

QUARTZ



One of the most common and widespread of all minerals and one that displays an enormous diversity in aggregate form, grain size, and color. It occurs as an essential mineral of numerous igneous, sedimentary, and metamorphic rocks, as well as hydrothermal vein and replacement deposits. It is the most abundant and widespread species in sands and as such occurs in every county of the state. Crystals of quartz occur in a wide variety of habits and colors, ranging from colorless (rock crystal) to white (milky), black (smoky), pink (rose), purple (amethyst), and yellow (citrine). Massive, cryptocrystalline varieties include chalcedony, chert, flint, jasper, and agate, among others. The chief types of occurrences in Michigan are

1. As chert concretions and quartz-crystal lined cavities in limestone; less commonly in shale and sandstone.
2. As beach pebbles: chert, agate, jasper, and carnelian, rarely as amethyst and smoky quartz.
3. As vein and vesicle fillings in native copper deposits.
4. As chert and jasper in the iron ranges.
5. As white vein quartz.
6. In granitic pegmatites.
7. As pebbles and boulders in glacial drift: chert, jasper, quartzite, and vein quartz.

Because of its widespread occurrence, only the more important localities are given here. Northern and Southern Peninsulas.

Alger County: 1. *Lake Superior beaches* near Grand Marais: Color-banded translucent agate pebbles. 2. Chert nodules occur in dolomite of the Niagaran Series (Silurian) in Scott's quarry near Trout Lake.

Antrim County: 0.8 km south of Norwood: Chert concretions with pyrite, calcite, and marcasite in Antrim Shale (Devonian).

Arenac County: 1. Griffin and Burt limestone quarry near Omer: Concretions lined with chalcedony, quartz crystals, or both. Brown calcite

crystals up to 15 cm in diameter have been found in association with quartz. 2. Near Au Gres: Chert nodules with calcite in the Bayport Limestone (Mississippian).

Baraga County: 1. Taylor mine 3.2 km north of Alberta just off old U.S. 41, NE ¼ NW ¼ section 9, T41N, R33W: Abundant as colorless, drusy crystals lining cavities in brecciated iron formation; associated species are pyrolusite, manganite, goethite, and rare barite. 2. Imperial (Wetmore) mine, NW ¼ section 25, T48N, R31W, Michigamme: Crystals of amethyst to 1 cm have been found in brecciated iron formation.

Charlevoix County: 1.6 km north of Norwood along shore of Lake Michigan: Colored and banded chert (Poindexter et al., 1939) derived from concretions in the Traverse Limestone.

Chippewa County: 1. Lake Superior beaches: Banded agate pebbles. 2. Quarry 14.5 km east of Trout Lake: Chert nodules (Poindexter et al., 1939).

Dickinson County: 1. Chapin mine at Iron Mountain: Colorless crystals in iron formation. 2. Menominee iron range generally: Jasper granules occur in the banded Traders and Curry members of the Vulcan Iron Formation (Bayley et al., 1966), chert in iron formation, vein quartz, and some crystals along faults (Brower, 1968). 3. Road cut on Highway 69, on west end of the village of Felch: Numerous small crystals of colorless to pale smoky quartz line cavities in brecciated iron formation. 4. *Vulcan mine*: Pale amethystine crystals to 1 cm lining "vugs" in hematite ore. Also in milky gray crystals to 5 cm stained red by hematite. 5. *West Vulcan mine*: Colorless to pale smoky crystals up to 2 cm lining "geodes" in soft earthy hematite. Some crystals contain acicular inclusions of goethite. 6. *Norway*: A rock and gravel quarry approximately 1 km east of Fumee Lake in SE ¼ section 25, T40N, R30W, exposes a brecciated sub-unit of the Felch Formation hosting cavities lined with small crystals of milky, colorless, and pale smoky quartz. Crystals of pale colored amethyst to 3 cm, as well as rare microcrystals of chalcopyrite and malachite (to ~2 mm) also have been found in some cavities. The quarry is privately owned and permission must be obtained before visiting. 7. Rian's quarry, south of Felch: Groups of attractive small crystals have been

found on the west side of the quarry (DeMark, 2000).

Gogebic County: **1.** Gogebic iron range generally: The iron formation contains 1) oolitic or granular chert, 2) very fine-grained chert, and 3) hematitic chert or jasper (Hotchkiss, 1919). **2.** *Sunday Lake mine*, Wakefield: As crystals of both dark smoky quartz and amethyst to 2 cm with hematite. **3.** Powdermill Creek, Bessemer: Small colorless-to-milky crystals up to 1 cm occur in veins exposed in the bed of Powdermill Creek north of its crossing with highway 28 (A. Maki, personal communication, 1999).

Houghton County: **1.** Copper deposits generally: Quartz forms veins, vesicle fillings, and replacements of other minerals and rock. It occurs most abundantly in the Isle Royale lode, plentifully in the Baltic and Pewabic lodes, and locally in the Osceola and Kearsarge lodes. Chalcedony appears as vug linings in the Pewabic lode and as amygdule fillings in the Kearsarge lode. It also replaces zoisite and calcite (Butler and Burbank, 1929). **2.** *Franklin mine*: Centimeter-sized crystals with prehnite. **3.** *Tamarack mine*: Colorless, white, and pale green crystals (some due to frosted coating of prehnite). **4.** *Isle Royale mine*: Colorless crystals to 5 cm, some with calcite and barite; fine specimens. Also veins of massive quartz. **5.** *Osceola mine*: Crystals with prehnite. **6.** *Wolverine mine*: In crystals and as agate with copper bands. **7.** *Laurium mine*: Abundant as colorless prismatic crystals with epidote, pumpellyite, and calcite in amygdules in basalt; rarely colored blue due to inclusions of kinoite (q.v.). **8.** Baltic Number 2 mine: Veins of massive quartz. **9.** *Centennial mine*: In fine specimens of colorless crystals with epidote. **10.** *Calumet and Hecla mine, Red Jacket Shaft*: Superb groups of lustrous, colorless crystals to 5 cm in length. Some occur with epidote and “pumpellyite,” others are tinted pale green by chlorite inclusions. Among the finest quartz specimens known from Michigan. **11.** Mesnard mine: Small crystals with prehnite and calcite.



Figure 112: Crystallized quartz from the Red Jacket Shaft, Calumet and Hecla mine, Calumet, Houghton County. 8.5 x 8.5 cm. A. E. Seaman Mineral Museum specimen No. DCG 2218, Jeffrey Scovil photograph.

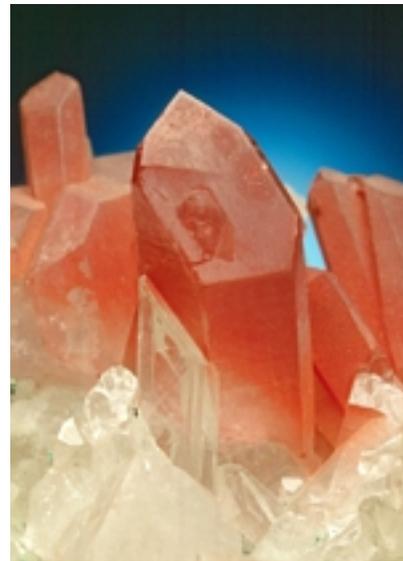


Figure 113: Hematite-stained quartz crystals from the Copper Range mine, Houghton County. Main crystal is 2.5 cm long. A. E. Seaman Mineral Museum specimen No. JTR 221, Jeffrey Scovil photograph.

12. *Naumkeag mine*: Etched, greenish, milky crystals with analcime. **13.** *St. Louis mine*: A most unusual amygdule-filling agate containing bands of native copper (S. M. Carlson, personal communication, 2000).

Huron County: **1.** Wallace Stone Company quarry and other occurrences in the Bay Port area in Bayport Limestone (Mississippian): As small

colorless crystals lining geodes and fossil replacements, and as nodules of chert. Chert nodules are irregular to spherical, white to black, some with a concentric internal structure, and as much as 20 cm across. These were an important source of “flint” for the Native Americans of the Southern Peninsula (Dustin, 1934; Ueck, 1953). **2.** Pigeon: Similar occurrence. **3.** Grindstone City: sandstone quarries (Marshall Sandstone) were a major source of grindstones for many years, beginning in 1850. Major quarry sites were in sections 23, 24 and 25, T19N, R13E. Individual stones over 3,500 kg were cut from the sandstone (Lane, 1900; Heinrich, 1979).

Iron County: **1.** Bates iron mine, Iron River: Veinlets of quartz that appear isotropic, due to exceedingly minute grain size (Winchell, 1924). **2.** Bengal (Cannon) mine, Stambaugh: As small, colorless crystals to 1 cm in cavities in iron formation. **3.** Crystal Falls mine: Pale smoky-to-amethystine crystals in cavities in iron formation.

Keweenaw County: **1.** Copper district generally: Chalcedony and agate are abundant near top of Kearsarge flow. Quartz is an abundant accessory mineral in numerous amygdaloid and fissure lodes. Fine colorless crystals with prehnite were formerly found at the *Central mine*. **2.** Mohawk mine: Crystals from fissure veins. **3.** *Seneca mine*: Crystals from fissure veins (1-3, Stoiber and Davidson, 1959). **4.** Keweenaw Point beaches: Pebbles of amethyst and smoky quartz were first recorded by Schoolcraft in 1824. Amethyst-lined vugs in beach pebbles have been



Figure 114: Quartz (variety amethyst) from Seven Mile Point, Keweenaw County. A. E. Seaman Mineral Museum specimen No. DCG 1420, Jeffrey Scovil photograph.

found (Mihelcic, 1954). **5.** Fort Wilkins-Copper Harbor area beaches: Agate and jasper pebbles (Rosendahl, 1966). **6.** *Horseshoe Harbor*: Groups of amethyst crystals similar to those from some of the Thunder Bay, Ontario localities. Just south of Horseshoe Harbor, section 36, T59N, R29W, a 7.85-kg banded agate, one of the largest ever found, was collected (Dobell, 1966c). **7.** Agate Harbor: Agate pebbles and amethyst pebbles. **8.** Eagle River: Agate pebbles. **9.** Mouth of Silver Creek: Agate pebbles. **10.** Five Mile Point: Agate pebbles. **11.** Seven Mile Point, from first small cove to west of the point to the mouth of the Gratiot River: Agate, jasper, and thomsonite pebbles. Agate occurs in situ in basalt at Seven Mile Point, and amethystine quartz lining geodes in basalt has been found in outcrops on the beaches to the south of the point. **12.** Black Creek: Agate pebbles were found on beaches and inland in basalt. **13.** North shore of Lake Manganese: Agate in place. **14.** *Manitou Island*: Agate and amethyst occur as vesicle fillings in basalt. **15.** *Isle Royale beaches*, from Blake Point to Washington Harbor: Agate, carnelian, jasper, rock crystal, and rare amethyst pebbles. Notable localities are Carnelian Beach, Agate Beach, Siskiwit Bay, Conglomerate Bay, Senter Point, Tobin Harbor, Caribou Island,

and Mott Island (Dustin, 1931; Poindexter et al., 1939). Agates with inclusions of native copper from Isle Royale have been described by Sukow (1987, 1990). **16.** Ahmeek Numbers 3 and 4 mines: Veins of massive quartz. **17.** Mandan mine: Veinlets of milky crystals in red jasper (Hawke, 1976). **18.** *Ojibway mine*: Crystals several centimeters in length, often colored green due to chlorite inclusions (5-7, Mihelcic, 1954). **19.** *Copper Harbor*: Narrow veins of translucent banded agate are exposed on the west bank of a small creek that crosses highway 26 approximately 2.5 km west of Copper Harbor. Some of the agate contains small flecks and crystals of native silver. A limited number of exceptional specimens have been found (S. M. Carlson, personal communication, 2000).

Luce County: Lake Superior beaches: Agate pebbles, some color-banded.

Marquette County: **1.** Marquette iron range generally: Siderite-chert rock in which the chert occurs in particles 5 to 10 microns across (Mann, 1953). “Jaspilite” (banded red jasper with hematite) is very well developed in ores of this range (Carr and Dutton, 1959). **2.** Jackson mine, Negaunee: Jaspilite and in small colorless crystals with manganite in cavities in white quartz veins. **3.** *Jasper Knob*, Ishpeming: Outstanding outcrop of folded jaspilite (Figure 10). Please note: collecting is not allowed. **4.** *Goose Lake*, near Ishpeming: As well-formed, prismatic, colorless-to-milky crystals over 25 cm in length (specimen DM 19968, A. E. Seaman Mineral Museum, Michigan Technological University). The locality consists of a quartz vein north of Grace Lake, approximately 2 km east of Goose Lake; one of the best localities for quartz in the state (DeMark, 2000). **5.** Along M-95, SE ¼ NW ¼ section 21, T47N, R29W (Snelgrove et al., 1944): Quartz in graphic granite in a pegmatite with feldspar and biotite. **6.** SE ¼ SE ¼ section 23, T46N, R30W: Same type occurrence (Snelgrove et al., 1944). **7.** Crockley pegmatite, section 22, T47N, R29W: Graphic granite (Heinrich, 1962a). **8.** Mount Homer in the Huron Mountains: Graphic granite in a 70 cm-wide pegmatite (Lane, 1907). **9.** Partridge Island: Narrow agate veins in gabbro (Dana, 1892).



Figure 115: Quartz crystals from near Goose Lake, Marquette County. 4.5 × 8.5 cm. A. E. Seaman Mineral Museum specimen No. DM 22764, Jeffrey Scovil photograph.

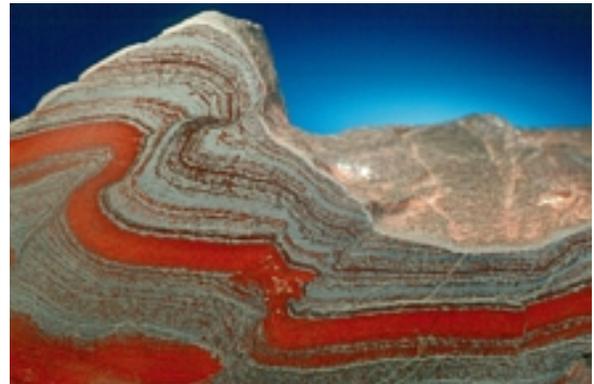


Figure 116: Banded jasper and hematite (“jaspilite”) from Jasper Knob, Ishpeming, Marquette County. Field of view 6 × 7 cm. A. E. Seaman Mineral Museum specimen No. DM 10116, Jeffrey Scovil photograph.

10. *Empire mine*, Palmer: Amethyst (Morris, 1983). Similar specimens at the Tilden mine, nearby (DeMark, 2000). Near the end of its production a zone containing amethyst crystals over 20 cm long was encountered in the old Empire pit. A number of these showed amethyst to greenish citrine color zones, reminiscent of the popular gemstone “ametrine” (Tsu-Ming Han, personal communication, 2002). **11.** Color-banded quartz veins cut the altered peridotite on Presque Isle.

The centers are salmon pink to red jasper with borders of colorless, white, and pink fine-grained quartz and scattered zones of relatively large white or black euhedral crystals. Some of the quartz shows a fibrous comb-structure texture, probably inherited from serpentine replaced pseudomorphously (Kalliokoski, 1975). **12.** *Republic mine*: As small colorless, smoky, or ferruginous crystals with calcite, lining fractures in brecciated iron formation. Also rarely encountered as gray, to purplish pink banded agate, the principal occurrence of which was found in 1963 (J. Hall, personal communication, 2001). **13.** Michigan Quartz Silica Company (Michigan gold mine) north of Ishpeming: Very pure quartz rock mined in 1918 and used for scouring polish (Smith, 1918; Allen, 1920). **14.** Michigamme: Phenocrysts of quartz with late quartz overgrowths in rhyolite porphyry (Clements, 1895). **15.** Dalliba mine: Drusy smoky crystals lining cavities in iron formation. **16.** *Volunteer mine*, Palmer: As milky gray crystals with abundant red hematite inclusions lining cavities in iron formation. **17.** Ropes Gold mine, north of Ishpeming: As pale smoky microcrystals with calcite, lining cavities in fractured quartz on the 1,548' level. **18.** Negaunee: Milky crystals of quartz to several centimeters in length were found in a quartz vein exposed in a road cut on the north side of County Road 480, near the Negaunee city limits (M. P. Basal, personal communication, 2001).

Monroe County: **1.** Navarre quarries on Plum Creek near Monroe: Transparent quartz crystals as cavity lining and encrustation with associated dolomite. **2.** Point aux Peaux, Stony Point, and Brest quarries near Monroe: Rare amethyst as cavity fillings and encrustations associated with dolomite, calcite, celestine, and strontianite (Dana, 1892). **3.** Dundee Formation: Brown, irregular chert nodules in seams and crevices and as thin beds between dolomite and limestone. Commonly enclose silicified fossils (2-4, Sherzer, 1900).

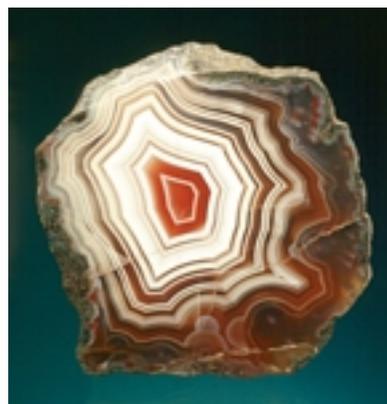


Figure 117: Lake Superior agate, Lake Superior, Michigan, 5 × 5.5 cm, A. E. Seaman Mineral Museum specimen No. JTR 997, Jeffrey Scovil photograph.

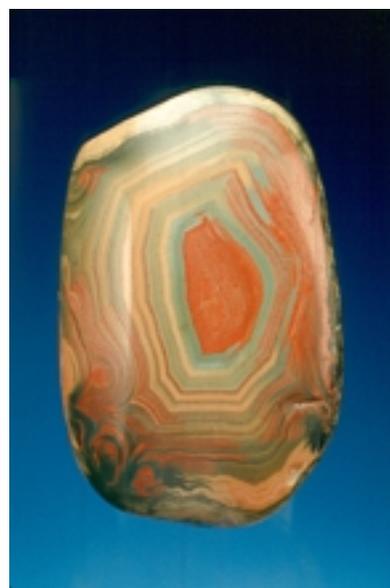


Figure 118: Lake Superior agate, Keweenaw County, 3 × 4 cm, A. E. Seaman Mineral Museum specimen No. DCG 1056, Jeffrey Scovil photograph.



Figure 119: Lake Superior agate, Esrey Park, Keweenaw County, 10 x 20 cm, A. E. Seaman Mineral Museum specimen No. DCG 1365, Jeffrey Scovil photograph.



Figure 120: Lake Superior agate, Lake Superior, Michigan, 7 x 9.5 cm, A. E. Seaman Mineral Museum specimen No. JTR 1005, Jeffrey Scovil photograph.

Ontonagon County: 1. Lake Superior beaches near Ontonagon: Agate pebbles (Mihelcic, 1954). 2. Gull Point on M-64: Agate beach pebbles. 3. Porcupine Mountains: As milky crystals in vugs and amethystine radial aggregates in veins with chalcopyrite, purple fluorite, and sphalerite (University of Michigan collection). In the Porcupine Mountains, Carp River, and White Pine quadrangles a felsite layer contains vesicles with quartz and “some quartz in vesicles is pseudomorphic after platy crystals of tridymite” (Hubbard, 1975, page 524). The layer is in the

“unnamed formation” which is conformable with but slightly younger than the Portage Lake Lava series. 4. National mine: Unusual nodular gray chalcedony with cuprite and malachite (specimen DM 1316, A. E. Seaman Mineral Museum, Michigan Technological University). 5. Minesota mine: Milky white crystals to 5 cm with native copper. 6. Caledonia mine: Milky crystals with epidote, “adularia” and copper. 7. White Pine mine: In small crystals with calcite, filling fractures; also as agate in the gravel overlying the deposit (Rosemeyer, 1999). 8. Adventure mine: Opaque, smoky gray crystals with “adularia” and calcite.

Schoolcraft County: Quarries near Manistique: Chert nodules (Poindexter et al., 1939) in dolomite of Niagaran Series (Silurian).

Van Buren County: Lake Michigan beaches south of South Haven: Chert pebbles. Source for Indian artifacts (Ueck, 1953).

Wayne County: 1. International Salt Company, Inc. mine at Detroit: A rare constituent of the Salina Group (Silurian) (Briggs, 1900). 2. Rockwood (Ottawa Silica) quarry: Quarries in Sylvania Sandstone (Silurian) are sources of very pure glass sand (Allen, 1920; Heinrich, 1979). At the Rockwood quarry, granular, opaque, milky white subhedral crystals occur sparingly with celestine and calcite.

UPDATE

Dickinson County: Rock Dam gold prospect: Recent collecting along Pine Creek, ~210 meters upstream from the Rock Dam gold prospect (SW ¼ SE ¼ section 31, T41N, R29W) has produced groups of milky quartz crystals over 10 cm in length. Some have a thin coating of black botryoidal hematite (q.v.), making attractive specimens. (Carlson et al., 2007b).



An 11 cm long milky quartz crystal from the Rock Dam gold prospect, Dickinson County. A. E. Seaman Mineral Museum specimen DM 27988, John Jaszczyk photograph.



Amethyst from the Peska (Motte Construction) quarry near Rockland, Ontonagon County; 7.5 x 9 cm. A. E. Seaman Mineral Museum specimen DM 25715, George Robinson photograph.



A 3.5 x 3.5 cm group of quartz crystals from Goose Lake, Marquette County. Shawn M. Carlson specimen, John Jaszczyk photograph.

Marquette County: Goose Lake: Through persistence and careful field work conducted by a local mineral collector, Matthew Heilman, the formerly “lost” Goose Lake quartz crystal locality has recently been rediscovered and good specimens collected. The locality is situated in the SE ¼ SE ¼ NE ¼ section 13, T47N, R26W, at U.T.M. coordinates 0462340mE, 5146260mN (NAD27 CONUS).

Ontonagon County: Rockland: The Peska (Motte Construction) quarry near Rockland has produced good specimens of both agate and amethyst as amygdule fillings in vesicular basalt flow tops exposed in the quarry. Specimens over 30 cm across have been reported. The quarry is privately owned, and collecting without prior permission is prohibited.

Tuscola County: Hill in NE ¼ section 14, T11N, R9E: As small, colorless to milky, drusy crystals lining cavities in silicified coral fossils (A. Cook, personal communication, 2007).

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