANKLIN COUNTY

RINGOLD, area gravels of the Columbia R. benches—**agate**.

GRANT COUNTY

BEVERLY, in volcanic ash on slopes of Saddle Mts. S of hwy. From Beverly to Corfu, go S to Mattawa, then E 3 mi. and N (fee) —**opalized logs**.

GRAND COULEE, regional lava outcrops, in debris—**opalized wood** (logs).

MOSES LAKE, area of Moses Coulee, in regional lava outcrops—**opalized wood**.

QUINCY: ① area diatomaceous earth deposits (mined), as nodules—common **opal**; ② W 6 mi. on Rte. 10, area—**silicified wood**.

SCHAWANA, S, in the Saddle Mts., all washes, draws, surfaces—**opalized wood**. The wood weathers out of volcanic ash exposures, often as huge perfectly silicified logs.

TRINIDAD, area outcrops of lava—**opalized wood**.

GRAYS HARBOR COUNTY

ABERDEEN, on beaches and in stream banks all the way to Raymond—**flower jasper**.

MOCLIPS, N, along ocean beaches and in regional stream gravels—**agate**, **jasper**.

OAKVILLE, N 10 mi., regional rd. cuts and stream banks—**agatized** and **chalcedonized clams** and **oysters**.

Washington

JEFFERSON COUNTY

AREA: ① W central part of the Olympic National park at Mt. Anderson, elev. 7,326' (reached only by trail from rd. ends): (a) outcrops on mt.—rock **crystal**; (b) gravels of Rustler Cr. —rock **crystal**; ② central part of the park, near summit of Mt. Olympus (reached only by many miles of rugged trail) —rock **crystal**.

KALALOGH, area beach gravels—**agate, jasper**.

QUEETS, area ocean beach gravels—**agate, chert, jasper**.

KINGS COUNTY

AREA: ① Bear Basin, Devil's Canyon, and W side of Denny Mt. (above Denny Cr.) —rock **crystal**; ② the Great Republic Mine—**Stibnite**.

BARING, SW, the Climax claims—**Bornite, Chalcopyrite**.

BERLIN, 6 mi. distant at Money Cr., area lode mines—**Gold**.

ISSAQUAH, go S on Hobart rd. 3 mi., turn E on Tiger Mt. Rd. for 1½ mi. then N on dirt rd., go ½ mi. to E side of Fifteen-Mile Cr.—**amber**.

KITTITAS COUNTY

CLE ELUM: ① area: (a) Fish lake mining dist., area lode mines—**Gold**; (b) NE, in basalt flows—blue chalcedony **nodules**; ② E 8 mi. to US 97, then N toward Liberty: (a) 2 mi. N to old logging rd., park car, walk 1¾ mi. up RR track to old skid rd., area—**agate** (blue, large masses); (b) in canyon N of RR, sides and bottoms—blue **agate**; (c) Mineral Springs Camp, W on dirt rd. 5 mi. to Crystal Mt., area—blue chalcedony **geodes** (must be dug out); (d) N to Medicine Cr. rd., then W to end, park car, climb to summit of Red Top Mt. (elev. 5,300'), along summit of Teanaway Ridge—blue agate **geodes** (occur along entire route on both sides of rd. and including the parking area); (e) gravels of the Middle Fork of the Teanaway R.—**agate, chalcedony geodes**; (f) N to Ryepatch, all surrounding area—**agate**; ③ N 20 mi. and a little W, deposit—**Hematite**.

ELLENSBURG, N, in lava flows, weathering out—blue chalcedony **geodes**.

LIBERTY: ① old placer mining operations along Liberty Cr., abundant—**Gold**; ② N, along Williams, Boulder and Swauk creeks, placer and lode mines—**Gold**; ③ NE 2 mi., a 2 sq. mi. area of stream beds, washes and talus slopes—**agate, chalcedony nodules**.

VANTAGE: ① area: (a) almost entire E part of Co., (b) all region outside boundaries of the Petrified Forest State Park, (c) Columbia R. gravels and sands W and S of town for many mi.—**opalized and petrified wood**; ② S, in the Saddle Mts. (extending into Yakima Co.): (a) washes, etc.; and (b) Crab Canyon, area—**opalized wood**.

Klickitat County

ALDERDALE, N and E into the Horse Heaven Hills (extending E into Benton Co.), all regional cuts, canyons, hillsides, draws, washes, etc. —**opalized wood**. This range of hills of the Eocene Latah fm. Reveals exposures of whitish volcanic ash along some 120 mi., extending from Glenwood in the NW corner of Co. E across entire Co. and into Benton Co. with overlap into adjoining Yakima Co. on the N.

BICKLETON, CLEVELAND, all regional canyons, draws, slopes of the Horse Heaven Hills—**opalized and petrified wood**.

GLENWOOD (E end of the Horse Heaven Hills which extend N into Yakima Co.) —**opalized wood**.

GOLDENDALE, NE 20 mi. (and 2 mi. W), at Warwich, area—**agate, carnelian, jasper, opalized wood**.

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LYLE: ① E 2 mi., on area hillsides—**petrified wood**; ② 6 mi. distant along the Klickitat R., area—**petrified wood**.

ROOSEVELT: ① N, on steep hillsides of the Horse Heaven Hills—**opalized wood**.

LEWIS COUNTY

ADNA: ① W, along Rte. 6 to Lucas Cr. (tributary of the Newaukum R.), area rd. cuts, banks, etc. —**agate, carnelian, chalcedony, geodes, jasper, petrified wood**; ② take bunker Creek rd. N 4 mi., then W on Ceres Hill rd. 4 mi. to McCoy farm (fee) —**carnelian, petrified wood**.

CENTRALIA, regional stream gravels, cut banks, etc. —**agate, carnelian, chalcedony, geodes, jasper, petrified wood**.

DOTY: ① area lava outcrops—**Peridot**; ② gravels of the North Fork of the Chehalis E.—**agate, carnelian, chalcedony, geodes, jasper, petrified wood**.

FOREST, gravels of the Newaukum R. and its tributaries—**geodes, nodules**.

MARYS CORNER: ① area farm fields, stream gravels, etc. —**agate, carnelian, chalcedony, geodes, jasper, petrified wood**; ② Salmon and White rivers and all tributaries: (a) in gravels and banks, and (b) loose in soil of all farm fields in the drainage region—**agate, Salmon River carnelian, geodes**. This carnelian is clear and translucent deep red from 1" to 6" in dia.

MINERAL, area mines—**Realgar**.

MORTON, area Mercury mines—clear **chalcedony** (spotted with Cinnabar), **Cinnabar**.

PE ELL, regional stream banks and gravels—**agate, carnelian, chalcedony, geodes, jasper, petrified wood**.

TOLEDO, regional stream banks and gravels—**geodes, nodules**.

LINCOLN COUNTY

DAVENPORT: ① Hell Gate Bar (a few mi. above Sanpoil), and ② Peach Bar, area placer mines—**Gold**; ③ N 15 mi., area mines of the Crystal Dist., as prominent metal—**Silver**.

MONDOVI: ① N ½ mi., ② NW 1 mi., area lava outcrops—precious **Opal**; ③ NW 3 to 4 mi., lava outcrops—fire **Opal**.

OKANOGAN COUNTY

AREA, very many mining dists. In Co., located mostly on regional maps, both placer and lode mines—**Gold**.

LOOMIS, NW and W about 35 mi., near Cathedral Peak, area mines—**Wolframite**.

METHOW: ① area mines—**Stibnite**; ② Upper Methow Cr., area mines—**Chalcopyrite** (Gold and Silver bearing).

OROVILLE, N, Osoyoos Lake, area mines S of the Canadian boundary—**Copper** minerals, **Pyrite**.

RIVERSIDE, NE 7 mi.: ① just above mouth of Tunk Cr. (a tributary of the Okanogan R.), area—**Quartz** crystals; ② gravels of Tunk Cr.—**Corundum** (blue, pink), **Quartz** crystals, **Thulite** (pink Zoisite), **Plagioclase** (fluorescent).

TWISP: ① area lode mines—**Gold**; ② W, mines along the Twisp R.—**Chalcopyrite** (Gold and Silver bearing); ③ Myers Cr. dist.: (a) many area placers, (b) Mary Ann Cr. (tributary of Myers CR.), placers—**Gold**; (c) the Monterey and Yakima mines—**Galena** (Gold and Silver bearing); ④ the Squaw Cr. dist., many area mines—**Chalcopyrite** (Gold and Silver bearing).

Washington

WAUCONDA, numerous area lode mines—**Gold**.

PACIFIC COUNTY

BROOKLYN, area cr. banks, gravels and rd cuts of the Willapa Hills—agatized **fossil** shells.

LEBAM, area gravels of the Willapa R. —agatized **fossil** shells, **chalcedony**.

LONG BEACH and OCEAN PARK, area beach gravels, as pebbles—**agate**, **chalcedony**, **Quartz**.

RAYMOND: ① E along Rte. 6 to Pe Ell in Lewis Co., in every stream bed and bank along hwy. For some 40 mi.—**agate**, **carnelian**, **chalcedony**, **jasper**, etc.; ② S, at Greens Cr. (on Rte. 6 above Menlo), in stream bed and banks—**agate**, **carnelian**, **chalcedony**, **jasper**, etc.

PEND OREILLE COUNTY

METALINE FALLS, the Josephine Mine—**Smithsonite**.

NEWPORT: ① area stream gravels, pits, etc.—**Amethysts**; ② S, at Sacheen Lake, area around lake shores—**Garnets**.

PIERCE COUNTY

CLAY CITY, E 1 mi. on Siegmund ranch—**Amethyst**.

FAIRFAX (NW corner entrance to Mt. Rainier National Park), the Carbon R. mines—**Copper** minerals, **Pyrite**.

SKAGIT COUNTY

DIABLO, SE, the Thunder Creek Dist. (along Thunder Cr.), numerous area mines—**Silver**.

HAMILTON: ① along S bank of the Skagit R., deposits, mines—**Hematite**; ② Skagit R. gravel bars along entire length—placer **Gold**.

LYMON, S 10 mi., numerous mines on Bald Mt.—**Copper** minerals.

MARBLEMOUNT, 7 mi. above town, former mine—**Talc**.

SKAMANIA COUNTY

AREA, Gifford Pinchot National Forest at Table Mt., region W, NW and N of a line drawn between Mt. St. Helens and Mt. Adams (best reached from Cougar, Cowlitz Co. via FS rd.) —**agate**, **carnelian**, **chalcedony**, **jasper**, **Quartz** crystals.

SNOHOMISH COUNTY

DARRINGTON: ① area stream gravels—placer **Gold**; ② area lode mines—**Gold**.

GOLD BAR, placer sands along the Skykomish R.—**Gold**.

GRANITE FALLS: ① gravel and regional streams—**Gold**; ② area lode mines **Gold**.

INDEX, regional mines and prospects—**Bornite**, **Chalcocite**, **Chalcopyrite**.

MONTE CRISTO (Dist.), area mines—native **Arsenic**, **Arsenopyrite**, **Azurite**, **Chalcopyrite**, **Malachite**, **Melaconite**, **Pyrite**, **Pyrrhotite**, **Realgar**, **Scorodite**.

SILVERTON, area placer sands—**Gold**.

STARTUP, area mines—**Gold**.

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STILAGUAMISH (Dist.): ① area mines, and ② especially the Forty-Five Mine—**Arsenopyrite, Chalcopyrite, Gold, Pyrite, Silver, Tetrahedrite.**

SULTAN: ① area placer mines along the Sultan R. —**Gold**; ② mines on NE rim of the Sultan Basin—**Azurite, Malachite, Garnets.**

SPOKANE COUNTY

AREA, on the W flank of Mt. Spokane, 30 mi. NE of Spokane, the Daybreak Mine—**Autunite** (fluorescent).

CHATTAROY (N of Spokane on US 2), gravels of the Little Spokane R. for entire length N and S—**Garnets, Quartz** crystals.

SPOKANE, SE 12 mi., at Silver Hill, area prospects—**Cassiterite.**

STEVENS COUNTY

COLEVILLE: ① area mines, as chief Silver bearing ore—**Galena**; ② the Copper King Mine—**Chalcopyrite** (Gold bearing).

LOON LAKE: ① area Copper mines—**Azurite**, argentiferous **Cosalite, Huebnerite, Malachite, Pyrite**; ② NE 5 mi., scattered through exposures of Quartz veins—**Pyrite.**

MARCUS: ① area placers—**Gold**; ② Wilmot Bar, placer—**Gold.**

MYERS FALLS, ORIENT (Dists.), regional lode mines—**Gold.**

NORTHPORT, SE, near Deep Lake, area mines—**Hematite.**

SPIRIT, E in Cedar Canyon (best reached from Metaline Falls in Pend Oreille Co.): ① area mines—argentiferous **Cosalite, Wolframite**; ② in the adjoining Deer Trail Dist., the Silver Queen and Orchid mines—**Argentite, Cerargyrite.**

THURSTON COUNTY

BUCODA, take rd. S to Tono, then 5 mi. over hill to coal mine spoil piles, dig by creek bed, or go to right to dig under clay stratum—**agate, carnelian.**

WHATCOM COUNTY

AREA, E side of Co. and E of the S end of Ross Lake in the Pasayten Wilderness (a very rugged region open 4 to 5 months per year), numerous lode mines of the Slate Cr. and Barron Cr. watersheds (best reached from Mazama in Okanogan Co. via dirt rd.) —**Gold, Pyrite**, etc.

WHITMAN COUNTY

AREA: ① gravel and sandbars of the Snake R., placers—**Gold**; ② Bald Butte, S side, area draws, washes, etc.—**Smoky Quartz** crystals.

COLTON, in sandpit—**Smoky Quartz** crystals.

PULLMAN, NE 5 to 6 mi. (near the ID state line), area lava outcrops—fire **Opal.**

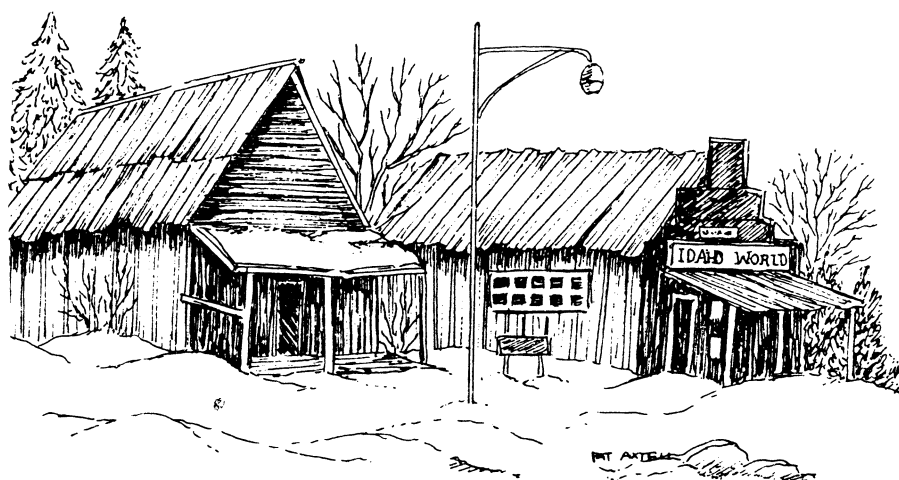
YAKIMA COUNTY

AREA: ① American R., ② Morse Cr., ③ Summit Dist., ④ Surveyors Cr., regional placer operations—**Gold.**

Washington

MABTON: ① all regional draws, washes, hillsides, breaks, etc.—**opalized** and **petrified wood**; ② regional stream gravels, placer—**Gold**.

SUNNYSIDE: ① NE 11 mi. on Rte. 241, area of S side of the Rattlesnake Hill—**opalized** and **petrified wood**; ② ENE, to the Yakima Ridge, E end of ridge at Cairn Hope Peak, area of S side (best reached from Cold Creek in Benton Co.) —**opalized** and **petrified wood**; ③ ESE, in the Rattlesnake Hills (extending E into Benton Co.), all regional draws, washes, canyons, hillsides, in volcanic ash exposures—**opalized** and **petrified wood**.



WEST VIRGINIA

West Virginia is an irregularly bounded state of many contrasts and spectacular scenery, much of which remains almost in the same primeval wilderness first encountered by the pioneers. With an average elevation above sea level of 1,500', the state ranks as the highest geographic entity east of the Mississippi River. It has a low point of 247' at historic Harpers Ferry on the Potomac River in Jefferson Co. and a high point of 4,860' at Spruce Knob in Pendleton Co., Near the Ridge Province east of the Allegheny Escarpment, where 15 counties expose fossiliferous Devonian strata. The rest of the state is covered by the Allegheny Plateau. The main range of the Allegheny Mountains runs in a series of rounded parallel ridges though the state from northeast to southwest, exposing igneous rocks most abundantly in Pendleton Co. and metamorphic rocks in Jefferson and Pocahontas counties.

More than half the state's 55 counties are occupied principally with coal mining or the production of oil and natural gas. Clay, sand, gravel, sandstone, limestone and slate help place West Virginia fifth in the nation in basic mineral production.

Unlike other states in the general Appalachian belt, West Virginia lacks metallic minerals in minable quantities. **Gold** was saltatorially found in the 1920's on a few farms in Tucker Co. Only one important alluvial Diamond has been found (a pale green crystal). While fossils abound throughout the exposed Silurian, Devonian and Mississippian formations, few gemstones have been found.

BERKELEY COUNTY

AREA, ① countywide limestone quarries (many flooded), in exposed levels and adjoining surroundings—**Calcite**, **Dolomite** crystals, **Quartz** crystals; ② 13 mi. W of the Blue Ridge, in the Slate Dist., regional pegmatites—**Muscovite**, **Pyrite**.

MARTINBURG: ① S 2 mi., limestone quarries, as gemmy crystals—**Calcite**, **Dolomite**, **Quartz**; ② N 3½ mi., on E side of US 11, active limestone Quarries—crystals of **Calcite**, **Dolomite**, **Fluorite** and **Travertine**.

BRAXTON COUNTY

STRANGE CREEK, deposit at mouth of Cr. of same name—**Siderite**.

CABELL COUNTY

BARBOURSVILLE, regional deposits along the Guyandot R.—**ocher**.

CLAY COUNTY

AREA, Standing Rock Run, some mines—**Siderite**.

CLAY, some mines along Little Sycamore Cr. (tributary of the Elk R.) —**Siderite**.

GRANT COUNTY

AREA, SE part of Co., at South Fork Mt., area prospects—**Hematite**.

MAYSVILLE: ① quarry on Rte. 42, in Tuscarora sandstone—rock **crystal**; ② Gosmer Gap, area deposits—**Hematite**; ③ Kline Gap, E, mined deposit—**Hematite**.

West Virginia

PETERSBURG: ① E 2 mi., an abandoned quarry crystals—**Calcite**, **Dolomite**, **Quartz** crystals; ② 6 mi. out on Rte. 28, in North Fork Gap, a limestone quarry—**Calcite**, **Celestite**, **Dolomite** crystals, **travertine**.

GREENBRIER COUNTY

AREA, around the Eckle School in fields, ditches, banks, excavations, etc.—**Calcite**, **Pyrite**, rock **crystal**, **Sphalerite**.

ALVON, area manganese mines—**Psilomelane** and other **Manganese** minerals.

FORT STRING, in the Acme Limestone Co. Quarry—**Calcite**, **Celestite**, **Dolomite** and **Quartz** crystals.

GLENMORE, area Oriskany formation Iron ores—**Hematite**, fossil **Iron** ore, **Manganese** minerals.

LEWISBURG, area at confluence of a small cr. (running parallel to Rte. 60) with the Greenbrier R.—**Quartz** crystals (smoky brown, perfectly terminated).

RENICK (Sta.), E 1 mi., abandoned quarry on hillside above RR along river—**Calcite**, **Fluorite**.

RONCEVERTE, W 4 mi., area—rock **crystal**.

WILLIAMSBURG, area excavations, stream gravels, etc.—red **silicified coral**, **Quartz** crystals.

HAMPSHIRE COUNTY

AREA, several exposures of the Keefer sandstone in Co.—**jasper**.

HANGING ROCK, S 1 mi., in outcrops of the Helderberg Ls.—rock **crystal**.

MECHANICSBURG, E 2 mi. on US 50, a quarry—**Calcite** and **Fluorite** crystals.

ROMNEY: ① S 3 mi., in gap in Mill Cr. Mt. on US 220, the Tonoloway Limestone Quarry—**Calcite**, **Dolomite** and **Quartz** crystals, **Celestite**, **chert**; ② N 4 mi. on Rte. 24 (where Poland rd. turns E), a quarry—**Barite** concretions, **Calcite**, **Pyrite**.

HARDY COUNTY

AREA, numerous Iron mines in Co., on dumps—**Iron** minerals, **jasper**, **Pyrite**.

BAKER, NW 5 mi., on E slope of Branch Mt., area—rock **crystal**, **Hematite**.

MOOREFIELD: ① S 4 mi. on US 220, rd. cut—**septarian nodules** (veined with Barite and Dolomite crystals); ② 2 mi. from Asbury Church to slopes of South Branch Mt., area—**Quartz** crystals.

PERRY, area mines—**Hematite**.

Wardensville: ① area mines—**Hematite**; ② SW 9 mi. on Rte. 55, quarry on hillside N of Lost R. near Baker Lime Plant—white **Calcite**, **Dolomite**, **travertine**; ③ S 5 mi. on the Waites Run rd., old mine dumps—**Hematite**, etc.

JEFFERSON COUNTY

AREA SE part of Co., turn N from Rte. 7 at Snickers Gap for 2 mi. on narrow rd., area rd cuts, fields, banks, etc.—**Amphiboles** (blue, green), **Quartz** (with Epidote).

CHARLES TOWN: ① E, at (a) the Moler Quarry (just W of village of Millville), and (b) 1 mi. N of village at the Martin Marietta Co. Quarry—**Dolomite** and **Quartz** crystals, **Pyrite**; ② SE 7 mi., on E bank of the Shenandoah R., the Howell Zinc prospect in limestone—**Dolomite** crystals, **Galena**, **Sphalerite**.

HARPERS FERRY, deposits along the Lost R.—**ocher**.

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RIPPON, S, near state line on US 340, a rd. cut through pegmatite—**Tourmaline, Zircon**.

SHEPHERDSTOWN: ① area mines or excavations—**Fluorite, ocher**; ② a nearby quarry—**Calcite, Fluorite**.

KANAWHA COUNTY

CHARLESTON: ① across South Side Bridge, then left onto Loudon Heights rd. to Connell rd., then 1½ mi. on to Woodvale Dr. and ¾ mi. to a sharp turn, area woodlands—**silicified wood**; ② W 4 mi. on Rte. 14 to Davis Cr. bridge, then along Davis Cr. rd. leading to the Berry Hills Country Club: (a) area stream banks and gravels—**petrified wood**; (b) soils and breaks in the timbered hills N of cr. —**petrified wood**.

MERCER COUNTY

BLUEFIELD, a quarry on US 21 By-pass—nodules of **chert** (jet black).

WILLOWTOWN, area quarries—**Calcite, onyx**.

MINERAL COUNTY

BURLINGTON, NW 1.9 mi., on Dry Run (off Mill Cr.), in outcrop of white Quartz—**Galena**.

KEYSER: ① SE 1 mi., area mines—**Hematite**; ② 1.6 mi. W of Short Gap, the Aurora Stone Co. Quarry (just E of crest of Knobly Mt.) —**Calcite** and **Dolomite** crystals, **Fluorite** cubes, **Sulfur** (in Calcite); ③ E along Rte. 46, on E face of Knobly Mt., a quarry—**chalcedony**, rock **crystal**, **Sphalerite**; ④ E, at foot of a mt., two quarries—**Calcite, chert, Dolomite, Celestite, Fluorite, travertine**, native **Sulfur**.

NEW CREEK: ① area, in angle between US 50 and US 220, a quarry—**Calcite, chert**; ② E 1 mi., prospects—**Hematite**, red **quartzite**.

RIDGELEY: ① S, at Cedar Cliff (on W face of Knobly Mt.), in limestone outcrop—blue **Celestite** crystals; ② S another mi., in RR cut on W base of Knobly Mt.—blue **Calcite** crystals.

MONONGALIA COUNTY

BARKER, area coal mines, especially the Connellsville Coal Co. No. 1 Mine—**Calcite, Marcasite, Pyrite, petrified wood**.

CASSVILLE, W, at heart of Scott Run—**opal** stalactites.

COOPERS ROCK, N 2½ mi., exposure—**Hematite** nodules, **opal**.

MORGANTOWN: ① NW 3 mi., at mouth of Scott Run—**Pyrite** concretions; ② S of Booths Cr., rd. cut on hillside, in coal seam—**Pyrite** with green **Melanterite**; ③ S 4 mi., at Uffington (on Rte. 73), in exposure of Brush Creek Sh.—**Siderite** nodules; ④ SE 8 mi., at Greer, area quarries—pink **Calcite** crystals.

WESTOVER, S from rd. to Everttville at Grant Chapel turn right down steep hill to Lock 13 (on the Monongahela R.), walk ¼ mi. to sandstone cliffs above RR, area—**Barite, Melanterite, Selenite, Siderite** nodules, **Sphalerite, travertine**.

West Virginia

MONROE COUNTY

ALDERSON: ① halfway along rd. to Blue Sulphur Springs, exposures along rd.—rock **crystal** (doubly terminated); ② soils and cuts in Frankford and Neff's orchard—**agate**.

SWEET SPRINGS, area of Moss Mt.: ① on summit, and ② on SE flanks, diggings—**chert** nodules, **Iron** minerals, **Manganese** minerals, **Psilomelane** (irregular nodules), **Quartz** crystals (clear, smoky).

UNION: ① area exposures and gravels along Turkey Cr.—**Quartz** crystals (with clay inclusions); ② the Fullen Bros. Farm, loose in soil—rock **crystal**; ③ slopes of a hill between town and Knobs, in rd. cuts—rock **crystal**.

MORGAN COUNTY

BERKELEY SPRINGS, NE, along Warm Springs Ridge (beginning 1 mi. NE of resort office and extending 4 mi. along US 522), in area glass sand quarries—**Calcite**, some **jasper**, **Pyrite** cubes, **Quartz**, **Selenite**.

ROCK GAP, 2 mi. N of entrance to Capapon Mt. State park, on side rd. off US 522, in a limestone quarry—**Calcite**, **Dolomite** and **Quartz** crystals.

PENDLETON COUNTY

AREA, many igneous dike exposures in heavily forested region (little explored)—igneous **rocks** and **minerals**.

FRANKLIN: ① W 4 mi. on US 33, near Friends Run in exposure of Oriskany sandstone—**chert**, **Quartz** crystals (clear, smoky); ② 7 mi. E of US 220 jct. with US 33, a quarry at Hively Gap on S side of rd.—**Calcite** crystals, **Celestite**, **Selenite** blades, **Sulfur**.

JUDY GAP, limestone quarry between US 33 and Rte. 28—**Calcite** crystals (enclosed in **Dolomite** crystals), **Quartz** crystals (smoky), **travertine**.

RIVERTON: ① E 3 mi. on US 33 to quarry near Seneca Caverns—**Barite**, banded **travertine**; ② N 4 mi. on Rte. 28, turn onto Mill Cr. rd. for 1.6 mi., the Germany Valley Limestone Quarry—**Fluorite** cubes.

SMOKE HOLE, area limestone cliffs—**fossils**, **geodes**, **Gypsum**, **Pyrite**.

POCAHONTAS COUNTY

EDRAY, E, off US 219 on the Clover Lick rd. to State Road Commission quarry—**Calcite**, **Celestite** (light blue), **Dolomite** crystals, **Fluorite**, **Gypsum** (chatoyant, nodules), **Anhydrite**.

HILLSBORO: ① just N of Mill Point, on N side of jct. of US 219 with Rte. 39, area—red **silicified corals**; ② S 2 mi., off US 219 along Locust Cr., gravels and banks—blue **silicified corals**.

HUNTERSVILLE, the Possum Hollow mine dumps (1½ mi. SE of Brown Cr. and 1 mi. back of Rte. 89), as gemmy nodules—**chert**.

MINNEHAHA SPRINGS, S 9 mi. on Iron mine dumps on SE slope of Beaver Lick Mt. —**Iron** minerals, **Psilomelane**.

RANDOLPH COUNTY

ELKINS: ① of US 219 on the Simmons farm, area—**Pyrite** cubes; ② the Paulina Limestone Quarry on US 33—**Calcite** crystals (pink, white).

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HARMAN: ① area exposures of the Greenbrier limestone—**Calcite**, **Dolomite** crystals, **Quartz** crystals; ② a local quarry—**travertine**.

HUTTONSVILLE, E 7 mi. on US 250, a quarry—**Calcite**, rock **crystal**, **Pyrite**.

VALLEY BEND, S 2½ mi. on US 219, in outcrop of gray sandstone—abundant **Pyrite**, carbonized **fossils**.

TUCKER COUNTY

PARSONS: ① outcrops of Quartz in Sissaboo Hollow—**Pyrite**; ② 8 mi. out at the Riley Moore farm on Clover Lick Run, in Quartz outcrops—**Pyrite**.

WETZEL COUNTY

NEW MARTINSVILLE, SW 3 mi., in sandstone exposures along the Ohio R.—**Muscovite**.



WISCONSIN

Bordered by rivers and lakes, the Badger State is laid on a foundation of Precambrian gneisses, granites, syenites and crystalline rocks of a hornblende, micaceous and chloritic nature. The oldest rocks are Eozoic in age, outcropping immediately south of Lake Superior, while a broad exposure of Upper Cambrian crystalline rocks occur throughout the west central counties. Ordovician formations from a crescent shaped belt extending from Green Bay in Brown Co. to the Illinois border and thence north to St. Croix Co. Silurian exposures extend all along the eastern part of the state, fronting onto Lake Michigan, while a very narrow strip of Devonian rocks outcrop between Sheboygan and Milwaukee.

The highest point in the state is Rib Mountain in Marathon Co. with an elevation of 1,941' above sea level. Low, rounded hills of the Keweenaw and Gogebic ranges—Ordovician dome uplifts of Precambrian rocks—stretch across the northern counties, rich in Iron ore. Topographically, Wisconsin was fashioned by the advance and retreat of all four periods of glaciation during the Pleistocene epoch. The state lends its name to the last great advance, which reached its maximum about 20,000 years ago and is still retreating from the Northern Hemisphere. Nevertheless, with some overlap into bordering states, nearly 10,000 sq. mi. of the southwestern corner escaped the ice. This driftless area was protected by the Keweenaw and Gogebic ranges, which effectively deflected the slow moving ice. Today, the Driftless Area presents many interesting examples of how the pre-Pleistocene land surfaces must have appeared throughout the northern states before the ice age.

The earlier Paleozoic formations which outcrop in numerous places reveal some carbonaceous beds, limestones and **Iron** ore deposits. Thus Iron mining has contributed a substantial amount the state economy.

Gemstones are quite commonly found in Wisconsin; perhaps the most abundant and intrinsically interesting species is the *Lake Superior agate*, which occurs in every county in almost every gravel deposit or pit, stream bed, excavation, mine or quarry. Wherever the agate is found, there too are usually fine **Quartz** crystals. Other gemstones frequently found are a brownish red to orange aventurine, a gemmy **Albite** peristerite known locally as *Wisconsin moonstone* or Labradorite. Along with these occur **Epidote**, **Rhodonite**, and **Unakite**. **Catlinite** (pipestone) is found in Barron Co. Metallic minerals often found, especially in the mining districts, include fine crystals of **Calcite**, **Galena**, **Marcasite**, **Pyrite** and **Sphalerite**.

A true gem that is found all over the state in glacial moraines, and most abundantly from the counties around Milwaukee, is **Diamond**. These alluvial crystals were brought into Wisconsin by the glaciers from an unknown source. The largest find was a 21 carat stone.

ASHLAND COUNTY

AREA, regional stream gravels—**agate**, **jasper**.

BUTTERNUT, W of town In schists and gneisses outcropping in W½, Sec. 14 and the NE Sec. 22, T. 41 N, R. 1 E. — **Kyanite**.

MELLEN, N, area of Copper Falls State Park, some—native **Copper**.

BARRON COUNTY

RICE LAKE, E 5 mi., area quarries—**catlinite**, gemmy **quartzite** (banded red & white).

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BAYFIELD COUNTY

AREA, stream gravels, pits, excavations—**agate, jasper**.

GRANDVIEW, area marble quarries—gemmy **marble**.

CHIPPEWA COUNTY

AREA, Penokee Gap (along the Chippewa R.), mixed ores in area mines—**Hematite, Magnetite**.

CHIPPEWA FALLS, area quarries and gravel pits—*Lake Superior* **agates, Quartz** crystals.

CLARK COUNTY

NEILLSVILLE, regional stream gravels of Co., particularly in the Black R. and its tributaries—**agate, jasper**.

OWEN, area gravels of pits, stream, etc.—**jasper**.

CRAWFORD COUNTY

PRAIRIE DU CHIEN: ① area quarries, stream gravels, excavations, etc. —**agate**;
② Mississippi R. beds, fresh water mussels—gem **pearls**.

DANE COUNTY

OREGON, SW 2½ mi., gravels of the Kettle Moraine—**Diamond**.

DODGE COUNTY

IRON RIDGE, MAYVILLE, regional mines—**Hematite**.

DOUGLAS COUNTY

AREA, sandstone exposures along the Annicon, Brule and Black rivers—native **Copper**.

GORDON, on banks of Ounce Cr., the abandoned Weyerhauser Copper mines, and dumps NW¼, SE¼, Sec. 12 (shafts No. 1 to 3) and SW¼, SW¼ (Shaft F), of Hwy. 27 on W on Denver rd. to "T" intersection with East Mail rd., turn S - pavement ends, another ½ mi. turn Left, then another ½ mi. Left again, go another mile over 2 small bridges, dumps ahead—brown **agate, Azurite, Bornite, Chlorite**, native **Copper, Diopside, Epidote, Malachite, Prehnite, Quartz**, native **Silver**.

DUNN COUNTY

COLFAX, area quarries—**fossils**.

MENOMONIE, area gravel pits and quarries—*Lake Superior* **agates**.

Wisconsin

EAU CLAIRE COUNTY

AREA, ① on the Eau Claire river at Big Falls Park, NW¼, SE¼, Sec. 13, T. 27 N., R. 8 W., in gneisses—**Alamandine** (in coarse anhedral masses), **Cummingtonite**, **Hornblende** & **Plagioclase**; ② in the Little Falls area of the Eau Claire River—**Beryl**.

FLORENCE COUNTY

AREA: ① in a pegmatite dike in NE¼, NE¼, NW¼, Sec. 22, T. 31 N., R. 17 E.—**Beryl** (as beige subhedral crystals), **Quartz**, **Spodumene** & **Zinnwaldite**; ② in a pegmatite dike in SE¼, SE¼, SW¼, Sec. 22, T. 39 N., R. 17 E.—**Albite**, **Beryl** (as beige crystals), **Columbite-Tantalite**, **Elbaite**, **Microcline**, **Muscovite**, **Triphylite**.

COMMONWEALTH, FLORENCE, mines in the W extension of the Menominee Range, especially in T. 40 N, R. 18 E, in beds of great thickness—**Hematite** (hard red Iron ore), **Limonite**.

FERN, near the Pine River in Sec. 22, T. 31 N., R. 17 E., as pale yellow crystals several centimeters long in a float boulder of granite pegmatite—**Beryl**.

FLORENCE, 5 mi. S at the Pine River Reservoir, in veins—**Quartz** with **Kyanite** & specular **Hematite**.

HOMESTEAD, S, in area schist exposure—**Chalcopyrite**.

GRANT COUNTY

BOSCOBEL, Wisconsin R. bed mussels—gem **pearls**.

CASSVILLE, regional gravel deposits, quarries, stream beds—**agates**, **Quartz** crystals.

CUBA CITY, area mines—**Barite**, **Calcite**, **Galena**, **Marcasite**, **Pyrite**, **Smithsonite**, **Sphalerite**, etc.

HAZEL GREEN, regional mine dumps—**Barite**, **Calcite**, **Galena**, **Marcasite**, **Pyrite**, **Smithsonite**, **Sphalerite**, etc.

MUSCODA, area quarries, stream gravels, pits, etc.—**agate**.

PLATTEVILLE, area mine dumps—**Barite**, **Calcite**, **Galena**, **Marcasite**, **Pyrite**, **Smithsonite**, **Sphalerite**, etc.

POTOSI, in beds in the Grant R., mussels—gem **pearls**.

TENNYSON, area mine dumps—**Barite**, **Calcite**, **Galena**, **Marcasite**, **Pyrite**, **Smithsonite**, **Sphalerite**, etc.

WERLEY, area mine dumps—**Barite**, dogtooth **Calcite** crystals, **Galena**, **Marcasite**, **Pyrite**, **Smithsonite**, **Sphalerite**, etc.

GRANT, IOWA & LAFAYETTE COUNTIES

REGION. The Lead and Zinc mines of these three counties constitute what is known as the Zinc Region, with very many active and inactive mines and sizable dumps—**Azurite**, **Barite**, **Chalcocite**, **Chalcopyrite**, **Cerussite** (a secondary mineral), flint **nodules**, **Galena**, **Marcasite**, **Pyrite**, **Smithsonite**, **Sphalerite**, etc.

GREEN COUNTY

MONROE, area mines—**Galena**, etc.

GREEN LAKE COUNTY

BERLIN, UTLEY, regional quarries—gem **rhyolite**.

IOWA COUNTY

COBB: ① W $\frac{1}{2}$ mi., in NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 2, T. 6 N, R. 1 E; ② SW 4 to 5 mi., at Centerville; and ③ N 5 mi., the Eberle Mine (on Rte. 80), on all dumps—**Aurichalcite**, **Azurite**, **Chalcocite**, **Chalcopyrite**, **Cuprite**, **Malachite**, **Smithsonite**, **Sphalerite**, etc.; ④ W 5 mi., Co. line mines around Montford (in Grant Co.) —**Galena**, **Pyrite**, **Smithsonite**, **Sphalerite**, etc.

DODGEVILLE, mines in E part of town—**Barite**, **Calcite**, **Galena**, **Marcasite**, **Nickel** minerals, **Pyrite**, **Smithsonite**, **Sphalerite**.

HIGHLAND, LIVINGSTON, MIFFLIN, all regional mines—**Barite**, **Calcite**, **Galena**, **Marcasite**, **Nickel** minerals, **Pyrite**, **Smithsonite**, **Sphalerite**.

LUDEN, area mines near Rte. 39—**Barite**, **Calcite**, **Galena**, **Marcasite**, **Nickel** minerals, **Pyrite**, **Smithsonite**, **Sphalerite**.

MINERAL POINT, area mine dumps—**Azurite**, **Barite**, **Calcite**, **Chalcocite**, **Chalcopyrite**, native **Copper**, **Galena**, **Malachite**, **Smithsonite** (fluorescent), **Sphalerite**, **Wad**, etc.

IRON COUNTY

AREA: ① regional sandstones and epodotized traprock, especially along the Montreal R.—native **Copper**; ② regional stream gravels, gravel pits, excavations, etc.—**agate**, **jasper**; ③ E side of Co., in the Penokee-Gogebic Range, as large ore deposit of soft red or brownish red consistency—**Hematite**, specular **Hematite** (hard, steely); ④ in a series of small outcrops in NE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec. 33—**Kyanite**; ⑤ in NE $\frac{1}{4}$, NW $\frac{1}{4}$, Sec. 23, T. 42 N.; R. 4 E.—**Almandite**, **Kyanite** (in subhedral crystals up to 3 cm. long with some quartz inclusions) & **Staurolite**; ⑥ in NW Sec. 3, T. 41 N., R. 2 E.—**Kyanite**.

HURLEY: ① the Montreal Mine, mainly NE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec. 33, T. 46 N., R. 2 E. (deepest Iron mine in the world, with shafts 4,000' deep), on dumps; ② E 1 mi., the Cary Mine, NW $\frac{1}{4}$, SE $\frac{1}{4}$, Sec. 26, T. 46 N., R. 2 E. — **Actinolite**, crystals of bladed **Barite** and bladed **Selenite**, **Braunite**, **Calcite** (cleavable masses), **Celestine**, **Dickite**, **Dolomite**, **Galena**, **Goethite**, **Gypsum**, **Hematite** (massive ocherous, coarse black botryoidal masses), **Manganocalcite** (pale pink up to 8 cm. across, fluoresces bright red under short UV), **Magnetite**, **Manganite** (lustrous, bladed), **Marcasite**, **Minnesotaite**, **Neotocite** (dark brown resinous masses), **Pyrite**, **Pyrolusite**, **Quartz**, **Rhodochrosite**, **Romanechite**, **Siderite** (massive), **Stilpnomelane**, **Talc** & **Vanadinite**.

MERCER: S of town in schists and gneisses in SE $\frac{1}{4}$, Sec. 35 T. 42 N., R. 3 E. —**Kyanite**.

POWELL, ① area mine dumps, in Sec. 28, 29, 32 & 33, T. 42 N., R. 4 E. —**Garnets**, **Kyanite**; ② in roadcut on Hwy. 182 W of Powell at SE $\frac{1}{4}$, SE $\frac{1}{4}$, Sec. 28 — **Almandite**, **Biotite**, **Kyanite**, **Muscovite**, **Quartz**, **Plagioclase**, **Sillimanite** & **Staurolite**.

SAXON FALLS, minerals occur in amygdules, groundmass and veins of basalt in the Kewenawan volcanic rocks along the Montreal River gorge, Sec. 20, T. 48 N., R. 1 E.—**Calcite**, **Chlorite**, **Epidote**, **Laumontite**, **Prehnite** & **Thomsonite**.

UPSON: ① roadcuts and outcrops along Hwy. 122 N of town, NW $\frac{1}{4}$, NW $\frac{1}{4}$, Sec. 32, T. 46 N., R. 1 E., in the Middle Proterozoic Potato River intrusion— **Augite**, **Clinopyroxene**, **Olivine**, **Picrite**, **Plagioclase**, **Titanomagnetite** & **Troctolite**; ② SE $\frac{1}{4}$, SE $\frac{1}{4}$, Sec. 19, T. 45 N., R. 1 E., in outcrops along the Potato River—**Ankerite/Dolomite**, **Chlorite**, **Hematite**, **Magnetite**, **Minnesotaite**, **Pyrite**, **Quartz**, **Siderite** & **Stilpnomelane**. ③ W of town along the Tyler's Fork River in the metamorphosed Ironwood iron formation, SE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec. 33, T. 45 N., R. 1 W.— **Ankerite/Dolomite**, **Chlorite**, **Hematite**, **Magnetite**, **Minnesotaite**, **Pyrite**, **Quartz**, **Siderite** & **Stilpnomelane**.

Wisconsin

JACKSON COUNTY

BLACK RIVER FALLS, E at the Jackson Co. Iron Mine, SE¼ Sec. 15, T. 21 N. R. 3 W., in biotite schist and talc schist associated with the iron formation—**Actinolite**, **Almandine**, **Andalusite**, **Biotite**, **Kyanite**, **Magnetite**, **Sillimanite**.

LA CROSSE COUNTY

LA CROSSE: ① area quarries, gravel pits, stream gravels—*Lake Superior* **agates**; ② bluffs of the Mississippi R. (along entire W boundary of state) —*Lake Superior* **agates**, **jasper**, occasional **Diamond**, **fossils**.

LAFAYETTE COUNTY

BENTON, SHULLSBURG, all regional mine dumps—**Barite**, **Calcite**, **Galena**, **Marcasite**, **Pyrite**, **Smithsonite**, **Sphalerite**.

MARATHON COUNTY

AREA, in the Stettin Pluton—**Nepheline** (fluorescent).

HALDER, W to jct. of Rte. 153 with rd. H, then N 1 mi., area outcrops—**Epidote**, **Unakite**.

WAUSAU: ① SW side of town, at Rib Mt. (1,941'), along rd. reading to summit—massive **Rhodochrosite**, **Quartz** crystals; ② N, to intersection called Little Yellow Schoolhouse, area pegmatite dikes—gemmy bright red **granite**, abundant **Albite** peristerite (*Wisconsin moonstone*); ③ at Anderson Bros. & Johnson Quarry—**Peristerite**.

OCONTO COUNTY

MOUNTAIN, S, in granite quarry—**Arsenopyrite**, **Chalcopyrite**.

TOWNSEND, N 3.3 mi. on Rte. 32, park by entrance to old trail, walk 500 yds. To a Quartz outcrop—**Quartz** crystals, specular **Hematite**. A giant quartz outcrop known locally as McCauslin Mt. extends for 20 mi. along the boundaries of Oconto, Forest and Marinette counties, 4 mi. wide, bounded on the W by Rte. 32, on the N by rd. C, and on the S by rd. F.

ONEIDA COUNTY

AREA, in the Lynn massive sulfide deposit, W of Rhinelander, in metamorphosed volcanic rock around an ancient hot spring—*Main ore* - **Calcite**, fine grained **Quartz**, **Talc**; *in stringers of sulfides in main ore* - **Chalcopyrite**, **Galena**, **Pyrrhotite**, and **Sphalerite** (amber colored); *rarer minerals found* - **Acanthite**, **Dyscrasite**, **Gold** and **Silver**, **Pyrargyrite**, **Tetrahedrite**; *in the country rock* - **Calcite**, **Cumingtonite**, **Diopside**, **Epidote**, **Garnet**, **Tremolite**.

OUTAGAMIE COUNTY

GREEN BAY, ONEIDA, SEYMOUR, regional stream gravels and gravel pits—gem **Rubies** and **Sapphires**.

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OZAUKEE COUNTY

SAUKVILLE, area glacial moraine gravels, occasional—**Diamond**.

PEPIN COUNTY

DURAND, area quarries and gravel pits—*Lake Superior* **agates**.

PIERCE COUNTY

DIAMOND BLUFF, in the area moraine gravels, occasional—**Diamond**.

ROCK ELM (Twp.), gravels of Plum Cr.—placer **Gold, Diamonds**.

POLK COUNTY

DRESSER, the Dresser Trap Rock Quarry, Sec. 5 & 6, T. 33 N., R. 18 W.—**Actinolite, Augite, Bornite, Calcite, Chalcocite, Chalcopyrite, Chlorite, Chrysotile, native Copper, Cuprite, Epidote & Hematite** (massive), **Ilmenite, Magnetite, Malachite, Orthoclase, Plagioclase, Quartz, Tremolite** and **Zoisite**.

PORTAGE COUNTY

STEVENS POINT, area mines—**Actinolite** asbestos.

RACINE COUNTY

BURLINGTON: ① area moraine gravels (in pits, excavations, etc.) —**Diamond**. ② In regional quarries along Rte. 83 all way to Waukesha are found **fossil** Crinoids and trilobites.

RACINE: ① area quarries, excellent specimens—gem **crystals, fossils**; ② the Ives Quarry (now flooded) —gemmy **Calcite** crystals, large bladed **Marcasite** crystals; ③ the Vulcan Materials quarry, 3 mi. N, next to the flooded Ives quarry, in limestone—**Calcite, Marcasite, Pyrite, Sphalerite, Wurtzite**.

RUSK COUNTY

LADYSMITH, the Flambeau Copper mine, in the Ladysmith 7½' quad., Sec. 9, T. 34 N., R. 6 W., 2 km. S of town, W on Hwy. 27, mine and on dumps—as country rock - **Actinolite, Andalusite, Biotite, Chlorite, Cordierite, Pyrite, Pyrophyllite, Quartz Sericite, Spessartite**; in the Primary sulfide zone - **Arsenopyrite, Biotite, Chalcopyrite, Electrum, Galena, Gold, Molybdenite, Pyrite, Pyrrhotite, Sericite, Silver, Sphalerite**; in oxidized zone - Hydroxyl **Apatite, Aurichalcite, Azurite, Copper, Cuprite** (massive and **Chalcotrichite**), **Goethite, Gold, Hematite, Illite, Jarosite, Malachite, Quartz, Rosasite, Silver, Tenorite-Melaconite**; Supergene enrichment zone - **Arsenopyrite, Bornite, Chalcopyrite, Covellite, Digenite, Dzhaldindite, Kolbeckite, Gold, Quartz, Tennantite**; Carbonate zone - **Ankerite, Aragonite, Arsenopyrite, Bornite, Calcite, Chalcocite, Dolomite, Hemimorphite, Quartz, Sericite, Siderite, Sphalerite**; Modern alteration minerals - **Chalcanthite, Halotrichite**.

SAUK COUNTY

AREA, the Baraboo, S, at Devil's Lake (State park), extensive Quartz deposit extending E toward Columbia Co., many regional quarries—*Lake Superior* **agates**.

Wisconsin

ROCK SPRINGS, N, at Ableman Narrows, in rd. cuts exposing quartzite, as fine pinkish crystals to 1" long—**Quartz** crystals on quartzite matrix.

SAWYER COUNTY

LORETTA, N on the S side of Blaisdell Lake in NW $\frac{1}{4}$, NE $\frac{1}{4}$, Sec. 16, T. 40 N., R. 4 W., in shallow excavations—**Kyanite**.

OJIBWA, regional stream gravels of Co., especially along the Chippewa R.—**agate**, **jasper**.

SHAWANO COUNTY

TIGERTON, in gravels of the South Branch of the Embarrass R.—**Bertrandite**, gem **Beryl** crystals, **Quartz**, **Phenakite**.

WITTENBURG, in boulders—**Labradorite**.

TAYLOR COUNTY

AREA, The Bend deposit, a new deposit about 35 mi. SE of Ladysmith in the Chequamegon National Forest (currently not developed)—**Azurite**, **Bornite**, **Calaverite**, **Chalcocite**, **Chalcopyrite**, **Gold**, **Krennerite**, **Malachite**, **Petzite**, **Pyrite**, **Tetrahedrite**, (upper zone is copper rich, lower zone is gold rich).

VILAS COUNTY

AREA, in the narrows between Spider Lake and Island Lake in SE $\frac{1}{4}$, Sec. 13, T. 42 N., R. 5 E.—**Kyanite**.

WAUKESHA COUNTY

EAGLE, in gravels, pit, excavations in the Kettle Moraine—**Diamond**. This large glacial moraine extends N and NE $\approx$ 15 mi. and has been a source of many crystals.

MILWAUKEE: ① Estabrook Park (along the Milwaukee R.) —**Millerite** crystals (in **Calcite**); ② outside park boundaries, on W side of river—**geodes**; ③ Franklin Quarry—**Calcite** crystals, **trilobites**; ④ the Hartung Quarry—**trilobites**.

WAUKESHA, WASHINGTON, RACINE, OZAUKEE & DANE COUNTIES

REGION, all stream gravels and gravel pits in these southeastern counties, among the most abundant sources for alluvial crystals in America —**Diamond**.

WAUPACA COUNTY

CLINTONVILLE, area deposits—**ocher** (red, yellow).

WINNEBAGO COUNTY

OSHKOSH, the Lutz Quarry—**Calcite**, **Galena**, **Marcasite**, **Pyrite**, **Sphalerite**, **fossils**.

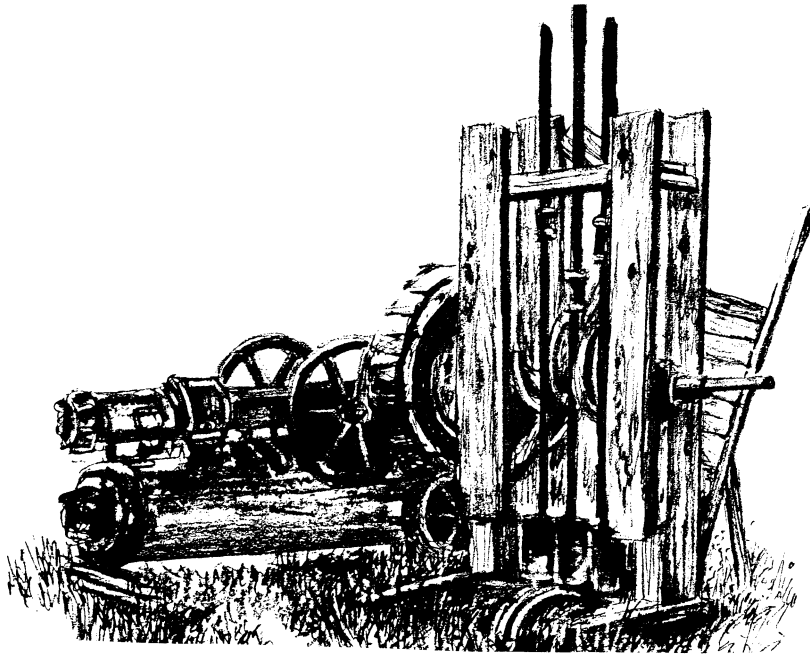
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WOOD COUNTY

AREA: ① central part of Co., in stream gravels: and ② on regional mine dumps of Co.—**agate, aventurine, quartzite.**

MARSHFIELD to WISCONSIN RAPIDS, a large and varied Quartz occurrence, in numerous sandstone quarries in contact zones of pre-Keweenawan igneous rocks and Upper Cambrian sandstones—gemmy colored **Quartz**, gem **aventurine.**

MILLADORE, area soapstone quarries—**Actinolite, Almandite** (crystals up to 1" associated with talc), **Brucite, Magnetite, serpentine, Talc.**



WYOMING

A state of many contrasts, from barren sagebrush covered deserts to high plateaus and perennially snow crested mountain ranges, Wyoming literally marks the western end of the Great Plains. From the South Dakota border, the Black Hills break westward into eroded badlands and sagebrush plains that sweep outward to the Powder River (*a mile wide and an inch deep*). Near the middle of this nearly square state the Great Plains end abruptly in the steep slants of the Big Horn Mts. Stretching 150 air mi. south from the Montana line and 50 air mi. broad, this mammoth fault block range divides the northern half of the state and crests in Cloud Peak (13,165') on the eastern edge of Big Horn County. The generally high tablelands of the southeastern Wyoming are interrupted by the snowy Laramie and Medicine Bow ranges, while western Wyoming is mostly high, rugged, practically impenetrable mountains that support the erratic Continental Divide. To the south the giant transverse range of the Unita Mts. looms along the skyline of Utah.

The character of western Wyoming was formed predominantly by extremely violent volcanic activity which followed the Laramide revolution of 100 million years ago, separating the Mesozoic and Cenozoic eons. Yellowstone National Park, where much of the later volcanism is evident, dominates the northwestern corner of the state. This geologically important park is guarded on its approaches by such great ranges as the Miocene conglomerate Absarokas on the east, the Gros Ventre and Wild River ranges on the southeast, and the Precambrian Tetons to the south.

In the central part of the state southwest of the Big Horn Mts., the strongly eroded, barren Owl Creek Mts. along the southwestern boundary of Hot Springs Co. reveal the entire geologic history of North America. Clearly defined exposures along the 20 mi. Wind River Canyon rise from the most ancient Precambrian schists, stratum by stratum, right up to the last Quaternary gravels in streams still flowing at full spring runoff—a time span exceeding 4 billion years. State highway markers along US 20 between Shoshoni in Fremont Co. and Thermopolis in Washakie Co. label the succession of formations, as layer by layer in the steeply dipping uplift as the road cuts sliced through them. This is quite possibly the only easily reached spot in the entire continent where all the major pages of geological history are readable in unbroken succession.

South of the glaciated Wind River that begins at the southeastern corner of Teton National park lies the Great South Pass, made famous by the Old Oregon Trail. Here, at either Atlantic City or South Pass City—both ghost mining camps immediately east of the Continental Divide—the gem and mineral collector finds themselves in the heart of the historic Gold mining, gemstone and petrified wood country 8,000' above sea level. To the east and south lies the vast Red Desert, with the heart of the famed Wyoming Jade fields at Lander in Fremont Co. Farther west on the sunset side of the Continental Divide lie entire mountains of fish fossils and widespread opalized and silicified forests containing uncounted stone stumps and tree trunks two to six feet in dia. These petrified logs contain cavities lined with Amethyst and Quartz crystals.

Nearly every county affords a wide variety of interesting gemstones, minerals and fossils. The plains and mountains have been prospected for minerals since 1842. Probably the first mineral actually mined was Hematite ore. Modern commercial minerals which contribute to the state's economy include oil and gas, great reserves of coal, **Gypsum**, **Bentonite**, ceramic **clays**, glass **sand** and **Uranium**. Wyoming is also a minor Gold producing state, primarily from Douglas Creek and the Atlantic City-South Pass City mines in Fremont Co.

ALBANY COUNTY

AREA: ① extreme NE corner of Co., 8 mi. NW of Laramie Peak (10 mi. SW of Esterbrook in Converse Co.), in SE corner of T. 28 N, R. 73 W, the Hoosier Group (of mines)—**Chalcocite, Chalcopyrite**; ② Sportsman Lake, E 1 mi., a prospect—**Gypsum**.

COMO BLUFF: ① in N½ Sec. 35, T. 23 N, R. 77 W, extensive deposit—**Gypsum**; ② N side of US 30 / 287 and near adjoining Carbon Co. line, area—petrified **dinosaur bones**. Here is the site of the dinosaur graveyard discovered in 1877 and considered the most prolific fossil bed ever discovered for reptilian remains.

CUMMINS CITY, SW ½ mi., the Copper Queen Mine—**Chalcocite**, native **Copper, Cuprite, Tenorite**, etc.

HOLMES: ① the Rambler Mine—**Barite, Lorandite** (deep red crystals), **Orpiment, Realgar**; ② Grand Encampment Dist., area mines and prospects—**Azurite, Malachite**.

JELM (Boswell): ① S end of Jelm Mt., in Sec. 24, T. 13 N, R. 77 W, area mines—**Bismutite**, native **Bismuth**; ② W, in pegmatite in SE¼ Sec. 32, T. 13 N, R. 78 W, the Many Values prospect—**Muscovite, Fergusonite, Garnets** (pink euhedral, orange subhedral), **Tantalite**.

LARAMIE: ① numerous outcrops within city limits, abundant—**Gypsum**; ② NE 5 mi., outcrops, pure—**Gypsum**.

MARSHALL: ① area draws, washes, surfaces, etc.—**agate, opalized and silicified wood**; ② E and SE on E slope of the Laramie Mts.: (a) all regional draws, canyons, washes, etc.—**agate, chalcedony, jasper**, etc.; (b) in regional metamorphic rock exposures throughout the mts.—**Iolite** (a Cordierite).

RED BUTTES, area 1 mi. S of Red Buttes, a deposit—**Gypsum**.

RED MOUNTAIN, regional outcrops—**Gypsum**.

WOODS LANDING, just S of bridge in weathered brown mica schists, large number of low grade but interesting crystals—**Garnets**.

BIG HORN COUNTY

AREA: ① Big Horn Mts., Willet Cr., SE, two dikes—**Galena, Pyrite**; ② SE corner of Co., the Zeismann ranch, in SE¼ Sec. 34, T. 49 N, R. 89 W, a number of area outcropping beds—**Gypsum**.

BASIN, E at Stucco in T. 53 N, R. 94 W, area mines—**Gypsum**.

CLOVERLY, E, in Red Gulch, interbedded deposits in 125' thick stratum of red shales—**Gypsum**.

FRANNIE: ① E 8 mi., a deposit in the Thermopolis Formation—**Bentonite**; ② the Silver Tip Coal Mine in Sec. 29, T. 58 N, R. 100 W—**Bentonite**.

GREYBULL: ① N, the Wyo-Ben Mine—**Bentonite**; ② NE, the Magnet Cove Mine—**Bentonite**; ③ N 3 mi., on N side of Shell Cr., in a 47' thick bed—**Gypsum** (The red sandstone beds that encircle Sheep Mt. to the N and extending E to the base of the Big Horn mts. contain many nearly pure deposits of gypsum, usually at the base of the Chugwater fm.); ④ E: (a) 10 mi., at the Reeves ranch, in SE¼ Sec. 11, T. 52 N, R. 92 W (3 mi. SE of the Shell Cr.), in the Morrison fm.—**Uranium** minerals (often found in petrified dinosaur bones); (b) all the badlands region stretching E of the Big Horn R. to the Big Horn Mts., regional draws, washes, outcrops, etc.—**gastroliths**, petrified **dinosaur bones**, marine **fossils** (Jurassic age); ⑤ N 18 mi., in T. 54 N, R. 95 W, an outcrop 1 mi. long—**Bentonite**.

HYATTVILLE, numerous outcrops and beds in surrounding region—**Gypsum, dinosaur bones, gastroliths**, marine **fossils**.

LOVELL: ① S 3 mi., various ranges of low barren hills, scattered deposits and mines—**Calcite, Gypsum**; ② SE 3 to 10 mi., on W hogbacks and low buttes surrounding Sheep Mt.—**Gypsum**, marine **fossils**; ③ E and SE, extensive badlands region extending to base of

Wyoming

Big Horn Mts., regional draws, canyons, bluffs, etc.—**fossil** ammonites, cephalopods, **dinosaur bones, gastroliths**; ④ E 30 mi., to summit of Big Horn Mts., area of Bald Mt. City and the Medicine Wheel (see Sheridan Co.); ⑤ N 40 mi., the TX ranch (straddling the Montana line at E end of the Pryor mts.): (a) area surfaces along the crest of Black Canyon of the Big Horn R.—**concretions, Dry Head agate**; (b) The Little Mt. area in T. 58 N, R. 94 W (a long anticlinal ridge trending NW to SE between East Pryor Mt. in Montana and the main mass of the Big Horn Mts. in Wyoming, many area prospect and mines—**Metatyuyamunite, Tyuyamunite** (both associated with Calcite).

PAINTROCK, area along Paintrock Cr., in Upper Chugwater beds as deposits—**Gypsum**.

SHELL: ① W on US 14 to N trending dirt rd., then N several mi. to famed dinosaur beds—**dinosaur bones, gastroliths**, etc.; ② mouth of Shell Cr. Canyon, 12' thick bed—**Gypsum**.

CARBON COUNTY

AREA, large geographic triangle cornered by Rawlins on the W, Medicine Bow on the E and Lea-Kortez Dam on the N, all regional washes, draws, cut banks, etc.—**Jade**.

BAGGS: ① surrounding region, and ② Poison Basin area, many radioactive mines and prospects—**Coffinite, Ilsemanite, Meta-autunite, Pyrite, Schroeckingerite, Uranophane, Uraninite**.

ELK MOUNTAIN: ① area, extensive beds covered with Tertiary debris—**Gypsum**; ② N and NE, and to S of Sheephead Mt., the Rattlesnake Creek Syncline, numerous beds—**Bentonite**.

ENCAMPMENT (Dist.): ① SW 1½ mi., deposit—Amphibole **asbestos**; ② W, to 2 mi. NW of Bridger Peak (elev. 11,007') and about ¼ mi. E of rd. between Rudefeh and Saratoga, the Creede Mine—**Cobaltite, Erythrite, Linnaeite, Pyrrhotite**; ③ S 6 mi., a mine—**Bismuth** minerals, native **Bismuth**; ④ W, in the Sierra Madre: (a) many regional mines and prospects—**Copper** minerals; (b) head of Jack Cr., near the Continental Divide, the Leighton-Gentry prospect—**Cobalt** minerals.

MEDICINE BOW: ① E and SE, numerous exposures—**Bentonite**; ② W 1 to 3 mi., at base of the Mesaverde formation, a mine—**Bentonite**; ③ N, the Flattop Anticline (extending several mi. along the Little medicine Bow R.), many regional outcrops—**Gypsum**; ④ N 35 mi. (on Rte. 487 to jct., then NE on dirt rd.), petrified forest area in Shirley Basin—**opalized wood**.

SARATOGA: ① N, along both sides of Rte. 130 all way to Walcott, regional draws, washes, surfaces, etc. —**opalized wood** (fluorescent); ② in the Saratoga Mts. at E end (about 6 mi. from the Buzzard ranch), on N side of the Ferris Mts. near Sand Pass, a mine—**Arsenopyrite**; ③ SW 19 mi., the Meta Mine—**Barite**.

SEMINOE, S of Freezeout Mt., in Chugwater beds in Sec. 11 & 14, T. 24 N, R. 79 W, deposits—**Gypsum**.

CONVERSE COUNTY

BILL, the Powder R. Basin, S area: ① in the monument Hill Dist. Of the Dry Fork of the Cheyenne R., and ② S, in the Box Cr. Dist., many regional mines and prospects—**Uranium** minerals.

COLD SPRING, NE, in N end of the Laramie Mts., many mines and prospects—**Copper** minerals.

DOUGLAS: ① SW 12 mi., Moss Agate Hill, area slopes, washes, etc.—**moss agate, chalcedony, jasper**, etc.; ② SW 30 mi., the Copper King Mine (on Crazy Horse Cr.) —**Chalcopyrite**, etc.

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GLENROCK: ① E, in Boxelder Cr. Canyon, S of its jct. with the N Platte R., area surfaces, draws, etc.—chalcedony **geodes**, **Quartz** crystals; ② NE, in Sec. 20, T. 32 N, R. 75 W, the Stardust claim—**Chrysolite**, **Vermiculite**; ③ SW 15 mi., the Deer Creek Mine (in Sec. 11, T. 31 N, R. 77 W, along the steep walled valley of Deer Cr. Canyon) — **Chromite**, **Kämmererite**, **Wolchonskoite**.

CROOK COUNTY

AREA, Warrens Peak, regional mines—**Azurite**, **Malachite**.

SUNDANCE: ① E, in the Black Hills, N section, many exposures—**Bentonite**; ② NW ≈ 8 mi., the Copper Prince Mine—**Chrysocolla**, some **Gold**, **Malachite**; ③ N 10 mi., in the Bear Lodge Dist. In the Black Hills National Forest, numerous mines—**Fluorite**, **Gold**.

FREMONT COUNTY

AREA: ① far S part of Co.: (a) in gravels of the Sweetwater R.—**agates**; (b) Long Cr., N of its jct. with the Sweetwater R.—**agates**, **Nephrite** jade; ② all SE parts of Co. N of the Sweetwater R., regional washes, draws, cr. beds, etc.—**agates**, **chalcedony**, **jasper**, etc.; ③ N of the Sweetwater R. in Twps. 30 & 31 N, Ranges 89, 90, & 91 W, all regional surfaces, draws, washes, etc.—*Sweetwater agates*; ④ Copper Mt., 14 sq. mi. between mt. and Cedar Ridge, numerous mines and prospects—**Uranium** minerals; ⑤ NW of the Granite Mts., area —**chalcedony**; ⑥ NW part of Co., the Bridger Dist., the Yankee Jack Mine, as fine specimen —**Argentite**, native **Bismuth**; ⑦ the Lucky Me Mine and the Pumpkin Buttes area—**Liebigite** (fluorescent).

ATLANTIC CITY-SOUTH PASS CITY, regional stream gravels, draws, washes, gullies, hillsides, etc.—**agate**, **chalcedony**, **Gold**, **Nephrite** jade, **jasper**, **Muscovite**, **Quartz** crystals, **agatized** and **opalized wood**, **Searlesite**, **Shortite** crystals, massive **Tourmaline**.

BURRIS, W, on slopes and in draws, washes, etc., of the NE flank of the Wind River Mts., many exposures—**Bentonite**.

FT. WASHAKIE, NW 10 mi., in broad area along both sides of US 287—**moss agate**, **chalcedony**, **jasper**, etc.

JEFFERY CITY: ① S, in Green Mts.: (a) area washes, draws, etc., and (b) N side of Beaver Divide, area—**agate** (banded, moss), **aventurine**, **Garnets**, **Sapphires**; ② E on US 287 to Co. line and corner where Fremont, Natrona and Carbon counties meet, all regional draws, washes, gravels, etc. —*Sweetwater agates*, **Nephrite** jade.

LANDER: ① region, including Cottonwood, Haypress and Warm Springs, heart of the famous jade region. The collecting region runs ≈ 140 mi. E to W and 60 mi. N to S, including parts of Carbon, Natrona, Sublette and Sweetwater counties. It takes in Farson (W of the Great South Pass), the Red Desert (S and SE of the South Pass in Sweetwater Co.), and Seminoe Dam and Alcova in Carbon Co.—**agate**, **jasper**, **Nephrite**. ② SE 40 mi. on US 287 to the Sweetwater R., entire area on both sides of river for many mi. —*Sweetwater agates*.

MARION, area gravels—**Rhodonite**, **Rubies**.

RIVERTON, gravel beds of the Wind R. and its tributaries—**agate**, **chalcedony**, **jasper**, etc.

SHOSHONI: ① NE 15 mi. (20 mi. SE of Thermopolis in Hot Springs Co.) and E of the Wind R. Canyon, pegmatite outcrops—**Aquamarine**, **Beryl**, **Feldspar** crystals, **Muscovite**; ② NW many mi. via dirt rds., to W end of Owl Creek Mts.: (a) the Abernathy deposit in Sec. 5, T. 7 N, R. 5 W (Wind River Meridian), and (b) Sec. 7, T. 42 N, R. 104 W (standard meridian), area mines—Amphibole **asbestos**.

Wyoming

SOUTH PASS CITY (4 mi. W of Atlantic City): ① area mines—**Gold**; ② Burnt ranch in the headwaters of the Sweetwater R., 10 mi. upstream, at point where the old Camp Stanbaugh rd. crossed the stream, abundant in stream gravels—**Garnets**; ③ SW, the Beaver Cr. deposit (5 mi. S of Beaver Hill in Sec. 19, T. 30 N, R. 100 W) —Chrysotile **asbestos**.

SPLIT ROCK, in schist on the Sweetwater divide—**Ruby**.

WARM SPRINGS, regional foothills and draws of the Wind R. Range—**agate**, **chalcedony**, **jasper**, **Nephrite** jade, **Quartz** crystals, **silicified wood**.

GOSHEN COUNTY

FT. LARAMIE, NW: ① in NW¼ Sec. 26, T. 28 N, R. 65 W, the Vaughn or Vulcan claims, as nodules—**Arsenopyrite**; ② in N central part of Sec. 35, the Savage claim, in pegmatite—**Beryl** (crystals to 4' long).

JAY ELM, regional land surfaces, draws, washes, gravels, etc.—**agate**, **Malachite**, **onyx**.

HOT SPRINGS COUNTY

AREA: ① regional quarries in Co.—**alabaster**; ② far W end of Co., along headwaters of Owl Cr., SE of the Washakie Needles, rich placer sands—**Gold**.

THERMOPOLIS: ① within city limits are numerous high, conical natural fountains flowing water sheets down sides, brightly colored—**Geyserite**; ② area along the Big Horn R., as colorfully formed high mineral bluffs and at short intervals between the river and Owl Cr.—**Selenite** crystals, **travertine**; ③ W 2½ mi., a deposit —**Gypsum**; ④ SW 18 mi., area mines—**Copper** minerals, **Limonite**.

JOHNSON COUNTY

BUFFALO: ① NE 12 mi., along both sides of US 16—**agate**, **chalcedony**, **gastroliths**, **jasp-agate**, **jasper**, **petrified wood**, **Quartz** crystals; ② E about 20 mi. on I-90, to region of Crazy Woman Cr. and the Crazy Woman Petrified Forest, general region—**opalized** and **silicified wood**; ③ SW, at head of the Kelley Cr., placer—**Gold**; ④ W about 40 mi. on US 16, to summit of Powder R. Pass in the Big Horn Mts. (elev. 9,666'), on a ridge just N of hwy. In SE¼ Sec. 4, T. 48 N, R. 85 W, mines—**Azurite**, **Malachite**, **Pyrite**.

KAYCEE, area mines—**Bentonite**.

LARAMIE COUNTY

AREA: ① the Adams Copper King Mine—**Barite**, **Copper** minerals; ② the Silver Crown Dist., area mines—**Copper** minerals, **Gold**, **Silver**; ③ NW corner of Co., in gravels of Chugwater Cr. (extending NE to Chugwater in Goshen Co.) —**Bloodstone** (heliotrope).

GRANITE CANYON, 4 mi. away in Sec. 25 & 26, T. 15 N, R. 70 W, area mines—**Copper** minerals, **Gold**, **Silver**.

IRON MOUNTAIN, area mines—**Iron** minerals.

LINCOLN COUNTY

AREA, all regional outcrops of the Green R. fm. In this and adjoining counties—**agate**, *turritella* **agate**, **chalcedony**, **chert**, **jasp-agate**, **Quartz** crystals, **petrified** and **silicified wood**.

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BORDER, area deposits, claims and mines within 3 mi.—**Orpiment**.

KEMMERER: ① badlands region along the Green R., ② especially along Hams Fork, and ③ all surrounding area breaks, washes, etc. —**agate**, *turritella agate*, **chalcedony**, **chert**, **jasp-agate**, **Quartz** crystals, **petrified** and **silicified wood**. ④ W 12 mi., a mountain containing—fish **fossils**.

NATRONA COUNTY

AREA: ① gravels of Sage Hen Cr.—**agate**, **chalcedony**, **jasper**, etc.; ② extreme SW corner of Co. in gravels of the Sweetwater R. especially in area 8 mi. E of Split Rock —*Sweetwater agates*.

CASPER: ① area quarries—**agate**, **alabaster**, **Amazonite**; ② 8 mi. out, at the Casper Mt. asbestos deposit in Sec. 16 & 17, T. 39 N, R. 79 W—Chrysotile **asbestos**; ③ S about 9 mi., the Haystack Range Dist. (covering about 2 sq. mi.), many pegmatite outcrops—**Beryl**, **Muscovite**, black **Tourmaline**; ④ W 40 mi.: 9a) gravels of Poison Spider Cr., and (b) washes, draws, breaks and gravels of a broad surrounding region—**agate**, **chalcedony**, **jasp-agate**, **jasper**, etc.

PARK COUNTY

AREA, the Brown Bear deposit in Sec. 19 & 20, T. 47 N, R. 116 W—**asbestos** (Amphibole, Chrysotile).

CODY: ① SW, a quarry—**Gypsum** (fluorescent); ② W 3 mi.: (a) along US 14 / 20, in Sec. 3 & 10, T. 52 N, R. 102 W, a mine on S side of the Shoshone R.—**Sulfur**; (b) along E side of Cedar Mt., from the Shoshone R. south for about 2 mi., as a terrace formed from mineral hot springs —**travertine**; (c) on N side of the Shoshone R. at foot of Rattlesnake Mt. in T. 53 N, R. 102 W, a deposit containing an estimated 25,000, kilo-tons—**Anhydrite**; ③ NW 4 mi., a mine—**Bentonite**; ④ NW $\approx$ 50 air mi., the Sunlight Basin Dist. (in the Absaroka Mts. and 35 mi. SE of Cooke City, MT): (a) area mines—**Copper** and **Lead** minerals; (b) regional draws, canyons, soils, etc.—**agate**, **chalcedony**, placer **Gold**, **jasper**, **petrified** and **opalized wood**; (c) Suphur Lake, near Sunlight Cr., in a NW to SE series of deposits—**Sulfur**. The Sunlight Basin region is exceptionally rugged and roads require much caution.

MEETEETSEE: ① area gravels of the Greybull R.—**agate**, **jasper**; ② S 38 mi., near headwaters of the North Fork of the Wood R., the Kirwin Mine (in T. 45 N, R. 104 W) —**Azurite**, **Barite**, **Chalcopryite**, **Cuprite**, **Galena**, **Gold**, **Limonite**, **Malachite**, **Molybdenite**, **Pyrite**, **Quartz** crystals, **Siderite**, **Specularite**, **Sphalerite**, **Stephanite**, **Tetrahedrite**.

PLATTE COUNTY

HARTVILLE: ① W, in regional draws, washes, flats, etc.—**agate** (seam, moss), **chalcedony**; ② region of the Hartville Uplift, $\frac{1}{2}$ mi. W of the highest peak of the Rawhide Buttes, the Copper Belt mines (the Omaha, Gold Hill and Emma claims) —**Azurite**, **Bornite**, **Chalcocite**, **Chrysocolla**, **Malachite**, etc.

SUNRISE: ① the N $\frac{1}{2}$ Sec. 7, T. 27 N, R. 65 W, a mine—**Barite**, **Copper** minerals; ② the Green Hope Mine in NW $\frac{1}{4}$ Sec. 26, T. 29 N, R. 65 W—**Arsenopyrite**.

WHEATLAND: ① area of the Cooney Hills, a large deposit—**Garnet**; ② to S and W along Hwy. 34—**moonstone**, **Labradorite**.

Wyoming

SHERIDAN COUNTY

SHERIDAN, W about 60 mi. on US 14 and 14A: ① dirt rd. turnoff to old mining camp of Bald Mt. City: (a) headwaters of the Little Big Horn R. (elev. 9,000'), mines in T. 56 N, R. 91 W, low grade free milling ores—**Gold**; (b) take USFS rd. to summit of medicine Rim (walk last ¼ mi. from parking space), W and N on the narrow limestone plateau, in crevices—**petrified coral**; ② area of Pass Cr. (near the Wyoming-Montana line), S to Little Goose Cr., a continuous outcrop—**Gypsum**.

SOAP CREEK, N of the North Platte R. in Sec. 24, T. 33 N, R. 81 W, bedded deposits—**Bentonite**.

SWEETWATER COUNTY

AREA: ① all regional exposures of the Green River formation—**agate, chalcedony, chert, jasp-agate, petrified and silicified wood, Quartz crystal, turritella agate**; ② mines on the E side of Lost Cr.—**Schröckingerite** (fluorescent).

EDEN, the Eden Valley (petrified forest area), loose in surface gravels of draws, washes, flats, etc.—*Eden Valley silicified wood* (coal black, silicified).

FARSON: ① gravels of the Big Sandy R. and all tributary gulches and draws (river is a dry water course); ② E and NE, widespread region of foothills, canyons, draws, flats, etc., of the distant Wind R. Range (no vehicles allowed)—**agate, chalcedony, chert, jasp-agate, jasper, Quartz crystals, Eden Valley silicified wood**, etc.

GRANGER, in talus debris of buttes along US 30 to Black Fork—*turritella agate*.

GREEN RIVER: ① W, along both sides of US 30 as far as Ft. Bridger in Uinta Co., broad region of draws, flats, washes—**agate, chalcedony, jasper, silicified wood**, etc.; ② at the FMC Mine as colorless crystals in a brown matrix—**Shortite** (fluorescent).

RINGER, W, along both sides of I-80 (including all side rds.) to Rock Springs: ① region of the Red Desert, and ② the vast expanses of the Great Divide Basin (both sides of the divide which here is literally flat with a completely imperceptible rise, elev. $\approx$ 7,000')—**agate, chalcedony, chert, jasp-agate, jasper, Quartz crystals, Eden Valley silicified wood**, etc.

ROCK SPRINGS, E, along I-80—**agate, chalcedony, chert, jasp-agate, jasper, Quartz crystals, Eden Valley silicified wood**, etc.

SUPERIOR, N 15 mi., slopes and draws of Steamboat Mt. (in the Leucite Hills)—**agate, chalcedony, jasper, petrified wood**.

WAMSUTTER: ① SW 3½ mi., along Bitter Cr., extending for 3 mi. as a ledge of lignite and shale—**Stechemigite** (Alum); ② S 8 mi., then to W—the famed *turritella agate* beds; ③ SW 15 mi., regional flats, draws, canyons, etc. of the Delaney Rim—*turritella agate*; ④ the Red Desert Mine—**Schröckingerite** (fluorescent).

TETON COUNTY

AREA, NE corner of Co.: ① region of the SW side of the rugged Absaroka Range, in draws, flats, canyon gravels—**opalized wood**; ② the Thorofare Wilderness, area stream gravels—**agate, jasper, opalized and silicified wood**.

MORAN, go S to Gros Ventre R., hike up bed 6 to 7 mi.—**Jade**.

MORAN JUNCTION: ① N, on Co. or USFS rds. to the Buffalo Fork of the Snake R. (about 35 mi. SE of Snake River on S boundary of Yellowstone National Park), area mines—**Copper** Mineral; ② N on US 89 / 287 to within 6 mi. of the south entrance of Yellowstone National Park, headwaters of Berry Cr. and 2 mi. E of the Teton Range watershed, a deposit—**asbestos** (Amphibole, Chrysotile); ③ E on US 89 / 287 to summit of Togwotee Pass (elev. 9,658): (a) SW 3 mi., the Black Rock Meadows (in T. 44 N, R. 110 W), a deposit—**Bentonite**; (b) S 10 mi., in Teton Canyon, area—**Bentonite**.

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UINTA COUNTY

AREA, NE corner of Co.: ① along Black Fork Cr.—**silicified algae**, *turritella* **agate**; ② regional outcrops of the Green River fm.—**agate** (common, *turritella*), **chalcedony**, **chert**, **jasp-agate**, **jasper**, **Quartz** crystals, **petrified** and **silicified wood**, etc.

EVANSTON, S 6 mi., and just W of Meyers Bridge in Sec. 30, T. 14 N, R. 119 W—**Bentonite**.

FORT BRIDGER, regional gravels (stream, flats, washes, etc.) —**agate** (common, *turritella*), **jasper**, **silicified algae**.

WASHAKIE COUNTY

TENSLEEP: ① NW 2 mi., along W side of No Wood Cr. and the N side of US 16, as well as in many other regional exposures—**Gypsum**; ② SE 12 mi., at the head of Bud Kimball Draw, a deposit—**Bentonite**.

WORLAND, broad regional bench gravels and sides and bottoms of regional draws, washes, etc.—**agate**, **chalcedony**, **jasper** (red, yellow), **quartzite**.

WESTON COUNTY

NEWCASTLE: ① SE, E and NE, along Stockade Beaver Cr., an extensive deposit—**Gypsum**; ② N 10 mi., in the valley 2 mi. SE of Mt. Pisgah, deposits—**Gypsum**.



Appendix A

Instability of Selected Minerals

EFFLORESCENT MINERALS

These minerals lose water of crystallization in dry air and should be kept in sealed containers.

Autunite	Laumontite
Borax	Melanterite
Chalcanthite	Torbernite
Colemanite	Trona
Halotrichite	Ulexite
Kernite	Zeunerite

DELIQUESCENT MINERALS

These minerals absorb moisture from damp air and may even dissolve into liquid, therefore it is recommended they be stored in dry containers.

Halite	Soda Niter
Hanksite	Sylvite
Melanterite	Thenardite

MINERALS THAT OXIDIZE OR TARNISH

Tarnishing cannot always be prevented, only reduced by keeping specimens in a stable dry atmosphere free of sulfur or acid fumes.

Argentite	Cinnabar	Malachite	Realgar
Arsenic Ores	Cobaltite	Marcasite	Silver
Bismuth	Copper	Niccolite	Smaltite
Bismuthinite	Crocoite	Proustite	Sphalerite
Bornite	Cuprite	Pyrargyrite	Stibnite
Chalcocite	Enargite	Pyrite	Sylvanite
Chalcopyrite	Iron	Pyrrhotite	Vivianite
			Zincite

MINERALS AFFECTED BY LIGHT

Apatite - pink variety loses color	Proustite - alters or turns gray
Argentite - photochemically alters	Pyrargyrite - grays or alters
Beryl - brown or orange types may change to pale pink	Quartz - colored var. (except citrine) become paler
Cerargyrite - changes color or becomes altered	Realgar - changes to orpiment
Cinnabar - changes color or alters	Spodumene - pinks become paler
Fluorite - green and purple types change color	Topaz - browns lose color
Orpiment - decomposes	Tyuyamunite - alters
	Vanadinite - darkens and dulls
	Vivianite - changes to dull bluish

Appendix B

Quartz Family Gemstones

Gemstone Name	Description
CRYSTALLINE QUARTZ VARIETIES	
Amethyst	Pale lavender to rich purple transparent crystals; may show color zoning
Apricotine	Yellowish red, apricot-colored quartz pebbles (Cape May, NJ)
Arkansas candles	Quartz crystals about six times as long as thick, in clusters (AR)
Arkansas stones	White porous rock filled with microscopic quartz crystals cemented with chalcedony; see novaculite (Hot Springs, AR)
Aventurine	Quartz spangled with mica flecks; variously colored; occasionally termed <i>crysoquartz</i> .
Binghamite	Crystalline quartz containing goethite replacements (MN)
Cairngorm	Scottish name for Smoky quartz
Cat's-eye	Quartz crystals with a silky luster from fibrous inclusions; somewhat translucent in green, gray, red, or yellow.
Citrine	Transparent pale to rich yellow quartz crystals; frequently showing smoky bands
Crocidolite quartz	Another name for Tiger's-eye
Crysoquartz	see Aventurine; an uncommon term
Dumortierite	Granular quartz with inclusions of dumortierite; blue, pink, purple, white-speckled
Falcon's-eye	Another term for Hawk's-eye
Gold quartz	Milky quartz containing gold inclusions; a rich commercial ore of gold
Green quartz	Transparent greenish quartz
Hawk's-eye	Transparent colorless quartz containing fine parallel fibers of blue crocidolite
Herkimer diamond	Usually pure, clear quartz crystals from Herkimer Co., NY which are many times doubly terminated

Appendix B

Gemstone Name	Description
CRYSTALLINE QUARTZ VARIETIES (cont.)	
Indian jade	Incorrect term for aventurine
Iris quartz	Clear rock crystal containing minute air-filled fractures which produce the effect of iridescence
Lake George diamond	see Herkimer diamond
Little Falls diamond	see Herkimer diamond
Madeira topaz	An amethyst which has been heat-treated
Middleville diamond	see Herkimer diamond
Milky quartz	Translucent to nearly opaque massive quartz, see also Gold quartz
Morion	Nearly opaque to deep black Smoky quartz.
Mosquito stone	Quartz containing minute dark inclusions; sometimes called mossy quartz
Novaculite	Trade name for quartz whetstones
Occidental diamond	Little-used name for rock crystal
Pincushion quartz	Clustered slender quartz crystals from Collier Creek Mine (Crystal Mt., AR)
Prase	Opaque, dark green quartz colored by inclusions of amphibole
Quartz cat's-eye	Light to dark grayish green crystalline quartz containing fibrous inclusions
Quartz topaz	Incorrect term for Citrine
Rainbow quartz	see Iris quartz
Regalite	A green quartz of white quartz with green veins; seldom-used term
Rock crystal	Transparent, water-clear quartz crystals with single or double terminations
Rose quartz	Pink or rose translucent quartz
Rutilated quartz	Transparent, sparkling quartz crystals containing needles of rutile

Appendix B

Gemstone Name	Description
CRYSTALLINE QUARTZ VARIETIES (cont.)	
Saganitic quartz	Transparent colorless quartz containing need-like inclusions of actinolite, goethite, rutile, tourmaline, etc. see Rutilated quartz.
Scotch pebble	Pebble chiefly of smoky quartz, but in general any variety of quartz pebble
Scotch topaz	Citrine or yellow quartz
Siberian amethyst	Trade name for deep reddish violet or purple amethyst (Twin Peaks, AZ)
Silkstone	Crystalline quartz containing fibrous goethite replacements; less pure than Binghamite
Sioux Falls jasper	A brown jasper-like fine grained quartz (Sioux Falls, SD)
Smoky quartz	Transparent to opaque smoky brown to black quartz crystal; see also Cairngorm and Morion
Smoky topaz	Incorrect term for Smoky quartz
Soldier's stone	Seldom-used name for amethyst
Sowbelly quartz	local Creede, CO ; name for amethystine quartz
Star quartz	Asteriated rose and clear quartz crystal
Thetis hair stone	Quartz crystal containing inclusions of green fibrous hornblende; see also Venus hair stone
Tigerite	Alternate name for Tiger's-eye
Tiger's-eye	Yellowish or yellowish-brown gem quartz pseudomorphous after crocidolite; colored by limonite
Topaz quartz	Recommended name for all topaz-colored quartz
Tourmalinated quartz	Transparent quartz crystal containing fine or coarse needles of tourmaline
Trenton diamond	see Herkimer diamond
Venturina	see Aventurine
Venus hair stone	Quartz crystal containing inclusions of reddish brown or yellow rutile fibers that appear to be tangled

Appendix B

Gemstone Name	Description
CRYSTALLINE QUARTZ VARIETIES (cont.)	
Water drop quartz	Quartz crystal containing inclusions of water drops or air bubbles
CRYPTOCRYSTALLINE QUARTZ GEMSTONES	
Agate	Endless varied; see Appendix C for nomenclature
Algae jasper	Bright-red jasper with cellular pattern (northern MN)
Amberine	Yellowish green chalcedony (Death Valley, CA)
Banded jasper	Jasper banded with contrasting colors
Basanite	Deep velvet-black amorphous quartz finer-grained than jasper; the “touchstone”; of the ancients “Lydian stone”, used by jewelers to test precious metals; not a gemstone
Black chalcedony	Dyed clear chalcedony popular for men’s jewelry; sometimes called “black onyx”
Bloodstone	Dark-green jasper spotted with blood-red specks
Boakite	Brecciated green and red jasper; a local name (NV)
Brecciated jasper	Jasper of mosaic pattern from resilicified fractured jasper fragments
Bruneau jasper	Local name for jasper found along Idaho’s Bruneau R.
Cape May diamond	Chalcedony pebbles in various colors from white to smoky found along the Cape may, NJ seashore
Carnelian	Red to orange chalcedony, often banded; translucent
Carnelian onyx	Any onyx with one or more alternating parallel bands being carnelian color
Cave Creek jasper	Jasper from Cave Creek area of Maricopa Co. near Phoenix, AZ
Chalcedony	Translucent (rarely transparent), gray, white, bluish, unbanded cryptocrystalline quartz; the mother of agate
Chert	White, gray to black unpatterned jasper
Chrysocolla	Bright blue chalcedony stained with copper minerals; see Appendix C

Appendix B

Gemstone Name	Description
CRYPTOCRYSTALLINE QUARTZ GEMSTONES (cont.)	
Chrysoprase	Bright yellow-green chalcedony
Creolite	Red and white banded jasper (Shasta and San Bernardino Co.(s) CA
Desert rose	Flower-like, flat, nodular form of chalcedony, pinkish, violet, some with carnelian centers, translucent to opaque, found in desert areas
Dinosaur bone	Agatized and jasperized actual bones and knuckles of Triassic and Jurassic dinosaurs (UT, CO)
Egyptian jasper	Orbicular jasper, similar to oregonite, found on the beaches of western Strait of Juan de Fuca, WA
Emeraldine	Green dyed chalcedony
False lapis	Chalcedony artificially dyed deep blue to resemble lapis lazuli
Ferruginous jasper	Lake Superior area jasper highly impregnated with iron oxide
Fish-egg jasper	Alternate name for Orbicular jasper
Flint	A mixture of quartz and opal, gray, brown to black, opaque; may resemble good-grade jasper
Flower stone	Chalcedony beach pebbles; more properly a “flower jasper” (S. CA)
Frost stone	Gray chalcedony (see Frost agate, Appendix C, but this is not an agate)
Gastrolith or “gizzard stone”	Any quartz family pebble that serves a dinosaur’s digestive process (Mountain states)
Green jasper	Jasper colored green by inclusions of iron silicate, chlorite, or chromite; an ornamental stone
Green onyx	Chalcedony dyed dark green; Emeraldine
Heliotrope	Dark green chalcedony spotted with red jasper
Iolanthite	Banded reddish jasper from central Oregon’s Crooked R.
Jasp-agate	A mixture of jasper and chalcedony, with jasper dominant

Appendix B

Gemstone Name	Description
CRYPTOCRYSTALLINE QUARTZ GEMSTONES (cont.)	
Jasper	Impure chalcedonic quartz, variously colored and patterned, opaque; varieties are jaspilite, moss, orbicular, banded, striped, ribbon, etc.
Jasperine	Uncommon name for banded jasper of various colors
Jaspilite	Bright red jasper alternating with black bands of specular hematite
Jasponyx	Opaque onyx in which some or all of the bands are jasper or jasper-like chalcedony; onyx
Kinradite	Trade name for jasper containing spherulites of nearly colorless to clear quartz (CA, OR)
Lavic jasper	Highly colored jasper (red with white markings) from near Barstow, CA
Moonstone	Incorrect term for chalcedony which exhibits a sheen; true moonstone is orthoclase feldspar
Morgan Hill jasper	Orbicular jasper from Morgan Hill, CA
Morrisonite	Local name for banded and colored chert occurring about 22 miles east of Ashwood, OR
Moss jasper	An incorrect term for petrified wood streaked with translucent quartz (AR, NM)
Myrickite	White to gray chalcedony containing red inclusions of cinnabar; named after "Shady" Myrick (Death Valley, CA)
Ochoco jasper	Jasper occurring around Ochoco Lake, east of Prineville, OR
Onyx	Chalcedony containing straight, parallel bands of strongly contrasting colors
Orbicular jasper	Jasper containing round spots or "eyes" of contrasting color; may be called kinradite or paradise jasper
Oregonite	An orbicular jasper, kinradite, occurring north of Holland, OR
Oriental chalcedony	Gray or white chalcedony, fine-grained, translucent
Oriental jasper	An alternative term for bloodstone
Paradise jasper	An orbicular jasper found near Morgan Hill, CA

Appendix B

Gemstone Name	Description
CRYPTOCRYSTALLINE QUARTZ GEMSTONES (cont.)	
Pastelite	A waxy jasper with large wavy areas of pastel browns, greens, pinks and reds (Mojave Desert, CA)
Petrified wood, coral, bone (agatized)	Organic fossil remains replaced with chalcedony, agate or jasper
Petrified wood (opalized)	Organic vegetal matter replaced by opal, opalite, etc.
Plasma	Semi-translucent green color, nearly opaque chalcedony, occasionally with white or yellowish spots
Point chalcedony	White or gray chalcedony containing tiny flecks of red iron oxide
Poppy jasper	Same as orbicular jasper
Poppy stone	see Orbicular jasper
Prase	Translucent light or grayish yellow-green chalcedony colored by needle inclusions of actinolite
Puddingstone (jasper)	A conglomerate of brecciated material occurring in the Lake Superior region
Ribbon jasper	Banded jasper with alternating ribbon-like stripes of contrasting colors
Rogueite	Local OR term for greenish jasper (Rogue R.)
Russian jasper	Jasper flecked with red
Sapphire quartz	Chalcedony of light sapphire blue to pale blue
Sard	Translucent brown to reddish brown chalcedony similar to carnelian
Sardoine	Carnelian of darker color than sardonyx
Sardonyx	An onyx-like chalcedony (or agate) with Straight parallel bands of brown to reddish brown, alternating with other colors; an onyx containing sard or carnelian in the bandings
Sard stone	Term used for both sard and sardonyx
Siliceous malachite	Green chrysocolla
Siliceous wood	Any petrified wood in which replacement of cells is with silica

Appendix B

Gemstone Name	Description
CRYPTOCRYSTALLINE QUARTZ GEMSTONES (cont.)	
Spherulitic jasper	Jasper containing quartz spherulites of contrasting color; usually an orbicular jasper
Stone Canyon jasper	A brecciated jasper from Stone Canyon (San Miguel, CA)
Striped jasper	Another term for banded jasper
Swiss jasper	Jasper dyed blue
Touchstone	Alternative name for basanite
Vabanite	Brown red jasper (CA)
White carnelian	White calcedony with faint reddish tints

Appendix C

The Various Names & Forms of Agate

Common Name	Description
Agatized wood	Petrified wood in which cellular matter has been replaced with agate, chalcedony or Jasper
Algae agate	Northern Minn. bright red jasper with cellular patterning; algae jasper
Auriferous agate	Uncommon light red stream pebbles of agate
Banded agate	Any agate with colors arranged usually in parallel bands (wavy, concentric, etc.)
Blood agate	Flesh red, pink, or salmon colored agate (UT)
Blue agate	Light sky blue to darker blue agate; rare
Botryoidal agate	Spherical “warts” of agate in the form of bunched grapes resting on a matrix of some other material
Bouquet agate	A very fine flower agate, with flower-like inclusions resembling arranged bouquets
Brecciated agate	Previously broken agate recemented by silica
Cat’s-eye agate	An opalescent agate giving a cat’s-eye effect
Chrysocolla agate	Blue green chalcedony
Circle agate	Agate with circular bandings
Cloud agate	Light gray, semitransparent chalcedony with larger spots and blotches of darker gray
Concretion agate	Agate found inside concretions; a general term
Coral agate	Agatized coral
Cyclops agate	An eye agate, showing only one eye
Dendritic agate	Agate with inclusion of iron or manganese oxide resembling moss, flowers, ferns, trees, etc.
Dot agate	White calcedony containing round colored dots
Dryhead agate	Highly colored fortification agate from the Dryhead area of northern WY and southern MT in the extreme north of the Big Horn basin

Appendix C

The Various Names & Forms of Agate (cont.)

Common Name	Description
Ellensburg blue agate	Pale blue agate from Ellensburg, WA area
Eye agate	Any agate banded concentrically about a dark center
Fairburn agate	Colorful fortification agate from an area east of Fairburn, SD
Fairhills agate	Similar to Fairburn agate but from the Black Hills, SD
Fire agate	A chalcedony containing limonite (or goethite), which gives an iridescent fire-like sheen
Flower agate	General term for moss agate; see also Bouquet and Plume agate
Fluorescent agate	An agate or chalcedony containing uranium mineral impurities which fluoresce
Fortification agate	Banded agates in which the bands resemble the angular structure of a fort; bands parallel but show acute cornering
Fossil agate	Any petrification (wood, coral, bone) in which cell replacement is with agate
Frost agate	Gray chalcedony containing white patterning resembling snow or frost
Glass agate	Exceptionally transparent agate or chalcedony
Grape agate	Wart-like clusters of small spherical mammillary agate growths attached to a matrix; botryoidal agate
Half-carnelian agate	Yellow agate
Hells Canyon agate	Fortification agate from Hells Canyon, SD; similar to Fairburn agate
Horse Canyon agate	A fine moss agate from Horse Canyon (Kern Co., CA)
Horsetail agate	Dendritic agate in which inclusions resemble a horse's tail (Nipomo, CA)
Iris agate	Banded agate exhibiting rainbow hues when thinly sliced and polished
Jasperated agate	A jasper mixed with agate; Jasp-agate (see Appendix B)
Keweenaw agate	Agate from Michigan's Keweenaw Peninsula; distinctive

Appendix C

The Various Names & Forms of Agate (cont.)

Common Name	Description
Lake Superior agate	Distinctive agate from the Lake Superior region and from some Iowa deposits of glacial till
Landscape agate	Gray or white chalcedony in which mossy inclusions depict rural landscapes
Macaroni agate	Milky quartz in chalcedony in which streamers have openings suggesting macaroni
Mammillary agate	Small spherulitic inclusions in agate, somewhat similar to grape agate
Mexican agate	Any agate from Mexico; highly colored and popular
Milk agate	Translucent chalcedony with a milky or cloudy effect
Montana agate (moss)	A notably scenic moss agate from southern Montana in which inclusions make black “scenes” against a usually reddish background; translucent to nearly transparent
Moss agate	Any translucent chalcedony, agate, or other cryptocrystalline quartz containing inclusions that show moss-like, flower-like, or treelike patterns, and fern-like or leaf-like designs
Nipomo agate	A sagenite agate containing marcasite inclusions (San Luis Obispo Co., CA)
Ochoco agate	Nodules or agate-filled thundereggs found in eastern OR; Ochoco jasper
Onyx agate	A banded agate in which the bands of contrasting colors occur in straight parallel layers; commonly black and white, black and red, white and red to brownish red
Oolitic agate	Agate containing grain-like inclusions resembling oolites: grape agate
Pagoda agate	Agate with markings like Chinese pagoda
Petoskey agate	Not an agate, but a fossil coral found around Petoskey, MI, and in other Midwest localities
Pigeon blood agate	A carnelian agate found near Cisco, UT
Pipe agate	Agate containing tube-like or pipe-like inclusions

Appendix C

The Various Names & Forms of Agate (cont.)

Common Name	Description
Plume agate	A moss agate with sagenite inclusions resembling plumes (OR, TX)
Point agate	see Point chalcedony in Appendix B
Polka dot agate	An Oregon agate containing opaque spots in a cream-like background; reddish brown, brownish black, or red spots
Pompom agate	A Texas sagenite agate containing inclusions resembling yellow to orange pompoms or chrysanthemums
Priday Ranch agate	Plume agate from Priday ranch near Willowdale, OR (Fulton Agate Beds)
Rainbow agate	see Iris agate
Redtop moss agate	Montana moss agate that is red at the top (or bottom, however cut) and containing dendritic inclusions
Ribbon agate	Agate containing ribbon-like bands of alternating color; differentiated from ribbon jasper by its translucency
Ring agate	Agate with concentric ring banding; less distinctive color contrasts than eye agate
River agate	Miscellaneous agate or jasper pebbles from stream gravels; a general term
Rose agate	Gray or rose banded agate from Brewster Co., TX
Ruin agate	Agate with fortification patterning resembling ruins; brecciated agate
Sagenite agate	Clear chalcedony containing tiny needled or inclusions of actinolite, goethite, rutile, tourmaline, etc., often densely packed
Sard agate	Sard or sardonyx
Sardonyx agate	Chalcedony in which straight parallel bands are of reddish brown to brown, alternating with other colors
Scenic agate	see Landscape agate
Seam agate	Agate found in thin veins in sedimentary rocks

Appendix C

The Various Names & Forms of Agate (cont.)

Common Name	Description
Seaweed agate	see sagenite or moss agate; inclusions resemble seaweed palms, fronds, etc.
Shell agate	Agate containing silicified mollusk shells
Star agate	Agate showing star-shaped figures, rather than “asterism”
State Park agate	Fortification agate similar to Fairburn agate from Custer State Park, SD
Sweetwater agate	Dark gray chalcedony nodules containing dendritic growths in star patterns; fluorescent; from WY
Tempskya agate	Agatized Tempskya tree fern; a petrified wood
Tepee Canyon agate	see Fairburn agate; from Tepee Canyon, SD
Texas agate	Any agate from Texas; more specifically a jasp-agate from Pecos River localities
Thunderegg agate	Agate filling of interiors of thundereggs, especially those occurring in central OR and in NM, usually banded, rarely carnelian
Thundereggs	Volcanic bombs or nodules filled with agate
Topographic agate	Agate containing markings resembling a topographic map; fortification agate
Tube agate	Agate containing tube-like inclusions that may be hollow; rather rare
Turritella agate	Agate containing silicified Turritella shells
Turtleback agate	Clear chalcedony exhibiting a layered effect, resembling a turtle’s back, when slabbed and polished
Union Road agate	Cream colored agate with pale red bandings; St. Louis, MO
Variegated agate	A moss agate, in which the inclusions and colors exhibit no pattern or scenes
Wart agate	see Grape agate; wart-like or mammillary protuberances or small spherical growths on colored agate
Wascolte	Part-agate with variegated designs (Wasco Co., OR)

Appendix C

The Various Names & Forms of Agate (cont.)

Common Name	Description
Wax agate	Yellow or yellowish red chalcedony of waxy luster
White moss agate	Agate with large blotches of white inclusions
Yellowstone agate	see Montana moss agate; from Yellowstone R. area
Zigzag agate	Brecciated fortification agate, re-silicified

Appendix D

The Various Names & Forms of Opal

Common Name	Description
Agate Opal	An opal, rather rare, with agate-like banding; some agate may be banded with opal
Agaty potch	Opalized potch in which parallel bands of different-color hues appears like the bands in agate
Amatite	Siliceous sinter; also called pearlite
Amber opal	Opal of golden or amber color
Angel stone	Silicified clay or sandstone often occurring just above a deposit of opal; often contains fractures permeated with precious opal
Azules	Mexican term for blue opal
Black opal	A costly opal in which the background color is dark gray to black, exhibiting subdued to brilliant fires; subject to cracking when sawed
Cachalong	A pale bluish white, opaque to semi-translucent, porcelain-like opal, sometimes banded with chalcedony; used for cutting cameos; cacholong is somewhat porous and readily absorbs moisture
Candlebox opal	General term for low grade opal
Chloropal	A green opal similar to prase opal
Common opal	Any variety of opal or opalite with no commercial value or real mineralogical interest
Fire opal	Transparent to translucent red to orange opal with or without any play of internal color
Flame opal	A fire opal containing brilliant red color plays in rather irregular streaks
Flash opal	A fire opal in which the play of color is dominant only when viewed in one direction
Gelite	A secondary accessory opal or chalcedony deposited usually in sandstone fractures
Glass opal	Another term for Hyalite

Appendix D

The Various Names & Forms of Opal (cont.)

Common Name	Description
Gold opal	Amber or golden opal
Harlequin opal	White opal with patches of close-set mosaics in color, like the clown suit of a harlequin
Honey opal	Honey colored opal, amber potch
Hungarian opal	Trade name for any white opal
Hyacinth	Reddish brown opal; not to be confused with the biblical essonite garnet (hyacinth)
Hydrophane	Opal which shows rainbow colors only when immersed in water
Jasper opal	Opaque common yellow brown opal resembling jasper; really a jasper in which the cementing agent is opal instead of quartz
Jelly opal	Colorless common opal; hyalite
Levin opal	Opal characterized by long, thin flashes of color
Light opal	Opal backgrounded in white, pale cream, or milky hues
Lithoxyl	Opalized wood showing the cellular structure
Mexican opal	Any opal from Mexico, especially the brilliant fire opal, of cherry red to orange fires; this is the only opal considered by jewelers to be a true “precious stone”
Milk opal	A pale cream or milky opal
Moss opal	Common opal containing black fern-like dendritic inclusions
Mountain opal	Opal occurring in igneous rocks of mountains; a general term
Noble opal	Same as precious opal
Onyx opal	Common opal with parallel bandings
Opal agate	An opal banded with alternating layers of opal and chalcedony
Opaline	Opal matrix
Opalite	impure colored varieties of common opal; opaque

Appendix D

The Various Names & Forms of Opal (cont.)

Common Name	Description
Opalized wood	Petrified wood in which the replacing mineral is common or, more rarely, precious opal
Opal matrix	The country rock surrounding an opal inclusion
Perlmutter opal	Common opal with a luster like mother-of-pearl
Pinpoint opal (pinfire opal)	A variety of opal containing pinpoints of fiery flashes; harlequin opal
Pipe opal	A naturally occurring opal cast of long, narrow, cigar-shaped steam vents in sandstone
Pitch opal	Yellowish to brownish common opal with a pitchy luster
Potch	A valueless, colorless opal; an Australian term
Prase opal	Opal colored green from chromium minerals; native to Australia, Brazil and Hungary
Precious opal	Any opal showing brilliant fiery plays of color; technically restricted to Mexican fire opal
Quincite (quinzite)	Rose colored common opal
Radio opal	Smoky common opal discolored by radiolaria or organic inclusions in the original gel
Red flash opal	Brilliant red precious opal, in which fiery flashes appear and disappear abruptly
Resin opal	Honey yellow to ocher yellow common opal having a resinous luster
Roebling opal	Proper name given to the largest (2,610 carats) known chunk of precious opal in the world, now in the U.S. National Museum at the Smithsonian. The Roebling opal is a piece of Virgin Valley opalized wood displaying brilliant red and green fire; it is sometimes called the Roebling black opal and is valued over \$250,000.
Rose opal	see Quincite
Rough opal	Any unpolished, field-run piece of opal; a general term
Rubolite	Reddish to red common opal

Appendix D

The Various Names & Forms of Opal (cont.)

Common Name	Description
Sobrisky opal	Opal occurring only at Lead Pipe Springs, near Death Valley, CA
Sun opal	see fire opal
Volcanic opal	see Mountain opal
Water opal	see hyalite; a misnomer for moonstone, which is orthoclase feldspar
Wax opal	Yellow opal with a waxy luster
White opal	Any precious opal with a light colored base
Wood opal	see Opalized wood
Yowah nuts	Small ironstone nodules containing precious opal

Appendix E

Fluorescent Minerals

Minerals which react to Ultraviolet Light can be categorized into three groups: Minerals which react to Long Wave Ultraviolet Light (with a frequency of about 254 nanometers), Minerals which react to Short Wave Ultraviolet Light (with a frequency of about 360 nanometers) and Minerals which react to both Long and Short Wave Ultraviolet Light. In many cases, there can be a color shift from one frequency to another, or in simpler terms, the mineral may appear a different color in one frequency than the other. Some of the listed minerals always fluoresce by most of the minerals listed on this table may only fluoresce from a couple locations. Caution should always be used with Ultraviolet Light. Use protective eye-wear or view through glass.

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Abernathyite	Yellow-green	Both	
Adamite	Green, Yellow	Long	
Aeschynite	Green	Both	Hg
Agrellite	Pink, Orange, Yellowish-orange	Both	
Albite	White, Violet-pink, Red, Yellow, Brown Blue, Violet, Tan, White Red, Pink	Both Long Short	
Allophane	Olive Blue, Pink, Blue-green Green, Yellow-green	Both Long Short	
Alamandite	Cream, Olive, Red	Both	
Alstonite	Peach weak Yellow weak Reddish-white	Both Short	
Aluminite	Cream, Yellow, White	Both	
Alunogen	Cream, Orange, Red pale Blue to White	Both Long	
Amblygonite	Cream, Yellow, Orange, Red weak Green	Both Short	
Analcime	Green, Yellow	Both	
Ancylite	pale Bluish-gray		
Andalusite	Yellow, Green	Short	
Andersonite	Greenish-white	Both	UO ₂ ⁺²
Anglesite	Yellow Pink	Long Short	
Anhydrite	Pink	Long	
Ankerite	Orange	Both	
Anorthite	Red, White, pale Blue	Both	

Appendix E

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Anthophyllite	Red, Peach, Cream	Both	Mn ⁺²
Antigorite	Blue	Short	
Apatite	Blue, Pink-orange, Violet Yellow Violet-blue	Both Both Long	Rare Earths, esp. Eu ⁺² Mn ⁺²
Apophyllite	Yellow Yellowish-green	Long Short	
Aphthitalite	Yellowish-white	Both	
Aragonite	Cream, Yellowish-white Pink Green White	Both Long Short Short	UO ₂ ⁺²
Arfvedsonite	bright Orange, Blue-pink		
Artinite	White	Both	
Ashoverite	pale White		
Austinite	White, Greenish-White	Both	(Phosphorescent)
Autunite	Green		UO ₂ ⁺²
Axinite	Red	Both	Mn ⁺²
Baddeleyite	Green	Both	Ti ⁺⁴ or U ⁺⁴
Bakerite	White	Both	
Barite	Yellow Bluish, Cream, Grayish, White	Both Short	
Barylite	Violet-blue	Short	
Barytocalcite	Blue White Red	 Both Short	
Bassanite	Violet	Short	
Bastnäsite	Green	Both	Hg
Bavenite	Yellow, Orange	Both	
Bayleyite	Green-white, Yellow-green		
Bazirite	Sky Blue	Short	
Becquerelite	weak Yellow-orange		UO ₂ ⁺²
Benitoite	Blue	Both	
Benstonite	Red, White Yellow	 Both	Mn ⁺²
Bertrandite	bright Green	Both	
Beryl	Yellow-orange, White	Both	

Appendix E

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Beryllite	Green to Green-gray Blue, Blue-white	Both Short	
Bityite	weak Yellowish-white	Short	
Blödite	White	Short	
Boltwoodite	weak Orange	Both	
Borax	Yellowish-white	Long	
Brannockite	bright Blue	Short	
Brewsterite	Cream pale Blue	Both Long	
Bromellite	Yellowish-white	Both	
Brucite	Bluish-white, Red	Both	
Burkeite	Yellowish-white	Both	
Burtite	Green		Ti ⁺⁴
Bustamite	Pink	Long	
Cahnite	White	Both	
Calcite	Green Red White Pink Red-orange, Blue Yellowish	 Both Both Long Short	UO ₂ ⁺² Mn ⁺²
Calomel	Orange-red	Both	Hg
Canavesite	weak Violet	Long	
Cancrinite	dull Orange Yellowish-white, white dull Violet, Greenish- white	Both Long Short	
Carnallite	Peach dull White	Long Short	
Carnotite	Yellow-green, Green	Short	
Cassiterite	Yellow	Short	
Catapleiite	Green Yellow	Both Long	
Celestite	White	Both	
Celsian	Blue	Short	
Cerussite	Yellowish-white	Both	
Cesstibtantite	Orange	Long	
Chabazite	Green	Both	
Charlesite	Bluish-white	Short	

Appendix E

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Chlorophane	Green	Short	
Chondrodite	Yellow Yellow-orange	Both Short	Mn ⁺²
Chrysoberyl	Red Yellow	Long Short	Cr ⁺³
Cleiophane	Blue	Long	
Clinochlore	deep Pink dull Orange dull Green	Both Long Short	
Clinohedrite	Orange	Both	Mn ⁺²
Clinohumite	bright Yellow-orange	Short	
Clinoptilolite	Green	Short	
Colemanite	Yellow, White, Cream	Both	
Collinsite	Yellow-brown, Cream pale Green	Both Short	
Cookeite	Pink, Blue-green, Cream	Both	
Corundum	Red	Long	Cr ⁺³
Cotunnite	Yellow-orange	Both	
Cowlesite	White to Gray	Both	
Creedite	White Blue	Long Short	
Cristobalite	weak red, Green	Short	
Cryolite (Kryolite)	White Pink	Long Short	
Cuprotungstite	Yellow, Greenish-white	Short	
Cuspidine	Yellow pale Yellow-orange	Long Short	
Danburite	Blue, Green, Yellow	Both	
Datolite	bright Yellow	Short	
Dawsonite	Bluish-white, White	Both	
Dewindtite	shades of Brown or medium Green	Long	
Diamond	Bluish-white	Both	N atom
Dickite	bright Blue-white	Short	
Diopside	Sky Blue	Short	
Dolomite	Yellow-orange	Both	
Dravite	Brown, Yellow	Short	
Dresserite	White	Short	

Appendix E

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Dumontite	Yellow-green		UO ₂ ⁺²
Dumortierite	Shy Blue	Short	
Dypingite	Light Blue	Both	
Edenite	Greenish-blue, Bluish-white, Greenish-gray	Long	
Elbaite	Blue	Short	
Elpidite	Yellowish-green	Short	
Enstatite	weak Bluish	Long	
Epsomite	pale Yellow	Long	
Erythrite	Orange, White	Long	
Esperite	Yellow	Both	Mn ⁺²
Ettringite	weak pale Blue	Short	
Euclase	dark Red, white Yellowish	Long Short	
Eucryptite	Red	Short	
Eudialyte	Red	Short	
Evansite	Tan, Yellow White, Orange Green, Violet	Both Long Short	
Ferrierite	brilliant Blue	Both	
Fersmite	Blue	Short	
Fluoborite	Pale Yellow	Short	
Fluorapatite	Orange, White	Short	
Fluorite	Violet, Yellowish Blue, Cherry Red Blue-violet Greenish, Whitish	Both Long Long	Eu ⁺² Organics and Rare Earths
Forsterite	Yellowish-white	Both	
Foshagite	Yellowish-white	Short	
Franconite	White	Both	
Fresnoite	bright Yellow	Short	
Gaidonnayite	Green	Both	
Gaylussite	weak Orange to Pink	Short	
Gearsutite	Pale Yellow	Both	
Genthelvite	Green	Both	
Gibbsite	Green White	Both Long	

Appendix E

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Glauberite	Yellow	Long	
Gonnardite	White	Short	
Gowerite	weak White	Long	
Greenockite	Orange-red, Yellow-orange		
	Yellow	Long	
Griceite	light Yellow	Short	
Guerinite	White	Both	
Gypsum	Yellowish, Green, Whitish		
Hackmanite	Orange-pink	Long	S ⁻² ion
Haiweeite	dull Green		UO ₂ ⁺²
Halite	Orange-red		Mn ⁺²
	Yellowish-white	Both	
Hambergite	Orange, Pink	Long	
Hanksite	Yellowish-white	Long	
Hardystonite	Purple	Short	
	Violet-blue	Both	
Harkerite	Weak Dark Red	Long	
Harmotome	Red, Orange, Yellow-orange, Blue-gray	Short	
Hawleyite	Weak Yellow	Long	
Haynesite	bright Green	Both	
Hedyphane	Yellow	Both	
Heinrichite	Greenish-yellow	Both	UO ₂ ⁺²
Helvite	Red	Both	
Hemimorphite	Green	Both	
Heulandite	Yellowish-white	Long	
Hodgkinsonite	Purple to Red	Long	
Hopeite	pale Yellow	Short	
Howlite	Shy Blue	Both	
Huntite	White	Both	
Hydroboracite	White	Long	
Hydrocerussite	White	Long	
Hydromagnesite	White to Yellow-green	Both	
Hydrotalcite	pale Yellow	Long	
Hydrozincite	Blue	Short	
	White	Both	

Appendix E

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Idrialite	Bluish, Greenish-white	Both	Organics
Jadeite	dark Green White	Both Long	
Jennite	Yellowish-white	Short	
Johnbaumite	Orange	Short	
Junitoite	pale Yellow	Long	
Karpatite	intense Shy Blue	Both	
Kenyaite	Yellowish-white	Short	
Kernite	Yellowish-white	Long	
Kogarkoite	Blue-white Green	Short Long	
Kurnakovite	Yellowish-white	Long	
Kyanite	Orange-red	Long	
Labradorite	Blue-violet Red, Pink, Blue, Yellow	Long Short	
Lansfordite	Violet Violet-blue	Long Short	
Lanthanite	Pink	Short	
Larsenite	pale Violet	Short	
Lazurite	Yellow, Orange, White Blue, Green	Both	
Leadhillite	Strong Yellow	Both	
Legrandite	Green	Both	
Leifite	Green	Short	
Leonhardite	weak White	Both	
Lepidolite	weak Yellow	Short	
Leucite	Yellow, Brownish-yellow Orange, White	Both	
Leucophanite	Blue, Pink	Both	
Leucosphenite	Yellow-white	Short	
Liebigite	bright Green-white	Both	UO ₂ ⁺²
Lorenzenite	Yellow	Short	
Magnesite	Bluish-white	Both	
Margarite	Bluish-white	Both	
Margarosanite	Sky Blue Violet-white	Short	

Appendix E

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Mashite	Cherry Red	Long	
Massicot	Yellow	Both	
Matlockite	Lemon Yellow	Both	
McAllisterite	weak Yellowish-white	Both	
Melanophlogite	White to Yellowish-white	Both	
Merwinite	Purple Violet-blue	Short Both	
Meta-ankoleite	Green	Short	
Meta-zeunerite	Yellow	Short	
Metalodevite	Green	Both	
Metamunirite	Pink	Both	
Metatorbernite	Green		
Meyerhofferite	Yellowish-white	Long	
Microcline	Red	Short	Pb ⁺² , Fe ⁺²
Milarite	Bluish-white	Short	
Mimetite	Orange, Red-orange, Pink, Yellow, White	Both	
Minehillite	Violet-blue	Both	
Minium	Orange	Both	
Miserite	Lemon Yellow	Short	
Monohydrocalcite	Green	Short	
Monteregainite	Green	Short	
Montroyalite	White	Both	
Mordenite	weak White	Both	
Mullite	Cram, Yellow	Both	
Nahcolite	Yellowish-white Bluish-white	Both Long	
Nasonite	Yellow	Short	
Natroalunite	weak White	Both	
Natrobistantite	Red-orange		
Natrofairchildite	Orange		
Natrolite	White	Both	
Natron	Yellowish	Both	
Nenadkevichite	Green	Both	
Nepheline	dark Red-orange	Both	
Newberyite	weak White	Both	

Appendix E

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Nicholsonite	White	Short	
Norbergite	Yellow, Orange-yellow	Both	
Norsethite	Orange dark Red	Long Short	
Northupite	bright Yellowish-white	Long	
Oligoclase	Blue, Violet-blue, dull Red	Long	
Olivine	Brown to Green dull Orange	Both Long	
Opal	Green	Both	UO ₂ ⁺²
Orthoclase	Purple, Red, Pink	Short	
Otavite	Red	Both	
Oyelite	Violet to White	Long	
Pabstite	bright Sky Blue	Short	
Parakeldyshite	Orange-white	Short	
Paraschoepite	bright Yellow-green		
Parawollastonite	Yellow Pale Orange	Long Short	
Pargasite	Yellowish-white	Short	
Pectolite	Pink Orange-pink Orange	Both Long Short	
Periclase	pale Yellow	Short	
Petalite	Cream, White, Yellow	Both	
Phenakite	Orange-red	Short	
Phlogopite	Yellow	Short	
Phurcalite	Yellowish-green	Both	UO ₂ ⁺²
Picropharmacolite	White	Both	
Pirssonite	White	Both	
Plombierite	Yellowish-white Blue-white	Long Short	
Pollucite	weak Orange bright Yellow, Blue-green Yellowish-white	Long Short	
Polyolithionite	Yellow	Short	
Powellite	Yellow	Both	WO ₄ ⁻²
Prehnite	Orange	Short	
Priceite	White	Both	

Appendix E

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Probertite	Lemon Yellow	Both	
Prosopite	Bluish-white	Both	
Pyrochlore	Yellow-green	Both	
Pyromorphite	Yellow	Long	
Pyrophyllite	Yellowish-white	Long	
Quartz	Green Yellow-orange	Both	UO ₂ ⁺²
Rabbittite	weak Green		UO ₂ ⁺²
Raspite	Olive	Short	
Remondite	Pink	Both	
Rhodizite	Yellow	Both	
Rhodochrosite	Pink to Red	Short	
Riversideite	Yellow	Both	
Roeblingite	Red Orange-red	Long Short	
Rosenhahnite	White	Both	
Rutherfordine	weak Yellow-green	Both	UO ₂ ⁺²
Sanbornite	White	Short	
Sanidine	Red	Short	
Sassolite	Blue	Both	
Scapolite	Yellow Orange, Pink Red	Both Long	Mn ⁺²
Scawtite	light pale Blue	Short	
Scheelite	Bluish-white, Yellow	Short	WO ₄ ⁻²
Schröckingerite	bright Green-white	Both	UO ₂ ⁺²
Searlesite	Orange Green	Long Both	Organics
Sellaite	Lemon Yellow Bluish-white Greenish-white, Pink	Both Long Short	
Senarmontite	Brown	Long	
Shortite	Yellow	Both	
Sillimanite	Yellowish Cream,	Both	
Sklodowskite	weak Yellow	Both	
Smithsonite	Pink, White Yellow Red, Blue	Both Long Short	

Appendix E

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Sodalite	Orange	Both	
Soddyite	dull Orange-brown	Both	
Sogdianite	Blue-white	Short	
Sphalerite	Blue, Pink, Red, Yellow Orange	Long Long	Mn ⁺²
Sphene	bright Yellow	Short	
Spodumene	weak Red, Violet	Short Long	Mn ⁺²
Spinel	Red	Long	Cr ⁺³
Stevensite	White to Yellow	Both	
Stilbite	weak White	Both	
Stolzite	bright Yellow	Short	
Strontianite	White	Both	
Sulfur	Orange	Both	
Sulphohalite	bright White, Yellow- white	Long	
Strunzite	Yellow	Long	
Susannite	Lemon-yellow	Both	
Svabite	Orange, Pink-orange	Short	Mn ⁺²
Swartzite	Yellowish-green	Both	
Szaibelyite	weak Yellowish-white	Long	
Talc	Yellowish-white	Long	
Talmessite	weak Green	Short	
Tarnowitzite	Yellowish-white	Both	
Terskite	Yellowish-white	Both	
Tetranatrolite	Pink	Both	
Thaumasite	dull White	Long	
Thenardite	White	Both	
Thomsonite	White	Both	
Thorite	Green, White	Short	
Thornasite	Green	Both	
Thulite	Yellow-orange	Long	
Tilasite	Pink, Yellow	Short	
Tincalconite	White to Yellowish-white	Both	
Tirodite	bight Red	Both	
Tobermorite	Yellowish-white	Short	

Appendix E

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Topaz	Yellow	Short	
Tremolite	Bluish-white, Yellowish-white Orange	Short	Mn ⁺²
Tridymite	Red	Short	
Trona	Yellow-orange	Both	
Tugtupite	Orange Red	Long Short	S ⁻² ion
Turneaureite	Orange	Short	
Tunellite	Yellow	Both	
Tveitite	Yellow-orange	Short	
Tychite	Yellowish-white	Both	
Tyuyamunite	Yellow-green	Both	
Ulexite	weak White	Both	
Uralolite	Yellowish-white Yellowish-green	Long Short	
Uranocircite	Yellow-green		
Uranospinite	Green	Short	UO ₂ ⁺²
Uvite	Yellow, Yellow-orange	Short	
Vanmeersscheite	strong Green	Both	
Variscite	Grass Green	Long	
Veatchite	Yellowish-white bright Bluish-white	Long Short	
Vesuvianite	White Yellow Green	Both Long Short	
Villiaumite	Orange Cherry Red	Both Short	
Vinogradovite	Red	Short	
Vuonnemite	Greenish-yellow	Both	
Walstromite	Orange, Pink	Both	
Wavellite	Yellow-orange	Short	
Weloganite	Pink Yellow	Long Short	
Wernerite	Yellow	Long	S ⁻² ion
Willemite	Green	Both	Mn ⁺²
Witherite	White	Both	
Wolframite	Yellow	Short	

Appendix E

Mineral	Color of Fluorescence	Wave Length	Activator (if known)
Wollastonite	Orange Yellow	Both Long	Mn ⁺²
Wulfenite	weak Red	Long	
Wurtzite	Red-orange Yellow	Long	Cd ⁺²
Xenotime	Orange-yellow	Short	
Xonotlite	White	Both	
Zektzerite	White	Short	
Zellerite	Green	Both	UO ₂ ⁺²
Zincite	Greenish-yellow	Long	
Zippeite	Yellow-green		UO ₂ ⁺²
Zircon	Blue, Green, White Yellow		Rare Earths Dy ⁺³ , U ⁺⁴ , other Rare Earths
	Yellow-orange	Short	
Znucalite	Green	Both	UO ₂ ⁺²
Zunyte	Cherry Red	Short	

Classification of Mineral Deposits

Deposits related to Igneous activity (with Temperatures ranging from normal surface conditions to 4,000 Atm. and 1,500°C+)

Magmatic Types (in and adjacent to intrusive igneous bodies or part of igneous bodies)

Early Magmatic

1. Igneous Rock — granites, etc., used as building stone.
2. Disseminations — Diamonds, Sapphires, Ruby.
3. Crystal Segregation — Chromite, Platinum, Magnetite.
4. Liquid Injection — *Kiruna*

Late Magmatic

1. Residual Liquid Segregation — Titaniferous dikes, Magnetite dikes; *Taberg, Sweden, Bushveld*.
2. Immiscible Liquid Segregation — *Insizwa, Sudbury*.
3. Liquid Injection (other than Pegmatites)
 - a. Residual Liquid Injections — *Kiruna, Adirondacks*
 - b. Immiscible Liquid Injections — *Vlackfontein, Bushveld, Sudbury*

Pegmatites

1. Simple
2. Complex

Contact Types & Pyrometasomatic Types

1. Genetic Types
 - a. Early (heat mainly)
 - b. Late (solutions mainly)
 - c. Mild Hydrothermal

Hydrothermal Types (Hot ascending fluids charged with igneous emanations)

1. Hypothermal (formed at great depth, in the temperature range of from 300°C to 500°C).

Appendix F

Hydrothermal Types (cont.)

2. Mesothermal (formed at considerable depth, in the temperature range of from 200°C to 300°C).
3. Epithermal (formed within 1 kilometer of the Earth's surface and in the temperature range of from 50°C to 200°C).
4. Leptothermal (formed at temperature depth and conditions between Mesothermal and Epithermal).
5. Bithermal
6. Xenothermal (formed at high temperature but shallow depth).
7. Telethermal (formed at shallow depth and relatively low temperatures, with little or no wall-rock alteration, presumably far from the source of hydrothermal solution).

Spring Deposits

Volcanic Types (in and adjacent to extrusive rock)

1. Sublimates — Antimony - Mercury.
2. Hydrothermal — Copper, Antimony, Mercury; Chalcedony, Calcite, etc.

Deposits related to Weathering, Erosion, Deposition and Ground Water Activity (Temperature & pressure relatively low)

Residual Concentrations at or near the surface

1. Mechanical — Gold
2. Chemical — Bauxite, Cuban & Superior Iron, Caledonian Nickel, etc.

Concentration by mobile agents at or near surface (water, wind, ice)

1. Mechanical Concentration on Surface.
 - a. Placers
 - Stream — Gold
 - Beach — Ceylon, Florida, Alaska
 - Eluvial — Malaysian tin
 - Aeolian — oolitic lime, gypsum
 - b. Other Mechanical Sedimentary Deposits
 - Gravels, Sand, Clay, etc.

Appendix F

Concentration by mobile agents at or near surface (cont.)

2. Chemical Concentrations at or near the surface mainly in bodies of water.
 - a. Evaporites
 - Marine — gypsum, anhydrite, salt, potash
 - Lake — salt, gypsum, borates
 - Groundwater — nitrates, aragonite, calcite, etc.
 - b. Other chemical sedimentary deposits
 - Iron formations
 - Manganese formations
 - Phosphate rock
 - Limestone
 - Dolomite
 - (etc.)
3. Chemical concentrations by groundwater at relatively shallow depths (supergene sulfide and oxide enrichment).
 - a. Enriched oxide zone
 - b. Enriched sulfide zone
4. Chemical concentrations by groundwater not included above.
Plateau type of Uranium, Vanadium and Copper deposits.
5. Lateral Secretion.

Biochemical Deposit (mainly in bodies of water)

Chalk
Diatomite
Coal
Iron formations
Phosphate rock
Oil
Manganese
(etc.)

Ideal Scheme of the Zonal Theory of Ore Deposits (associated with Batholiths)

It is understood that the whole succession would not likely be present in any one vein; that commonly several zones may be lacking, or changing conditions of pressure and temperature may superimpose one or more zones.

Earth's Surface

1. **Barren Zone**, often containing chalcedony, Quartz, Barite, Fluorite, etc. Some veins carry a little Antimony, Mercury or Arsenic.
2. **Mercury Zone**, quicksilver veins with chalcedony, Marcasite, etc. Some Barite - Fluorite veins.
3. **Antimony Zone**, Epithermal conditions, Antimony ores — Stibnite often passing downward into Lead, with Antimonides. Many carry Gold.
4. **Gold & Silver**, Epithermal conditions, bonanza deposits of the precious metals. Argentite, Antimony and Arsenic minerals common. Silver minerals, some Copper, Lead and Zinc sulfides, Quartz, Calcite, Rhodochrosite, Adularia, Alunite.
5. **Barren** — most nearly consistent barren zone, represents the bottoms of many Tertiary precious metal veins. Quartz, carbonates, etc., with Pyrite and small amounts of other sulfides.
6. **Silver Zone** — Argentite veins, complex Antimony Silver sulfides, Stibnite. Galena veins with Silver. Commonly silver decreases with depth. quartz gangue, Siderite common, often increasing with depth.
7. **Lead Zone** — Mesothermal conditions, Galena veins, commonly with some Silver, Sphalerite generally present, increasing with depth. Chalcopyrite common. Gangue is Quartz and often carbonates (of Fe, Mn and Ca).
8. **Zinc Zone** — Mesothermal conditions, Sphalerite veins with some Lead and Chalcopyrite, Quartz gangue.
9. **Copper Zone 1** — Mesothermal conditions, Tetrahedrite veins, commonly argentiferous, Chalcopyrite present. Some pass downward into Chalcopyrite. Enargite veins generally with Tetrahedrite and Tennantite.
10. **Copper Zone 2** — generally with Pyrite, often Pyrrhotite. The gangue is Quartz and in some cases carbonates. Some pass downward into Pyrite and Pyrrhotite with a little Chalcopyrite. Generally carry Silver and Gold.
11. **Gold Zone** — Hypothermal conditions, Gold veins with Quartz, Pyrite and commonly Arsenopyrite and Chalcopyrite. At places zones 10 & 11 are reversed.
12. **Bismuth Zone** — Hypothermal conditions, Bismuthinite and native Bismuth with Quartz and Pyrite.
13. **Arsenic Zone** — Hypothermal conditions, Arsenopyrite with Chalcopyrite and often Tungsten ores.

A Location Guide for Rock Hounds in America

14. **Tungsten Zone** — Hypothermal conditions, Tungsten veins with Quartz, Pyrite, Chalcopyrite, Pyrrhotite, etc. Arsenopyrite is commonly present.
15. **Tin Zone** — Hypothermal conditions, Cassiterite veins with Quartz, Tourmaline, Topaz, etc.
16. **Barren Zone** — Quartz with small amounts of other minerals.

General notes: Veins in the upper zones (2, 3 or 4) have rarely been developed below the barren zone (5). Nearly all of the zones below 5 have been observed at many places grading one into another. (above modified after W.H. Emmons)

Generalized Chart of Igneous Rock Types

Darker Color » » »	Light Colored Minerals with K Feldspar > 2/3 of the total Feldspar. Mainly K Feldspar, Quartz, and mica with minor amounts of dark minerals.	Mostly Light Colored Minerals with K Feldspar 1/3 to 2/3 of the total Feldspar. Mainly Feldspar, Quartz, and mica with minor amounts of dark minerals.	Light and Dark Colored Minerals (salt & pepper) with Na Feldspar > 2/3 of the total Feldspar. Mainly Na Feldspar, dark minerals, with some Quartz, and dark mica	Mainly Dark Colored Minerals with Ca Feldspar > 2/3 of the total Feldspar. Mainly Ca Feldspar, dark minerals, with little Quartz, and some Olivine	Dark Colored Minerals with little or no Feldspar. Mainly iron rich dark minerals and Olivine
Phaneritic (large crystal size)	Granites , Syenites and Nepheline Syenites	Quartz Monzonite , Monzonite and Nepheline Monzonite	Granodiorite, Quartz Diorite and Diorite	Gabbro, Diabase and Theralite	Peridotite , Dunite and Pyroxenite
Porphyritic (mixed large and very small crystals)	Granite Porphyry, Rhyolite Porphyry , Syenite Porphyry, Trachyte Porphyry, Phonolite Porphyry	Quartz Monzonite Porphyry, Monzonite Porphyry, Quartz Latite Porphyry and Latite Porphyry	Granodiorite Porphyry, Diorite Porphyry, Dacite Porphyry and Andesite Porphyry	Gabbro Porphyry, Basalt Porphyry and Theralite Porphyry	Peridotite Porphyry and Limburgite Porphyry
Aphanitic (very small crystal size)	Rhyolite, Trachyte and Phonolite	Quartz Latite, Latite and Nepheline Latite	Dacite and Andesite	Basalt and Theralite	Limburgite

(Note. The most common rock types are highlighted in bold print.)

Generalized Chart of Metamorphic Rock Types

Metamorphism » » »	Non-Directional Structure Contact Metamorphism	Directional Structure - Regional Metamorphism			
		Slaty	Phyllitic	Schistose	Gneissose
Light Color	Metaquartzite, Marble and Hornfels	(Most slates are dark colors)	Phyllite (an intermediate state between Slate and Schist) Phyllonite	Quartz and Mica Schists	Quartzite Gneiss and Granulite
Intermediate Color (including red or brown)	Metaquartzite, Marble, Hornfels and Serpentine			Garnet and Mica Schists , Serpentine	Granite Gneiss, Granodiorite Gneiss, and Biotite Gneiss
Dark Color (including green)	Metaquartzite, Marble, Hornfels and Serpentine	Slates		Greenschist and dark Schists , Serpentine and Amphibolite	Quartz Diorite Gneiss, Diorite Gneiss, Amphibolite Gneiss

(Note. The most common rock types are highlighted in bold print.)

Appendix I

Buddington's Theory of Magmatic Separation

GRANITIC

GRANITE

Associations of major importance: Fe, Mo, As, Sn, Bi, W, Au, Cu, Te, Zn, Pb, Ag, U, Sb, Hg.

Associations of subordinate importance: Co, Ni.

GRANITIC PEGMATITES

Associations of major importance: Fe, Mo, Gems, Li & P, Cu, Rare Earths, Sn, W, F, Bi.

ALKALIC

SYENITE

Associations of major importance: Corundum.

SYENITE & NEPHELINE SYENITE PEGMATITES

Associations of major importance: Corundum, Zr, P.

NEPHELINE SYENITE

Associations of subordinate importance: Fe, Cu, Au, Zn.

Associations of Hydrothermal alteration or weathering: Bauxite.

PYROXENITE

Associations of major importance: Fe, Ti.

GRANODIORITIC

GRANODIORITE

Associations of major importance: ① Fe, As, Au, Cu, Zn, Pb, Ag, Sb, Hg; ② Mo, Sn, W, Bi.

GRANODIORITE PEGMATITE

Associations of major importance: Mo, W.

Appendix I

SYENITIC

SYENITE

Associations of major importance: Fe.

QUARTZ SYENITE

Associations of major importance: Fe.

Associations of subordinate importance: ① Mo, F, Fe; ② Zn.

DIORITIC

QUARTZ DIORITE

Associations of major importance: Fe, As, Au, Cu, Zn.

Associations of subordinate importance: Pb, Ag.

MONZONITE

Associations of major importance: Fe & Ti, P.

DIORITE

Associations of major importance: Fe.

Associations of subordinate importance: As, Au, Cu.

GABBROIC

NORITE

Associations of major importance: Fe₇S₈, Ni, Cu.

Associations of subordinate importance: Pt, Pd.

GABBRO

Associations of major importance: Fe & Ti, P, Cu, Fe₇S₈ & FeS₂.

Associations of subordinate importance: ① Fe, Cu; ② Ti, F.

ANORTHOSITE

Associations of major importance: Ti & Fe.

PRIMARY BASALTIC MAGMA

PYROXENITE

Associations of subordinate importance: Ti & Fe, Fe₇S₈, Cu, Ni.

PERIDOTITE

Associations of major importance: Corundum.

Associations of Hydrothermal alteration or weathering: Pt, Cr, Serpentine & Asbestos,
Diamond & Pyrope, Magnesite, Ni, Hematite.

Glossary

- Abrasion**, The mechanical wearing, grinding, scraping, or rubbing away of rock surfaces by friction and impact.
- Absorption**, The increase in the weight of a rock due to water in the pores of the material, but not including water adhering to the outside surface of the particle, expressed as a percentage of the dry weight.
- Accessory**, A mineral that occurs in a rock in minute quantities, and does not affect the way the rock is named or classified.
- Acclivity**, A slope (as of a hill) that ascends from a point of reference.
- Accretion**, The gradual or imperceptible increase or extension of land by natural forces acting over a long period of time, as on a beach by washing up sand from the sea or on a flood plain by the accumulation of sediment deposited by streams.
- Acicular**, Needle shaped when referring to minerals.
- Acidic Rock**, An igneous rock that consists mostly of light colored minerals and has more than 66% free or combined silica.
- Acre**, A unit of land used in the U.S. & England, equal to 43,560 sq. ft. = 4,840 sq. yds. = 160 sq. rods = 10 sq. chains = 1/640 sq. mi. or = 0.405 hectares.
- Activator**, A foreign substance that causes minerals to fluoresce.
- Adamantine**, A brilliant luster like that of a diamond. Results from a mineral having a high index of refraction.
- Adsorption**, Adherence of gas molecules or of ions or molecules in solutions to the surfaces of solids with which they are in contact.
- Advection**, Lateral mass movements of mantle material; such movement has been proposed as the cause of strike-slip movements along the midoceanic ridges.
- Agglutination**, A syn. of sedimentary cementation, esp. in regard to coarse-grained rock, such as breccia or conglomerates.
- Alkaline Rock**, Any rock which contains more than average amounts of potassium bearing and sodium bearing minerals.
- Allogenic**, Formed or generated elsewhere, usually from a distant place; said of rock constituents and minerals that were derived from preexisting rocks and transported to their present depositional site.
- Alluvial**, Sand or silt deposited by running water.
- Alteration**, 1. Physical or chemical change in a rock or mineral after its original formation. Can result in new minerals or in textural changes in the rock. 2. Any change in the mineralogic composition of a rock brought about by physical or chemical means, esp. by the action of hydrothermal solutions.
- Amorphous**, 'Without form'. The term is applied to rocks and minerals that lack definite crystal structure.
- Amygdale**, A mineral containing cavity in an igneous rock formed by escaping gas.
- Angstrom Unit**, (Å) A measure of distance equal to 1×10^{-8} centimeters.
- Anhedral**, Said of an individual mineral crystal that (a) in igneous rock has failed to develop its own bounding crystal faces. This is caused by crowding of adjacent mineral grains during crystallization. (b) detrital mineral grains in sedimentary rock shows no crystal outline, characterized by a lack of crystal faces. An example would be calcite crystals in a recrystallized dolomite.
- Anisotropic**, Said of a medium whose physical properties vary in different directions.
- Aphanitic Rock**, A rock in which the crystalline constituents are too small to be distinguished without magnification.
- Arenaceous**, Said of a Sedimentary rock consisting wholly or in part of sand-sized fragments, or having a sandy texture or the appearance of sand.
- Argillaceous**, 1. Composed mostly of or containing clay; such as shale. 2. Pertaining to, largely composed of, or containing clay-size particles or clay minerals.
- Arsenates**, Minerals in which arsenate (AsO_4) is an important part.
- Asbestine**, Pertaining to or having the characteristics of asbestos.

Glossary

Asteriated, Showing a star-like pattern.

Authigenic, Formed or generated in place; said of rock constituents and minerals that have not been transported or that were derived locally on the spot where they are now found, and of minerals that came into existence at the same time, or subsequently to, the formation of the rock of which they constitute a part.

Basal, Cleavage parallel to the base of the crystal.

Basic Rock, An igneous rock with a low percentage of silica and a high percentage of pyroxene, hornblende, and Labradorite.

Bedding, The arrangement of sedimentary rocks in about parallel layers or strata which correspond to the original sediments.

Bedding Plane, A planar or nearly planar bedding surface that visibly separates each successive layer of stratified rock (of the same or different lithology) from its preceding or following layer; a plane of deposition.

Biaxial, Having two optic axes and three indices of refraction.

Birefringence, The ability of crystals other than those of the isometric system to split a beam of ordinary light into two beams of unequal velocities; the difference between the greatest and the least indices of reflection of a crystal.

Bituminous Rocks, Rocks that contain tar, petroleum, or asphalt.

Bladed, Elongated, flat, thin.

Borates, A group of minerals in which the borate radical (BO_3) is an important constituent.

Botryoidal, Resembling a bunch of grapes. A mineral of this type appears to have a surface covered with spherical bulges.

Bravais Lattice, Synonym for crystal lattice.

Brecciated, Converted into, characterized by, or resembling a breccia; esp. said of a rock structure marked by an accumulation of angular fragments.

Brittle, Easily broken.

Calcarenite, A limestone consisting predominantly (more than 50%) of detrital calcite particles of sand size; a consolidated calcareous sand.

Calcareous, 1. Containing calcium carbonate or calcite. 2. Said of a substance that contains calcium carbonate. When applied to a rock name it implies that a considerable percentage (up to 50%) of the rock is calcium carbonate.

Calcic, Containing calcium.

Capillary, Hair-like, referring to crystals.

Carat, A unit of weight, usually 200 mg. (about 1/150 oz.).

Carbonaceous, Composed chiefly of organic carbon. (i.e. carbon derived from plant and animal remains.)

Carbonates, Minerals, such as calcite, where the carbonate radical (CO_3) is an important constituent.

Cast, A mineral taking the shape of a cavity left in rock by decay of plant or animal matter.

Cat's-eye, A gem showing a sharp streak of light across it caused by reflections from fibers within the stone.

Chalcedony, A cryptocrystalline variety of Quartz composed primarily of SiO_2 . It is commonly microscopically fibrous, may be translucent or semitransparent, and has a nearly wax-like luster. In uniform tints, and a white, pale blue, gray, brown, or black color.

Chatoyance, 1. An optical phenomenon, possessed by certain minerals in reflected light, in which a movable wavy or silky sheen is concentrated in a narrow band of light that changes its position as the mineral is turned. 2. Reflecting light in form of moving or undulating streak-like cat's eyes in the dark.

Glossary

- Chert**, A hard, extremely dense of compact, dull to semi-vitreous, cryptocrystalline sedimentary rock, consisting dominantly of cryptocrystalline silica (chiefly fibrous chalcedony) with lesser amounts of micro or cryptocrystalline quartz and amorphous silica (Opal); it sometimes contains impurities such as calcite, iron oxide, and remains of siliceous and other organisms. It has a tough, splintery to conchoidal fracture, and may be white or variously colored gray, green, blue, pink.
- Clastic Rock**, A sedimentary rock comprised of fragments of preexisting rocks that have been transported and deposited.
- Clay**, 1) A soft sediment or deposit that is plastic when wet and comprised of very fine-grained materials, mainly hydrous aluminum silicates. 2) A particle size having a diameter $< 1/256$ mm.
- Cleavage**, A mineral is said to possess cleavage if when it breaks it yields definite plane surfaces. Cleavage can be perfect as in micas or, in some minerals, completely lacking. Cleavage is always parallel to crystal faces.
- Color Zone**, Striping or segregation of color within a crystal.
- Columnar**, Like a column, referring to crystals.
- Columnar Section**, A vertical section, or graphic representation in a vertical strip, of the sequence and original stratigraphic relations of rock units that occur throughout a given area or at a specific locality.
- Conchoidal**, 1. Concave, like the inside of a bivalve shell; referring to shape of fracture of a substance. 2. Said of a type of mineral fracture that gives a smoothly curved surface. It is a characteristic of quartz and of obsidian.
- Concretion**, An accumulation of mineral matter when mineral particles become cemented together into an orderly, rounded form.
- Contact Metamorphism**, Metamorphism resulting from the intrusion of magma which takes place at or near the contact point with the molten rock.
- Craze**, The tendency of a gem material to develop fine cracks on the surface.
- Cross-bedded**, An internal arrangement of the layers in a stratified rock, characterized by minor beds or laminae inclined more or less regularly in straight sloping lines or concave forms at various angles (but less than the angle of repose) to the original depositional surface or principal bedding plane, or the dip or contact of the formation. It is produced by swift, local, hanging currents of air or water.
- Cryptocrystalline**, Composed of crystals so minute that they are not visible without magnification.
- Crystal**, A solid mineral having a regular geometric shape and bounded by smooth flat surfaces (called crystal faces).
- Crystal Symmetry**, The repetitive pattern of crystal faces caused by the orderly internal arrangements of atoms within a mineral.
- Crystalline**, Having definite visible crystal structure.
- Declivity**, A slope (as of a valley) that descends from a point of reference.
- Deliquescent**, To melt away or become liquid by absorbing moisture from the air.
- Dendritic**, 1. Branching, tree-like; referring to patterns produced in a mineral by foreign mineral, or a branching form of a mineral. 2. A surficial deposit of an oxide of manganese, or an inclusion, that has crystallized in a branching pattern.
- Density**, The mass per unit volume of a substance.
- Detrital Sediment**, Deposited rock and mineral fragments.
- Dike**, A wall-like body of igneous rock that cuts across layers of surrounding rocks.
- Dimorphic**, That type of polymorphism in which there occur two crystal forms, known as dimorphs.
- Dip**, 1. The angle at which inclination of the rock bed departs from the horizontal. 2. The angle that a structural surface, e.g. a bedding plane or fault plane, makes with the horizontal, measured perpendicular to the strike of the structure.

Glossary

Dolomite (rock), A carbonate sedimentary rock consisting chiefly of (more than 50% by weight) of the mineral dolomite or approximating the mineral dolomite in composition.

Dolomitization, The process whereby limestone is wholly or partly converted to dolomite rock or dolomitic limestone by the replacement of the original calcium carbonate by magnesium carbonate, usually through the action of magnesium-bearing water (seawater or percolating meteoric water). It can occur pene-contemporaneously or shortly after deposition of the limestone, or during lithification at a later period. It is commonly accompanied by recrystallization and by shrinkage of volume (as much as 11% if the original limestone) leading to the formation of pores, cavities, and fissures.

Drusy, Rock surface covered with minute crystals.

Ductile, Able to be drawn into wire.

Efflorescence, A process which forms a fluffy crystalline powder on a rock surface by evaporation.

Epitaxy, Overgrowth of one crystal on another whereby the shared plane of atoms is consistent with the atomic arrangement in both crystals.

Euhedral, Said of a mineral grain (a) in igneous rock that is completely bounded by its own regularly developed crystal faces. Growth was not restrained by adjacent mineral crystals. (b) in sedimentary rock characterized by the presence of crystal faces. Such as calcite crystals in recrystallized dolomite.

Exsolution, A process whereby a homogeneous crystal phase separates into two or more crystals phases (minerals) without the addition or removal of new chemical constituents to the system.

Extrusive, A form of Igneous Rock forced to the surface while molten.

Face, Any surface on which mining operations are in progress.

Fault, A displacement of rocks in the earth's crust along a fracture zone.

Feldspar, A group of minerals containing aluminum and silica. They all show good cleavage in two directions at about 90 degrees. The hardness is about 6 and the specific gravity between 2.5 - 2.8.

Ferruginous, 1. Pertaining to or containing Iron. e.g. a sandstone that is cemented with iron oxide. 2. Said of a rock having a rusty color due to the presence of ferric oxide.

Fibrous, Mineral formed of thread or needlelike crystals.

Float, Rock fragments found on the surface some distance from outcrop or veins from which they came.

Flow Banding, A structure sometimes found in volcanic rocks where alternating layers of rock have different mineral compositions.

Fluorescence, Emission of light by a substance when it is exposed to ultraviolet rays.

Foliation, A layered structure present in some metamorphic rocks which results from the segregation of different minerals into roughly parallel layers.

Footwall, The underlying side of a fault, an orebody, or of mine workings. The name is due to the premise that this wall would be walked on as you climbed the fault.

Fracture, 1. Texture of a freshly broken surface of rock or mineral. 2. The breaking of a mineral or rock other than along planes of cleavage.

Fracture Zone, A zone in the rock strata that is highly fractured.

Friable, Crumbles or is pulverized easily.

Geode, A mineral shell lined with crystals or filled with mineral.

Glassy, Vitreous, resembling the luster of glass.

Gneiss, A coarsely foliated(layered) metamorphic rock.

Gossan, The weathered and oxidized zone overlying a sulfide deposit; contains a concentration of hydrated iron oxide.

Glossary

- Greasy**, A luster of a mineral which appears to be covered with thin coat of oil.
- Habit**, The physical form of a crystal. It's determined by the shape and relative proportions of the crystal faces.
- Hackly**, A jagged fracture like that of cast iron.
- Halides**, A group of minerals that are mostly compounds of halogen elements (bromine, chlorine, fluorine, iodine). Ex: halite, fluorite.
- Hanging Wall**, The overlying side of a fault, an orebody, or of mine workings. The name is due to the premise that this wall would be overhead if you climbed the fault.
- Hardness**, Hardness is the resistance of a smooth surface to scratching. It's determined by the binding force of atoms within the crystal structure. Mohs scale of hardness: 1) talc, 2) gypsum, 3) calcite, 4) fluorite, 5) apatite, 6) feldspar, 7) quartz, 8) topaz, 9) corundum, 10) diamond.
- Hexagonal**, A six sided crystal with hexagonal bases. An unsharpened pencil is a basic example.
- Hydrothermal**, The alteration of minerals or rocks by super-heated mineral rich fluids, usually water, within a crystallizing magma.
- Hygroscopic**, Property of attracting or absorbing moisture from the air.
- Inclusion**, A foreign particle in a mineral.
- Interbedded**, Bedded between two of more types of strata in a consistent manner.
- Intermediate Rock**, An igneous rock that is transitional between acidic and basic rocks. Have a silica content between 54-65%.
- Intrusive**, A form of igneous rock that has hardened before reaching the surface.
- Iridescence**, A spectral display of color in a mineral caused by the interference of light passing between layers of different refractive index.
- Isodimorphous**, The characteristic of two crystalline substances to be both dimorphous and isomorphous. e.g. Calcite and Aragonite.
- Isolith**, An imaginary line connecting points of similar lithology and separating rocks of differing nature, such as of color, texture, or composition.
- Isometric**, Cubic. Three axis, all the same length and at right angles to each other.
- Isomorphous**, The characteristic of two or more crystalline substances to have similar chemical compositions, axial ratios, and crystal forms, and to crystallize in the same crystal class.
- Isopach**, A line drawn on a map through points of equal true thickness of a designated stratigraphic unit or group of stratigraphic units.
- Isotropic**, Said of a medium whose properties are the same in all directions.
- Lamellar**, Composed of thin layers, scales, or plates.
- Lamination**, Color banding in a rock due to differences in the type or character of sediment laid down during deposition.
- Law of Crosscutting Relationships**, A stratigraphic principle whereby relative ages of rocks can be established: a rock is younger than any other rock across which it cuts.
- Law of Equal Declivities**, Where homogeneous rocks are maturely dissected by consequent streams, all hillside slopes of the valleys cut by the streams tend to develop at the same slope angle, thereby producing symmetric profiles of ridges, spurs, and valleys.
- Law of Minimum Lateral Thrust**, The statement that the relative displacement of overlying strata to underlying strata surrounding an inclined, concordant intrusion can be expressed as $B = (A \cot \Theta)$, in which B= the horizontally measured width of the inclined part of the intrusive body, A= the vertically measured width of the horizontal part of the intrusive body, and Θ = the angle of inclination.

Glossary

- Law of Original Continuity**, A general law of geology: Water laid stratum, at the time it was formed, must continue laterally in all directions until it thins out as a result of non-deposition or until it abuts against the edge of the original basin of deposition.
- Law of Original Horizontality**, A general law of geology: Water laid stratum are deposited in strata that are horizontal or nearly horizontal, and parallel or nearly parallel to the Earth's surface.
- Law of Superposition**, A general law upon which all geologic chronology is based: In any sequence of sedimentary strata that has not been subsequently disturbed by overthrusting or overhanging, the youngest stratum is at the top and the oldest is at the base, the older strata being successively covered or overlain by younger layers; or, each bed is younger than the bed beneath, but older than the bed above.
- Law of Unequal Slopes**, A stream flowing down the steeper slope of an asymmetric ridge or divide erodes its valley more rapidly than one flowing down the gentler slope, thereby causing the crest of the divide to migrate away from the more actively eroding stream toward the less actively eroding one.
- Law of V's**, A general topographic law: On any topographic map, outcrops of a horizontal bed forms a V as it crosses a valley and that the apex of the V points upstream.
- Lenticular**, Have a lens-like shape.
- Limestone**, A sedimentary rock consisting chiefly (more than 50% by weight) of calcium carbonate, primarily in the form of the mineral calcite, and with or without magnesium carbonate.
- Lithographic**, 1. A texture of certain calcareous rocks, characterized by uniform particles of less than clay sized and by an extremely smooth appearance. 2. Cryptocrystalline.
- Luminescence**, Light emitted by a substance because of any stimulation except heating; a more general term than fluorescence.
- Luster**, The general look of a mineral in reflected light. Minerals are divided into two types: metallic and non-metallic. There's no clear dividing line between the two. In general, non-metallic minerals will transmit light through a thin edge, are light colored, and will have a light or colorless streak. Non-metallic minerals are further described as: vitreous, resinous, pearly, greasy, silky, adamantine.
- Magma**, Molten rock beneath the earth's crust. It solidifies to form igneous rocks.
- Malleable**, Capable of being shaped by hammering.
- Marly**, Pertaining to, containing, or resembling marl; e.g. "marly limestone" containing 5-15% clay and 85-95% carbonate.
- Massive (min.)**, A mineral that does not show any definite external crystal form or consists of poorly defined masses of small crystals.
- Massive (rock)**, Said of a stratified rock that occurs in very thick, homogeneous beds, or of a stratum that is imposing by its thickness.
- Meteoric**, Pertaining to water of atmospheric origin.
- Mica**, A group of silicate minerals having perfect cleavage in one direction and which easily split into thin, elastic, sheets.
- Micrite**, A descriptive term for the semiopaque, crystalline, interstitial component of limestones, consisting of chemically precipitated carbonate mud whose crystals have diameters of less than 4 microns.
- Microcrystalline**, A rock in which the crystals are too small to be seen without a microscope.
- Molybdates**, A group of minerals in which the molybdate (MoO_4) is an important constituent. Ex: wulfenite
- Monoclinic**, A crystal with six faces and three axes of unequal length. Two axes are at right angles to each other and the third is inclined to the plane of the other two. A ream of paper with a long edge sloped at an angle is an example.

Glossary

Mudstone, An indurated mud having the texture and composition, but lacking the fine lamination or fissility of shale; a blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately the same.

Nacreous, Pearly.

Nodular, Appearing as or composed of irregular lumps of rock or a mineral.

Normal Fault, A fault with only vertical motion whereby the hanging wall moves down in relation to the footwall.

Oblique Normal Fault, A fault with vertical motion whereby the hanging wall moves down in relation to the footwall in addition to left or right horizontal motion.

Oblique Reverse Fault, A fault with vertical motion whereby the hanging wall moves up in relation to the footwall in addition to left or right horizontal motion.

Oolitic, Composed of small concretions like fish roe, usually in limestone.

Opalescent, Having a bluish milky appearance, like common opal.

Opaque, Incapable of passing light.

Orbicular, Marked with circular, eyelike patterns.

Organic Fill, Black Carbonaceous matter

Orthorhombic, A rectangular crystal with three axes of different lengths and all at right angles to each other. A closed book is a basic example.

Oxide, A group of minerals where oxygen joined with a metal is a major constituent.

Oxidized Zone, The portion of an ore body that has been altered by downward percolating groundwater and which contains dissolved oxygen and carbon dioxide.

Paleomagnetism, The study of the natural remanent magnetization to identify the intensity and direction of the earth's magnetic field in the past.

Pearly, A luster with the iridescent look of a pearl. Most commonly seen on surfaces parallel to cleavage planes.

Pegmatite, An igneous rock of very coarse grain size. Usually found as dikes within a larger rock mass. They are often excellent sources of fine crystals.

Perfect, A term for cleavage that is readily parted and leaves a smooth surface.

Phosphates, A group of minerals where phosphate (PO_4) is an important constituent.

Phosphorescence, Luminescence that persists after the exciting cause is taken away.

Piezoelectric, An effect in certain crystals whereby an electric potential is generated when mechanical stress is applied.

Pinacoid, A crystal form composed of two parallel faces.

Pipe, A cylindrical, vertical mass of igneous rock.

Pisolitic, Composed of rounded pealike masses.

Pitch, Dip or inclination of a mineral vein or bed at right angles to its strike.

Placer, A concentrated deposit of mineral particles that have weathered out of rock. Usually deposited by stream action.

Playa, A shallow basin or plain in a desert where water collects after a rain and then evaporates.

Pleochroism, The ability or property of an anisotropic crystal to absorb differentially various wavelengths of transmitted light in various crystallographic directions, and thus to show different colors in different directions. This property is more easily seen under polarized light than with the naked eye.

Plutonic Rock, A granular igneous rock that has solidified at great depth and shows a distinct grain structure. Ex: granite

Polymorphic, The ability for a substance to crystallize in more than one form called polymorphs.

Pozzolan, Siliceous material such as diatomaceous earth, opaline chert, and certain tuffs, which can be finely ground and combined with portland cement (in proportions of 15

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- to 40 percent by weight). The pozzolan reacts with calcium hydroxide that is liberated as concrete cures, forming compounds with cementitious properties.
- Precipitation**, The process by which dissolved or suspended solids are separated from a liquid.
- Pseudomorph**, A mineral that has taken the outward crystal form of a different mineral.
- Punky**, Having an abundance of large pores in a rock. A soft porous rock.
- Pyroelectric**, An effect in certain crystals whereby an electric potential is generated by certain changes in temperature.
- Pyroxenes**, A group of closely related and dark colored rock forming minerals. Ex: augite, diopside.
- Radiating**, Fanning out from a center, like rays from a light.
- Refraction**, The bending of light as it passes from one medium, such as air, into another, such as a gem material.
- Refractive Index**, In crystal optics the refractive index is the ratio of the velocity of light in a vacuum to the velocity of light in the crystal.
- Reniform**, Rounded, kidney-shaped mineral surface.
- Replacement**, The process by which one mineral is replaced by another and the original physical form is often retained.
- Resinous**, A luster with the appearance of resin.
- Reverse Fault**, A fault with only vertical motion whereby the hanging wall moves up in relation to the footwall.
- Sagenitic**, Crystal containing needlelike crystals of a foreign mineral.
- Saprolite**, Weathered rock in place.
- Schist**, A metamorphic rock which exhibits fine lamination or layers along which the rock may be easily broken. Mica is a good example.
- Seam**, A thin layer or stratum of rock separating two distinctive layers.
- Secondary Minerals**, Minerals formed by the alteration of pre-existing minerals.
- Sectile**, Capable of being cut into shavings.
- Shale**, A fine grained indurated, detrital sedimentary rock formed by consolidation of clay, silt, or mud, and characterized by finely stratified structure and/or fissility that is approximately parallel to the bedding plane.
- Silica**, Silicon dioxide (SiO_2). A very common mineral that is found in many forms including quartz, opal, chert.
- Silicates**, A group of minerals composed chiefly of SiO_4 .
- Silky**, A silk-like luster on a mineral. Results from a fine, fibrous and parallel surface.
- Slump Structure**, A generic term for any sedimentary structure produced by subaqueous slumping.
- Solid Solution**, A single crystal (mineral) phase that can vary in composition over a definite range.
- Solution Activity**, The passage of water of aqueous solutions through a rock.
- Specific Gravity**, 1. The relative density of a mineral. It is the ratio of: Weight in Air/(Weight in Air - Weight in Water). This measurement is an easily accomplished procedure using a simple balance or spring scale. 2. Specific Gravity. The ratio of the mass of a unit volume of a material at a stated temperature to the mass of the same volume of gas-free distilled water at a stated temperature. If the material is a solid, the volume shall be that of the impermeable portion.
- Star**, An asteriated gem, or one that reflects a four- or six-rayed star from fibers embedded in the stone.
- Strata**, Tabular sheet-like mass. (plural of stratum)
- Streak**, The color of the powder produced when a mineral is rubbed over the surface of a piece of unglazed, white porcelain.

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- Striations**, Very small parallel grooves or narrow channels of the faces of a crystal.
- Strike**, A compass direction at which inclined rock beds crosses the horizontal; perpendicular to the direction of dip.
- Strike-slip Fault**, A fault with no vertical motion, only horizontal motion whereby the hanging wall moves left or right in relation to the footwall.
- Stylolite**, A thin seam or a surface or contact usually occurring in "pure" or homogeneous carbonate rocks marked by an irregular and interlocking or mutual interpenetration of the two sides, the columns, pits, and teeth-like projections on one side fitting into their counterparts on the other. It resembles a suture or the tracing of a stylus. The seam is characterized by a concentration of insoluble constituents (clay, carbon, sand, iron oxides, etc.) of the rock.
- Subhedral**, Said of an individual mineral crystal that (a) in igneous rock that has partial faces or incompletely bounded by its own crystal faces and partially bounded by surfaces formed by pre-existing crystals. (b) in sedimentary rock that is characterized by partially developed crystal faces. An example would be calcite crystals in a recrystallized dolomite.
- Sulfates**, A group of minerals in which sulfate SO_4 is an important part.
- Sulfides**, A mineral group where sulfur is combined with one or more metals.
- Symmetry**, Correspondence in size, shape, and relative position of parts that are on opposite sides of a dividing line or median plane.
- Tabular**, Tablet shaped.
- Tenacity**, The ability of a substance to resist being separated.
- Termination**, Face or faces at the end of a crystal.
- Tetragonal**, A crystal with four rectangular (not square) sides and two square bases. A butter package is an example.
- Texture**, Size, shape, and pattern of a rock's components.
- Thrust Fault**, A fault with a dip of 45° or less in which the hanging wall appears to have moved upward relative to the footwall. Horizontal compression rather than vertical displacement is the characteristic feature.
- Translucent**, Able to pass light but not the image of the object.
- Transparent**, Able to pass light so that the object can be seen through it.
- Triclinic**, A crystal with six faces as parallelograms and three axes of unequal length all inclined to each other. An uncommon form of crystal.
- Twin**, A mineral specimen comprised of two or more single crystals intergrown in a systematic arrangement.
- Type Location**, (a) The place at which a stratigraphic unit (such as a formation or series) is typically displayed and from which it derives its name. It contains the type section, and is contained within the type area. (b) The place where a geological feature was first or originally recognized or described.
- Typomorphic Mineral**, A mineral that is typically developed in only a narrow range of temperature and pressure.
- Unconformity**, A substantial break or gap in the geologic record where a rock unit is overlain by another that is not next in the stratigraphic succession, such as an interruption in the continuity of a depositional sequence of sedimentary rocks or a break between eroded rocks and younger sedimentary strata.
- Unconformity Trap**, A stratigraphic trap associated with an unconformity.
- Unstratified**, Not formed or deposited in strata; said of massive rock or sediments with the absence of layering, such as granite or glacial till.

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Vein, A sheetlike extension of mineral matter cutting through preexisting rock.

Vertical Fault, A fault, the dip of which is 90° degrees.

Vesicle, A small cavity in a volcanic rock.

Viridite, A general term applied to the indeterminable or obscure green alteration products.

Vitreous, A luster like that of glass. Quartz is an example.

Vug, A small cavity in a vein or in a rock, usually lined with crystals of a different mineral composition from the enclosing rock.

Weathering, The destructive process or group of processes constituting that part of erosion whereby earthy and rocky materials on exposure to atmospheric agents at or near the Earth's character, with little or no transportation of the loosened or altered material.

Wettability, The ability of a liquid to form a coherent film on a surface, due to the dominance of molecular attraction between the liquid, and the surface over the cohesive force of the liquid itself.

Widmanstätten Structure, A triangular pattern observed on polished and etched meteorites.

Xenoblast, A mineral of low form energy which has grown during metamorphism without development of its characteristic crystal faces and the texture produced thereby.

Xenocryst, A crystal resembling a phenocryst in igneous rock that is foreign to the body of the rock in which it occurs.

Xenolith, An inclusion in an igneous rock to which it is not genetically related.

Xenotropic, Said of the fabric of a crystalline sedimentary rock in which the majority of the constituent crystals are anhedral. Also said of the rock (such as an evaporite, a chemically deposited cement, or a recrystallized limestone or dolomite) with such a fabric.

Zeolitization, Introduction of, or replacement by, a mineral (or minerals) of the zeolite group. this process occurs chiefly in rocks containing calcic feldspars or feldspathoids and is sometimes associated with copper deposits.

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