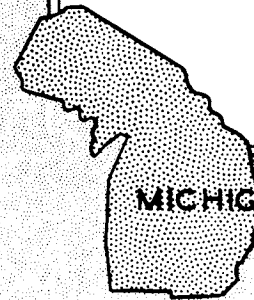


PAMPHLET 4

COLLECTING MINERALS
IN
MICHIGAN

BY
R. W. KELLEY
AND
H. J. HARDENBERG



MICHIGAN DEPARTMENT OF CONSERVATION

DEPARTMENT OF CONSERVATION
Gerald E. Eddy, Director

GEOLOGICAL SURVEY DIVISION
William L. Daoust, State Geologist

The State Geological Survey, established by the First Legislature in 1837, conducts investigations and gives information on the geology and mineral resources of Michigan. The Survey is primarily based on the concept of public service available to all citizens interested in the development and use of those resources.

One of the ways of providing knowledge being sought is through publications. This booklet has been issued in direct response to a growing interest demonstrated by many inquiries on the topic.

The present work is an improved and completely revised edition of, and supercedes, all previous issues designated by the following titles: "Mineralogical Guide", "Pebbles to Pendants", and "Michigan Gem Stones".

April, 1962

COLLECTING MINERALS IN MICHIGAN

BY
ROBERT W. KELLEY AND HARRY J. HARDENBERG
GEOLOGISTS

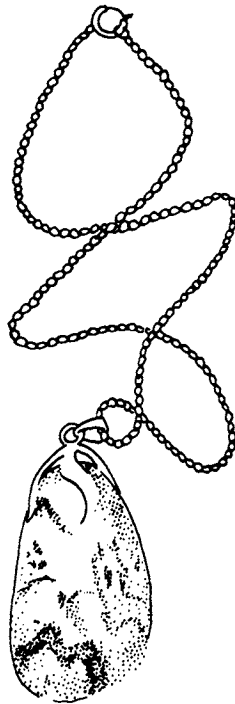


Lansing

COLLECTING MINERALS IN MICHIGAN

INTRODUCTION

Many people are just beginning to discover how interesting stones can be. The last few years have seen a tremendous growth in the number, hobbyists and otherwise, who are now collecting rocks and minerals, often converting their finds into attractive display pieces and jewelry. Much can be said in favor of these fascinating pursuits but we won't discuss that here. Rather, let us consider in this little publication some of the basic information which will be helpful in getting an enthusiast started in the proper direction. One of the more unusual aspects of this wonderful interest is the manner in which it cuts across all stations of society regardless of age, religion, race, or income. Let us hope that it will remain always so. One other thing on which you should be forewarned: once the interest is attained, it is rarely abandoned!



FROM PEBBLE TO PENDANT

SOCIETIES, MUSEUMS, LITERATURE

Your first steps should be toward seeking out others having a like interest. Join a society. Their memberships are comprised of a more-than-usual share of stimulating and hospitable people. Rubbing shoulders and exchanging information with such enthusiasts will not only be a source of inspiration but will stimulate your own progress more effectively than if you were to rely solely on your own resources.

Consultation with your local librarian will put you in touch with the literature most suitable to your needs. In addition to the many books written about the study of minerals, several dozen magazine articles, listed on page 21, are of especial interest to Michigan collectors. Appropriate reading material

is especially useful in the more advanced stages, but never get the notion that it will take the place of experiences gained through personal contacts or from observing actual specimens.

Make a point of visiting and using the museums listed on page 23. The finest specimens find their way eventually into these institutions. Likely you will be able to obtain information on nearby societies, and perhaps purchase some literature or other material.

If the bug bites you, you will also probably want to subscribe to a periodical. Some of the more popular ones are shown on page 25.

CLASSWORK

Eventually you may wish to take courses of instruction in the lapidary arts, mineralogy, or geology. Inquiries relating to the various possibilities should be directed to colleges, local schools, museums, and clubs. Some dealers, too, provide class sessions. Before investing in expensive equipment, beginners would do well to get some actual practice at available training facilities. You'll be the wiser for this experience when it comes to selecting things needed for your chosen activities.

VARIETY OF INTERESTS

Some hobbyists become known as collectors because their interest lies mostly in the acquisition of specimens. Their reward is to behold the enchanting colors and forms of nature's minerals. Collectors, however, often become specialists, limiting themselves to specific localities, specific classes of minerals, fluorescence, or crystals. Incidentally, much of the supply of semi-precious gem materials is credited to amateur collectors.

Other hobbyists carry the work a step further. They like to probe the inner beauties of minerals, or to reshape nature's handiwork. These are lapidaries, persons who practice the art of cutting and polishing stones. Some merely open up or saw specimens to see what's inside. Frequently this is done by cutting thin translucent or transparent slabs. Many lapidaries go beyond, however, and prepare "cabochons" - gem stones cut and ground into smooth, highly polished convex forms. A few specialize in producing beautiful mineral spheres of all sizes. And finally, come the advanced lapidaries who turn out the ultimate expression of the art—highly prized faceted gems.

Still another activity that has come in for much interest is "tumbling". Rough irregular materials are placed in a drum with water and abrasives. The drum is then rotated for many hours or days. The duration depends upon the hardness of the raw materials and the total number of abrasive stages chosen to achieve the desired polish. The result is a batch of very pleasing stones called "baroques"—well-rounded, irregularly shaped pieces having a high lustre—commonly used in pendants, earrings, and other jewelry.

PRINCIPLES

Precise information on specific collecting sites may be acquired only by experience and diligent search. Guidance by oldtimers is very helpful. Serious collectors cannot be expected to broadcast choice locations.

Remember, too, that one of the limitations of minerals is their inability to reproduce themselves. Conservationists call mineral resources "nonrenewables"—unlike forests or wildlife. Once a specimen has been removed from its place of origin, it will never be replaced. It is gone forever. Keeping this in mind will insure your putting these gifts to good use.

Published materials seldom contain exact directions leading to a collector's paradise. The usual treatment consists of the general location of broad areas offering the most favorable opportunities for uncovering specific minerals. Before embarking on a collecting trip, it is helpful to learn a little of the general geology and mineral resources of the region to be visited. Such information may be found in the booklet "Rocks and Minerals of Michigan" published by the Michigan Department of Conservation. Although now out-of-print, copies are available in most libraries. As a matter of fact, some of the basic information on collecting that follows has been abstracted from that booklet. It should be kept in mind that the present pamphlet serves merely as an introduction to the gem hunting grounds of Michigan. A comprehensive list of publications, references, Paleozoic bedrock exposures, formational names, and other geological information may be found in "An Index to Michigan Geology" also published by the Michigan Department of Conservation (May be purchased for \$2.00) and available in many libraries. The Department also distributes a useful little pamphlet entitled "Classified and annotated list of geologic contributions to 'Michigan Conservation', 1935-1960".

ASSAYS AND IDENTIFICATION

The Geological Survey Division receives inquiries from time to time regarding testing and analysis of minerals and ores. Such services, often involving considerable expense, are handled mainly by commercial establishments, not by state or federal agencies. The U. S. Bureau of Mines Information Circular 7695 "Laboratories that make Fire Assays, Analyses, and Tests of Ores, Minerals, Metals, and Other Inorganic Substances", is a good reference to firms in this line of work. The one firm listed for Michigan is the Detroit Testing Laboratory, 554 Bagley Avenue, Detroit 26, Michigan. There are firms, too, in Chicago, Cleveland, Indianapolis, Minneapolis, Milwaukee, Toronto, etc.

Less exact qualitative identification usually may be made with the help of the local mineral society, a museum, a gem dealer, a rock shop, or the geology staff at a local school or college. Generally, these are the most convenient sources for obtaining information. The Geological Survey Division will also make a cursory visual identification of specimens sent by citizens within the state.

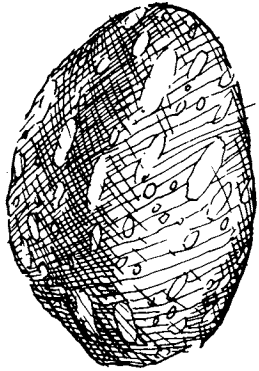
Hand identification of rocks and minerals, however, is not exact and often it is possible only to suggest a tentative identity.

FIELD TIPS

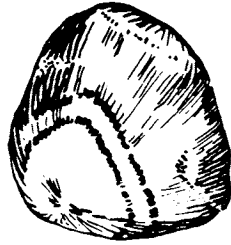
Some of the best collecting is done in quarries. Since most quarries are on private property, entry requires prior permission. During working days, there is a lot of activity—stripping, shoveling, hauling, blasting. Field excursions, therefore, are generally planned on week ends. Also, your chances of gaining access are much better when you accompany a recognized mineralogical group.

Recent experience indicates that many operators have turned against mineral collectors because of the thoughtless, careless, irresponsible, or wanton acts of a few persons who have tampered with machinery, entered buildings where they had no business, climbed around stock piles and conveyor belts, dropped rocks down drill holes necessitating expensive re-drilling, severed power and water lines by driving over them, borrowed and broke operator's tools, threw garbage around the property or disregarded barbed wire enclosures. Most of the guilty parties are not members of a responsible group. Organized mineral societies are working hard at maintaining excellent relations with quarry and mine operators and the community in general. The very principles upon which they have been founded are reminders of the conduct expected of members.

COPPER COUNTRY SPECIMENS



AMYGDALOID



THOMSONITE, X3



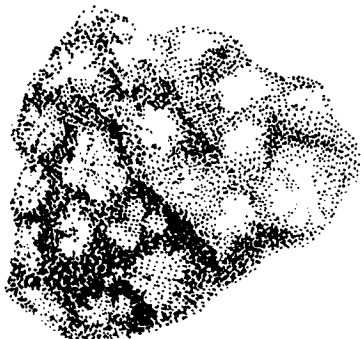
DATOLITE
NODULE



AGATE



PORPHYRYTIC
BASALT



DOMEYKITE
(MOHAWKITE)

CHLORASTROLITE, X 2



Field gear is something to be worked out individually according to your own needs and experience, but there are a few items oldtimers strongly advise. One is the wearing of safety goggles when hammering rock. Another is the use of specially tempered geologists' or prospectors' hammers or picks. Other types are liable to hurl steel splinters that are virtual shrapnel. Cold chisels are a must and need occasional dressing to keep the shoulder free of ragged knurled edges. Too, in a hard rock quarry, a small sledge is infinitely more useful than a hammer. Finally, many painful foot and ankle bruises and scrapes can be prevented by wearing sturdy high-topped shoes.

In quarries, and at mine waste rock piles, whether active or abandoned, there are many hazards. Be especially wary of overhangs and loose rock on steep slopes. Never get in a precarious position. No specimen, however valuable you may happen to believe at the moment, is worth the risk. Above all else, remember the cardinal rule of field workers: NEVER WORK DIRECTLY ABOVE OR DIRECTLY BELOW ANYONE ELSE!

COPPER COUNTRY

Mineral and rock material suitable for lapidary work can be found in a number of areas of Michigan, but the foremost area is the Keweenaw Peninsula—"Copper Country"—where a number of native materials may be classed among the gem stones. These minerals are associated with the copper-bearing rocks of the district. Mineralization has taken place in the porous and fragmental tops of lava flows (amygdaloids) and in the conglomerates. The most important economic mineral deposited is copper, but associated with the copper are minerals which have gem value. More than sixty minerals have been reported for this area; and at almost any mine rock pile at least twenty different ones can be collected.

Some of the best collecting places are along the shores of Lake Superior, where the lava flows and conglomerates are constantly being eroded and thus forced to give up their caches of minerals which then mingle with all the other stone rubble on the beach. The materials soon become concentrated, cleaned, and frequently polished by the tumbling action of the waves. Some of the most-sought stones are agates, and the zeolite minerals: chlorastrolite and thomsonite.

Chlorastrolite— commonly called greenstone— is rich light to dark shades of green in a polygonal mosaic pattern referred to as "turtleback". Radiate lines exhibit chatoyancy (as in tiger's-eye). This is distinctly an American gem--and a Michigan gem-- that ranks among the most enchanting. Though capable of taking a high polish, it also is rather easily marred because of intermediate hardness. Only painstaking search of the trap rock of the Keweenaw Peninsula will uncover good specimens. Many pea-sized greenstones have been recovered from the beaches on Isle Royale, but collectors are now reminded that the National Park Service has strict rules applicable to collecting.

Thomsonite is a beautiful pink and white mineral often tinted with shades of green from admixed prehnite and chlorastrolite. Many fine gem stone baroques have been picked from pebble beaches north of Ahmeek.

Agates of many colors and varieties are found along the Lake Superior shores where the pebbles have been weathered from the amygdaloids by erosive wave action. Perhaps the most common colors are shades of red, brown, white, and clear. Most of the agates are characterized by their concentric banding and rather high relative hardness. The shore road from Eagle River to Copper Harbor provides access to a number of potential collecting sites. Only a few large or showy specimens are found. Most of the agates recovered from the beaches have been fractured which substantially reduces their value as cutting material.

Remember, too, it takes a really practiced eye to consistently spot agates along a beach. With experience you will learn the slight difference in lustre and translucency that distinguish them from the other stones. With a little luck and perseverance you'll find them. In the summer, you won't be alone, for many others are combing our beaches in quest of lasting mementoes of a vacation on Lake Superior. There are the serious collectors, too, who "dig" vein agate from source formations occurring far inland from the shore.

Agates also occur along the Lake Superior shores of Ontonagon and Gogebic counties in the west end of Michigan.

The old waste rock dumps of abandoned copper mines afford excellent collecting opportunities. In the past several years, however, the surfaces of many of these piles have been thoroughly picked over by many visitors. Anyone seeking these treasures in earnest, therefore, is finding that more effort than ever before is now required to locate choice materials. Space in this pamphlet allows mention of only a few of the many locations.

Near Rockland and Mass, native copper and datolite are found in old mine waste rock piles.

At the Baltic No. 2 shaft, near the town of South Range, about seven miles southwest of Houghton, copper sulphide minerals can be collected from the dump. These include chalcocite, bornite, and chalcopyrite. Although not gem materials, they are worthwhile additions to a mineral collection.

From the waste dumps of the various Isle Royale mine shafts, about one mile south of Houghton, prehnite and massive epidote can be collected. Also clear quartz crystals one-half inch or more in length occur in amygdules in the lava, and in geodes.

In the amygdaloid rock piles of the Wolverine Mine near Kearsarge, epidote crystals and agates can be found.

Near Allouez, chrysocolla and cuprite can be found in the old conglomerate waste rock.

The Mohawk, Seneca, and Ahmeek mines yielded the copper arsenide minerals—domeykite (or Mohawkite), algondonite and whitneyite. Domeykite intergrown with white quartz rosettes may be worked into very attractive cabochons, though not without difficulty because of the difference in hardness. The freshly polished metallic surfaces give the appearance of untarnished silver. At this same location, one may pick up some rather unusual specimens of basalt in which large green crystals of feldspar are profusely scattered through a fine groundmass. The presence of native copper, too, becomes readily apparent when the rock is cut — altogether a most attractive material for desk ornaments.

From the dumps of the fissure mines in the vicinity of Phoenix, Delaware, and Mandan, prehnite and native copper can be collected.

Near Copper Falls (between Eagle River and Eagle Harbor) one of the minerals on an old mine dump is natrolite.

In the last few years, the old Clark Mine and Star explorations have yielded some nice finds of datolite. Of all the minerals of the Lake Superior district, this is surely one of the loveliest; and is much sought also because its high density, when coupled with good hardness, yields extremely lustrous surfaces when polished. Most datolites are porcelain white to buff-white, often slightly shaded grey, pink, very pale green, and peppered with minute red to brown specks. Sometimes there are copper, and rarely silver, inclusions. Pure green, or, pure yellow specimens are indeed the greatest prizes of all.

Many other seemingly uninteresting "stones" weathered from the copper formations exhibit beautiful colors when cut and polished, and therefore,

deserve being ranked as semi-gem quality. This observation is particularly true of the many varieties of chert and red and green basalts common to the region.

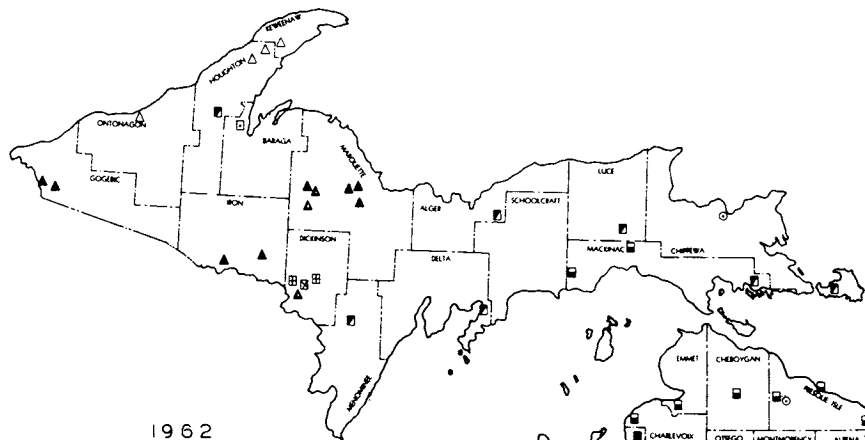
IRON COUNTRY

Michigan's "Iron Country" extending through parts of Marquette, Dickinson, Iron, and Gogebic counties contains a variety of minerals for the specimen collector, but only some are suitable for the lapidary. Many of the rocks and minerals are associated with intrusives and sediments that have undergone intense metamorphism. Only the Marquette Range, which affords the best opportunities, is discussed below.

Between Negaunee and Ishpeming a prominent knob called Jasper Hill consists of jaspilite—brilliant red bands of jasper alternating with bands of hard, bluish-black, specular hematite. The formation is folded, bent and twisted in a most contorted fashion that shows to good advantage in polished specimens. Associated with the Iron Formations in the Marquette District are several other interesting rocks suitable for polishing. One is banded ferruginous chert. Another is the rather colorful Kona dolomite which occurs in mottled and banded patterns of pink to brown and white—excellent material for bookends or other uses not requiring maximum hardness.

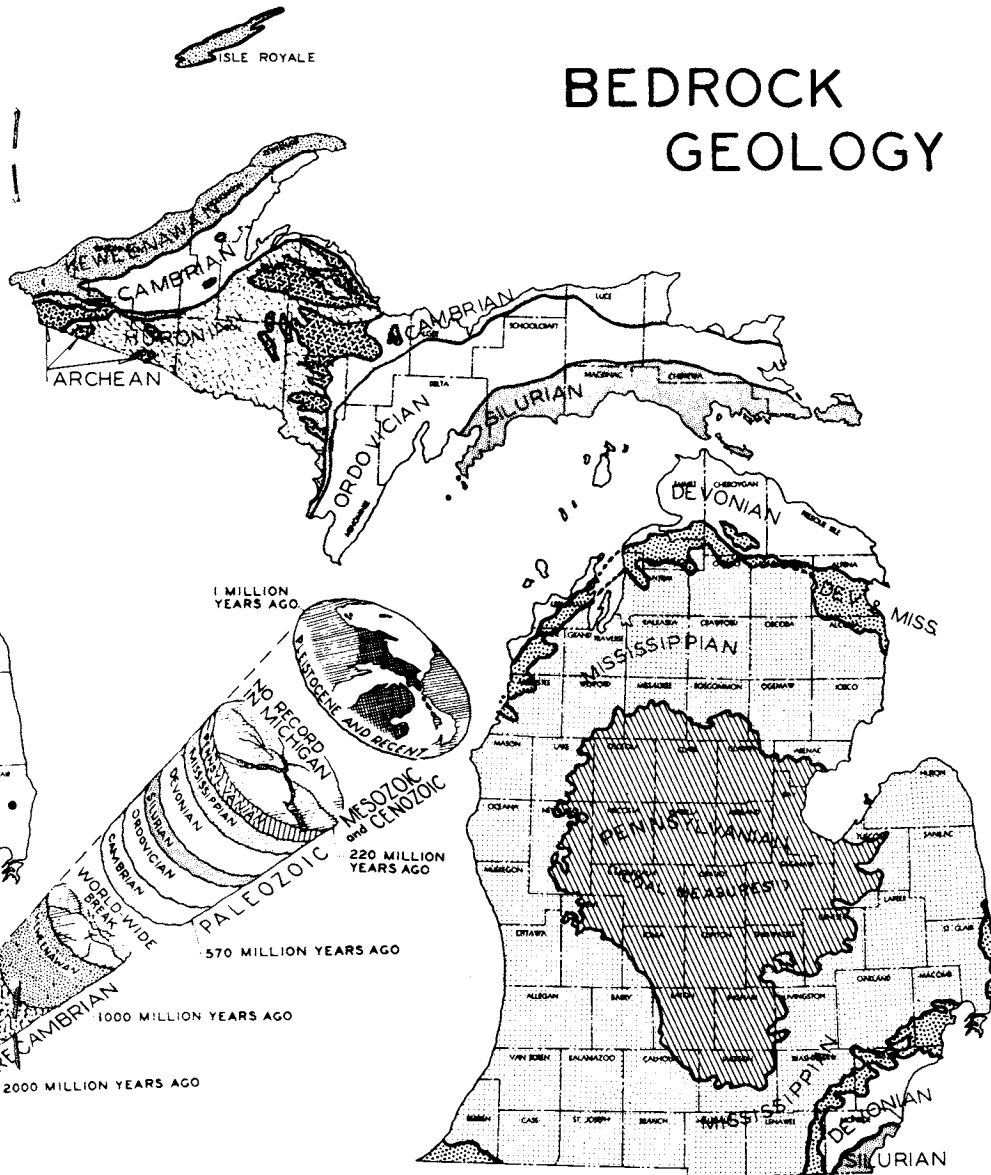
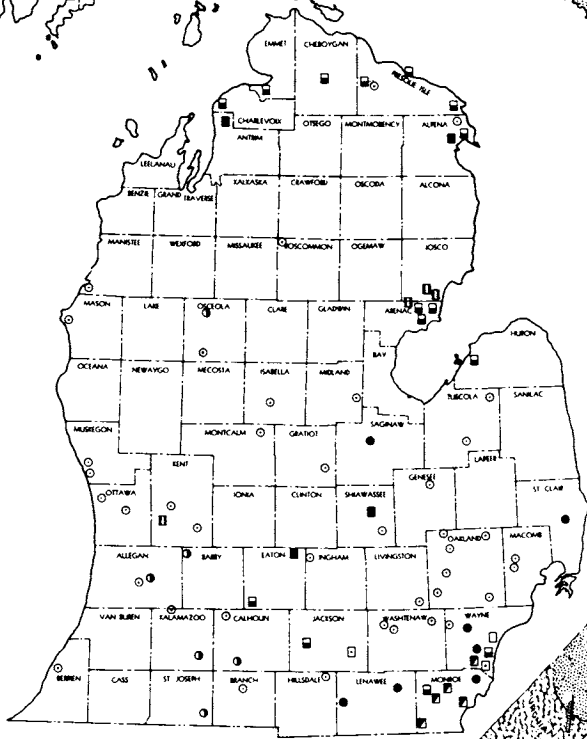
The old mine dumps and open pits in the area are good collecting spots for iron minerals. Although not suitable for polishing, they should be in every Michigan mineral collection. The iron minerals are limonite, goethite and hematite (and its several varieties: needle ore, grape ore, and specular), the manganese minerals manganite, pyrolusite and psilomelane, and associated minerals barite, apatite, and others. Bright red crystals of quartz colored by iron oxide may be found in some mine dumps.

BEDROCK GEOLOGY



1962 MICHIGAN MINES, PITS & QUARRIES

- IN BEDROCK**
- ▲ COPPER MINE
 - ▲ IRON ORE MINE
 - ▲ IRON ORE OPEN PIT
 - ▣ MARBLE
 - ▣ PEGMATITE
 - ▣ LIMESTONE
 - ▣ DOLOMITE
 - ▣ SANDSTONE
 - ▣ GYPSUM
 - ▣ SHALE
 - ▣ SALT MINE
- IN GLACIAL DRIFT**
- SAND & GRAVEL
 - CLAY
 - MARL



**ROCK COLUMN
AND
TIME SCALE**

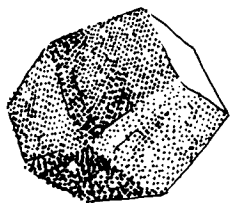
EXPLANATION

COPPER & IRON: SYMBOLS GENERALLY REPRESENT SEVERAL OPERATIONS TOO CLOSELY SPACED TO BE SHOWN SEPARATELY.
 LIMESTONE, DOLOMITE, SANDSTONE: ACTIVE OPERATIONS ONLY.
 GYPSUM: IOSCO COUNTY AREA, QUARRIES; KENT COUNTY, MINES.
 SALT: DOES NOT INCLUDE SALT WELL OPERATIONS WHERE THE SALT ROCK IS DISSOLVED AND RECOVERED AS ARTIFICIAL BRINE.
 SAND & GRAVEL: THERE ARE SEVERAL THOUSAND PITS, BUT ONLY OPERATIONS EXCEEDING 200,000 TONS IN 1960 ARE SHOWN.
 MARL: ONLY SIX COUNTIES SHOWN. PITS ARE WIDELY SCATTERED.

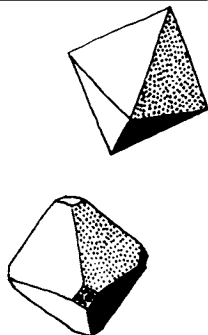
PEAT, PETROLEUM, NATURAL GAS, NATURAL SALINES AND CEMENT ARE NOT INCLUDED IN THIS PRESENTATION, ALTHOUGH OFTEN INCLUDED IN MINERAL STATISTICS.

DETAILED INFORMATION REGARDING PRODUCTION STATISTICS AND LOCATION OF MINERAL INDUSTRIES IS AVAILABLE IN A REPORT ISSUED ANNUALLY BY THE GEOLOGICAL SURVEY DIVISION OF THE MICHIGAN DEPARTMENT OF CONSERVATION.

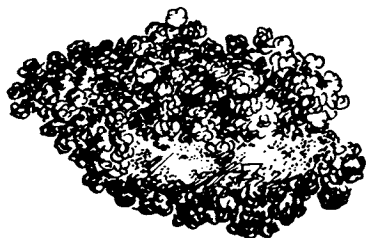
IRON COUNTRY SPECIMENS



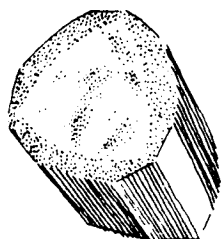
GARNET
CRYSTAL



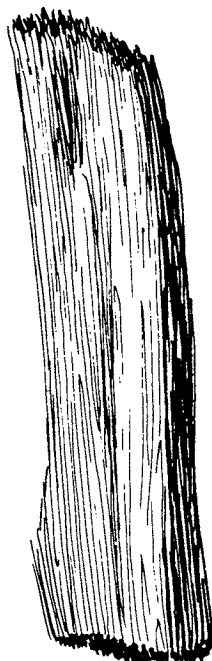
MAGNETITE
CRYSTALS, X3



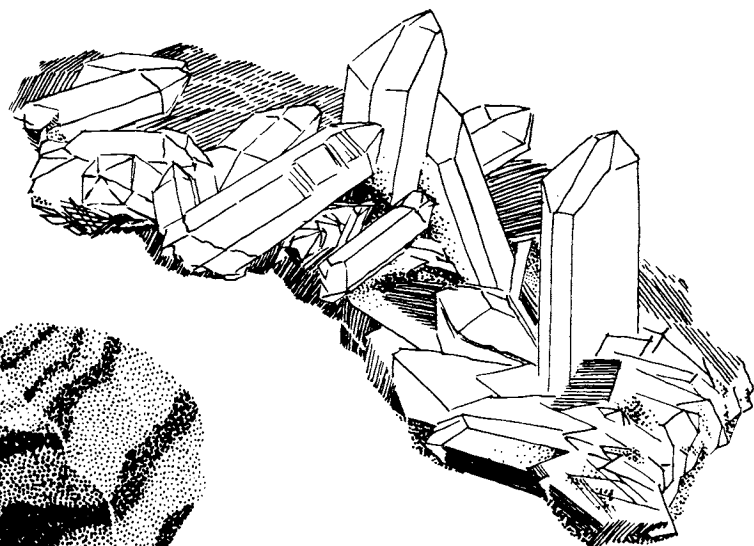
GRAPE ORE



TOURMALINE, X4



NEEDLE ORE



QUARTZ CRYSTALS

JASPILITE



North of Ishpeming, in the vicinity of Ropes Gold Mine (abandoned more than 60 years ago), verde antique marble occurs in an old working. This dark green rock, more precisely identified as serpentine, is mottled and streaked with calcite and dolomite, and is very attractive when slabbed and polished. Veins of low grade asbestos also cut the formation.

On Beacon Hill at the Champion Mine, the following minerals can be collected: martite, magnetite, pyrite, grunerite, garnet, siderite, titaniferous hematite, sericite, and tourmaline. Some of the garnets are more than one inch in diameter (at the old iron mine workings about one-half mile east of the town of Michigamme, garnets more than one inch in diameter were not uncommon) but are not of gem quality. Black pseudo-garnets are rather common and interesting. They are twelve-sided rhombic forms of iron ore which replaced the original true garnets. The tourmaline is found as slender black prisms embedded in crystal quartz.

Pegmatites (very coarsely crystalline granites) near Republic contain crystals of quartz, tourmaline, garnet, beryl, topaz and other minerals which make good display pieces. In central Dickinson County pegmatites become virtually binary granite consisting essentially of a flesh-colored orthoclase feldspar which is a satisfactory lapidary material.

Near Felch, a beautiful white crystalline dolomite marble is quarried and crushed for various industrial uses. Shades of pale green and pink to light brown run through the formation. Masses of satiny crystals of tremolite are common. This material makes very attractive desk ornaments.

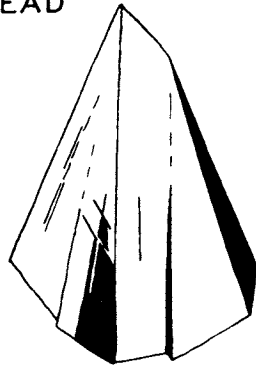
EASTERN UPPER PENINSULA

All of the minerals discussed so far are native to the Precambrian bedrock formations which became deeply buried by younger formations in the

LOWER PENINSULA SPECIMENS



CHERT
ARROW HEAD

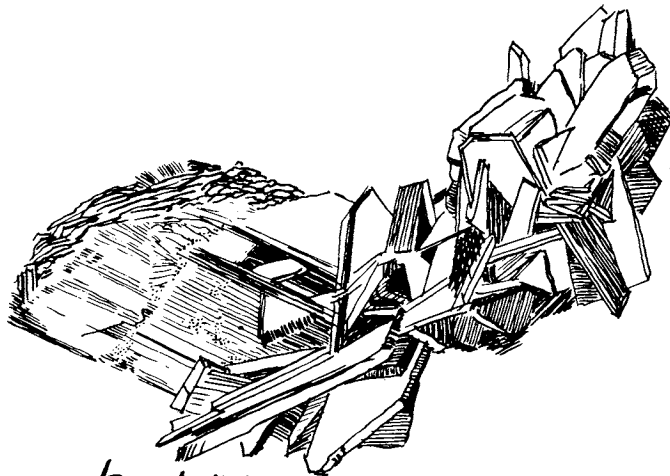
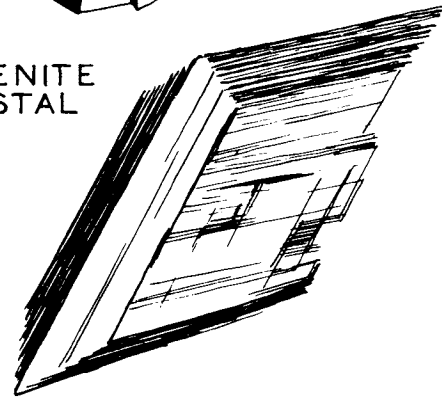


CALCITE
CRYSTAL
(DOGTOOTH
SPAR)



PYRITOHEDRON
CRYSTALS

SELENITE
CRYSTAL



CELESTITE
CRYSTALS

eastern part of the Upper Peninsula. Nevertheless, many beautiful agates and colorful cherts have been found along the Lake Superior shores of Alger, Luce, and Chippewa counties. These stones were brought southward to us several thousand years ago by the great continental glacier that formerly enveloped so much of North America, and bequeathed us the Great Lakes.

Chert and flint are in the dolomite of Niagaran age in the Northern Peninsula, exposed in Scott's Quarry near Trout Lake, and the old quarries at Manistique.

LOWER PENINSULA

The chert in a number of formations is sufficiently hard for some lapidary uses, but most of it lacks color. Perhaps the most attractive chert is the banded variety found in the Traverse limestone north of Norwood in Charlevoix County. Chert nodules are abundant in the Bayport limestone quarries in Arenac and Huron counties.

Display specimens include pyrite from the Antrim shale near Alpena and from the Bell shale near Rogers City; calcite crystals (dog-tooth spar) in the dolomite quarries near Monroe; crystals of sulfur and celestite in a dolomite quarry near Maybee; celestite and yellow calcite in geodes in the Sylvania sandstone quarry near Rockwood; brown calcite crystals in the Bayport limestone at Bayport, Huron County, and at Omer, Arenac County; crystalline pyrite and calcite from the Bayport limestone in the quarry at Bellevue, Eaton Co.; and several varieties of gypsum, including alabaster and selenite from the gypsum quarries in Iosco and Arenac counties, and the mines at Grand Rapids.

A variety of hard and colorful stones are available in almost any of the numerous gravel

FOSSIL SPECIMENS

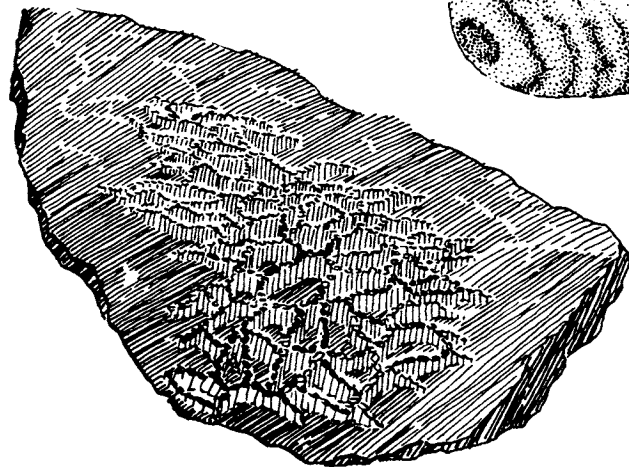
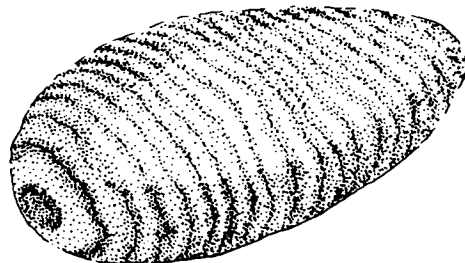


PETOSKEY CORAL

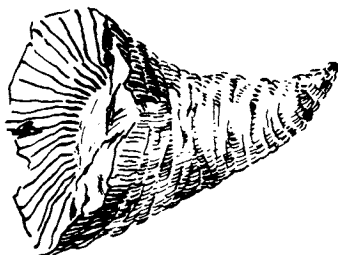


HONEYCOMB CORAL

STROMATOPOROID



CHAIN CORAL



HORN CORAL



ORGAN PIPE CORAL

pits scattered throughout the state. Some polish very well. Specimens of the various forms of quartz, are most abundant. Included are clear crystal quartz, rose and smoky quartz, agate, banded chert, jasper, and puddingstone (Jasper conglomerate). Some of the larger boulders frequently have an abundance of other minerals, such as tourmaline.

FOSSILS

Michigan's sedimentary rock formations contain a wealth of fossils which should prove interesting to lapidaries. Although much of the fossilized material is composed of calcium carbonate and, therefore, relatively soft, many of the specimens do take a polish. This is well demonstrated by the "Petoskey stone", a fossil colonial coral, genus Hexagonaria, common to the Traverse formation of the Devonian System. The attractive appearance of the Petoskey stone is due to the internal structure of the coral. The wall of each individual coral, or corallite, forms a rough hexagonal pattern. The radiating lines within each corallite are the septae. This fossil is common in the beach rubble along the south shore of Little Traverse Pay from Petoskey to Charlevoix. Here, wave action has worn down the fossil and partially polished it. Unweathered specimens can be collected from the old limestone quarries along the shore bluff from Petoskey to west of Charlevoix and in gravel pits south of this entire region.

On the east side of the state, the same fossil can be collected from Traverse formation outcrops and quarries in Alpena and Presque Isle counties and in the Afton-Onaway area in Cheboygan and Presque Isle counties.

Another colonial coral that provides interesting cutting material is the genus Favosites— the common "Honeycomb" coral which is especially abundant in the Alpena area.

Simple (solitary) cup or horn corals also make interesting cutting and polishing pieces. They may be found in nearly all the Traverse formation outcrops, but some of the easiest collecting places are the old quarry dumps. When cutting corals, interesting patterns may be developed by experimenting with cross sections in various directions.

Another coral-like fossil found in the prolific Traverse formation is the massive stromatoporoid. Polishing brings out the minute laminations.

Dolomite rock formations of Niagaran age (Silurian System) have a large assemblage of fossil corals that have been silicified. Though harder to work, they should prove satisfactory. Excellent specimens may be obtained near Raber, Chippewa County; in the vicinity of Scott's Quarry, east of Trout Lake, Chippewa County; and in the vicinity of Whitedale, Schoolcraft County.

If you desire to know more about fossils, the booklet "Guide to Michigan Fossils" (published and distributed by the Michigan Department of Conservation) will add to your understanding of these curious and interesting objects.

FURTHER READING

Alessi, A. J.: "Serpentine at Ishpeming, Michigan", Rocks and Minerals, vol. 11, no. 1, p. 11, Jan. 1936; "Hunting agates around Lake Superior", Rocks and Minerals, vol. 11, no. 9, p. 139, Sept.-Oct., 1936; "Some minerals of Ishpeming, Mich.", Rocks and Minerals, Vol. 12, no. 7, p. 209, July, 1937; "Chloride garnets of Michigan", Mineralogist, vol. 6, no. 6, p. 9-10, June, 1938.

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EXHIBITS OPEN TO THE PUBLIC

A. E. SEAMAN MINERALOGICAL MUSEUM

Michigan College of Mining and Technology, Houghton
Exhibits: 81 cases of minerals, including many Lake Superior minerals and ores; 1 case of fossils.

CALCITE QUARRY VIEW

Michigan Limestone Division, U. S. Steel Corp., Rogers City
Exhibits: Processing and uses of limestone; 1 case of fossils.

CON FOSTER MUSEUM

Clinch Park (Municipal), Traverse City
Exhibits: 39 cases of minerals; 1 case of fossils.

CRANBROOK INSTITUTE OF SCIENCE

Bloomfield Hills
Exhibits: 115 cases of minerals; 6 cases of fossils.

EXHIBIT MUSEUM

University of Michigan, Ann Arbor
Exhibits: several cases with minerals; 200 cases of fossils.

FORT WILKINS MUSEUM

Fort Wilkins State Park, Copper Harbor
Exhibits: several cases of Lake Superior minerals and ores.

GEOLOGY DEPARTMENT EXHIBIT

Natural Science Bldg., Michigan State University, East Lansing
Exhibits: 12 cases of minerals; 5 cases of fossils.

GRAND RAPIDS PUBLIC MUSEUM

54 Jefferson Ave., S.E., Grand Rapids
Exhibits: 17 cases of minerals; 2 cases of fossils.

JENISON TRAILSIDE MUSEUM

Bay City State Park, 5 miles north of Bay City
Exhibits: 2 cases of minerals; 1 case fossils.

KENSINGTON METROPOLITAN PARK

Nature Center, Milford
Exhibits: several cases of minerals.

KINGMAN MUSEUM OF NATURAL HISTORY

Leila Arboretum, Battle Creek
Exhibits: 6 cases of minerals; 8 cases of fossils.

MICHIGAN HISTORICAL MUSEUM

505 N. Washington, Lansing
Exhibits: 2 cases of minerals and fossils.

MINERALOGY MUSEUM

Department of Geology and Mineralogy, Univ. of Mich., Ann Arbor
Exhibits: many cases of minerals.

NATIONAL SKI HALL OF FAME

Ishpeming
Exhibits: 2 cases of minerals.

PORT HURON PUBLIC LIBRARY MUSEUM

1115 Sixth St., Port Huron
Exhibits: 3 cases of minerals and fossils.

SAGINAW MUSEUM

Bristol and N. Michigan, Saginaw
Exhibits: 3 cases of minerals.

THE MUSEUM

Michigan State University, East Lansing
Exhibits: 5 cases of minerals; 17 cases of fossils.

MAGAZINES FEATURING MINERALS

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Mentone, California

ROCKS and MINERALS

P. O. Box 29
Peekskill, New York

MAPS

County highway maps showing towns, sections, roads, trails, railroads, lakes, streams, quarries, etc. are generally available within each county jurisdiction. The Michigan Department of Conservation also publishes and distributes maps of all the counties showing the above features as well as all State and Federal owned land available for various recreational uses. Copies are generally available at many of the Department's facilities throughout Michigan and through the Publications Room, Department of Conservation, Lansing 26.

U. S. Geological Survey topographic quadrangle sheets cover most of the state. The Geological Survey Division, Michigan Department of Conservation, Lansing 26, Michigan issues a free price list and index for these excellent large scale maps, and will fill small orders for the same. Large orders, however, should be directed to the U. S. Geological Survey, Washington 25, D. C.

Geologic maps of the state, published by the Geological Survey Division, are available from the Publications Room, Michigan Department of Conservation, as follows:

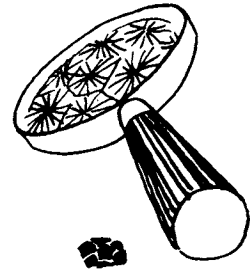
Bedrock map of the Southern Peninsula. Pub. 39, 1937, in color, scale 8 miles to the inch, 50¢. (The companion map for the Upper Peninsula is out-of-print).

Geologic map of Michigan, 1957. Black and white outline revision of the above, scale 24 miles to the inch, 10¢.

Surface formations of the Southern Peninsula. Pub. 49, 1955, in color, scale 8 miles to the inch, 50¢. The companion map for the Upper Peninsula (1957) is also available for 50¢.

Geologic quadrangle maps depicting the areal geology and location of mining operations and many former explorations are available for the following quadrangles: Ahmeek (GQ 27), Phoenix (GQ 34), Bruneau Creek (GQ 35), Eagle Harbor (GQ 36), Delaware (GQ 51), Lake Medora (GQ 52), Mohawk (GQ 54), Manitou Island (GQ 73), and Fort Wilkins (GQ 74). These detailed maps, printed in colors and including explanations of the geology, are available for \$1.00 each from the U. S. Geological Survey, Washington 25, D. C.

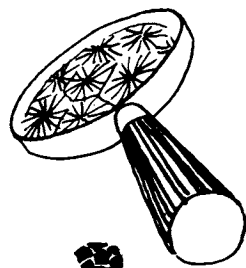
A "Geologic Map Index of Michigan" is also available from the U. S. Geological Survey for 60¢. This publication is a map outlining the exact coverage of most of the geologic maps issued for areas within the state prior to 1953.



Lake Superior Greenstone
(see page 8.)

COLLECTING MINERALS
IN
MICHIGAN

BY
R. W. KELLEY
AND
H. J. HARDENBERG



Lake Superior Greenstone
(see page 8.)



MICHIGAN DEPARTMENT OF CONSERVATION