

State of Michigan  
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The Michigan Department of Environmental Quality, Geological and Land Management Division collects, interprets and disseminates information about the geology of Michigan. One way of presenting information is through publications. This pamphlet is an attempt to make information available in response to public requests.

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Illustrations are by the author.

**"A rock or a stone is not a subject that, in itself, may interest a philosopher to study."  
James Hutton circa 1795, one of the founders of geology**

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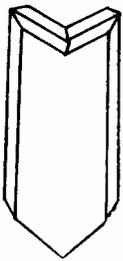
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## Introduction

The number of people discovering the enjoyable pastime of collecting rocks, minerals and fossils grows daily. There are millions of rockhounds in the United States. It can all start innocently enough. You could be strolling leisurely along one of Michigan's beautiful beaches and pick up a stone that catches your eye. Next, you might find yourself wanting to display your treasure, or wondering what it is, how it got there, or how it would look in a piece of jewelry. Beware, once you become interested in rocks, minerals and fossils, the interest is rarely lost.



Selenite crystal called a 'fishtail twin'

This pamphlet is for the beginning collector. It is not a textbook or a glossary. It is meant to give the beginner an idea of what can be done beyond picking up specimens. Hopefully, this guide will help you get off on the right foot so that collecting becomes even more enjoyable and rewarding. Remember, whenever and wherever you collect, collecting is a privilege, not a right. Always let courtesy and conservation be your guides.

## A Hobby with Endless Variety

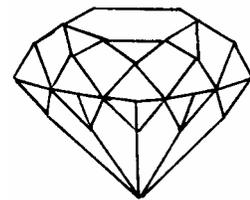
Just as the science of Geology is varied, so are the hobbies that stem from it. The hobby in general is called rockhounding, but rockhounds specialize in many ways. Collectors are hobbyists whose main interest is in obtaining specimens. Their satisfaction comes from the beauty of color and form found in nature. Collectors often become more specialized, limiting themselves to specific localities, classes of minerals or fossils, fluorescent minerals, or certain crystal types or sizes. Collecting can be done in the field, by swapping and trading, or by "silver pick" from a dealer. Amateur collectors have made many contributions to paleontology (fossils), mineralogy (minerals) and archaeology (ancient man).

a fossil solitary or horn coral



Other hobbyists' interests lie in probing the inner beauty of rocks or minerals by reshaping nature's handiwork. These people are called lapidaries. Lapidary is the art of cutting and polishing stones and minerals. Some lapidaries merely open up a specimen by sawing it in two. Frequently, this may lead to cutting thin slabs if the material is translucent or transparent. Many go beyond cutting a stone or slab by grinding a part of it into a pleasant form. Lapidary machinery can be simple or complex, homemade or purchased. The variety of forms and applications of lapidary seem endless. One simple, inexpensive piece of machinery for polishing stones is a tumbler. Rough material is placed in a drum with water and abrasives. Then the drum rotates for a time, the duration depending on the quality of the material and the desired polish. The resulting rounded, irregularly shaped pieces will challenge your creativity. Tumbled stones may be used in pendants, earrings or other jewelry.

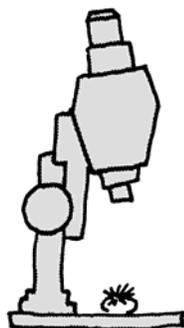
a faceted stone



One area of interest to rockhounds is paleontology, the study of fossils. This involves collecting specimens and interpreting the clues left by past life. Some rockhounds collect from specific localities, geologic ages, by biologic classifications or by size. Preparation and identification of fossils may seem complex at first, but the rewards of the work are well worth the effort.

Another popular specialty for fossil and mineral collectors is micromounting. Micromounters require magnification to observe and identify their specimens. These small, often nearly perfect specimens add another dimension to the hobby. The advantages of micromounting are the low cost of readily available specimens that are easily stored and moved. There is one major disadvantage — the cost of a good microscope. Good quality magnification is necessary to

view and identify the miniature specimens. Micromounting is rarely practiced by beginners because it takes practice to identify the specimens primarily by sight. If you want to experiment with micromounting, start by learning to use a hand lens. Many minerals and fossils found in Michigan are suitable for micromounting. Some occur only as micro specimens.



Micromounts need magnification - a hand lens or microscope - to be seen and identified.

## Societies and Museums

If you are interested in pursuing rockhounding, one of your first steps should be to join a society. Here you will have an opportunity to talk to others sharing your interests. The membership is usually made up of friendly, stimulating and knowledgeable people. Commonly societies conduct classes, lectures, and field trips relating to various aspects of the hobby. The exchanges that occur can only serve to whet your appetite and increase your knowledge. There are many societies in Michigan. For the name and address of a society near you, contact the Midwest Federation of Mineralogical and Geological Societies on the internet.

Another possibility is to visit a museum. There you will find educational displays keyed to increasing your knowledge and understanding of geology. These displays will help you develop ideas for your own collection and displays. Museums offer trips and classes that cover a wide range of interests. Michigan museums are listed in the back of this book

## Literature

Next, find a good book, one that you can read, understand and use. Whatever your interest may be, a book will help. A good place to start is your local library. There you can sample some of the available books, take some home, and perhaps buy

a copy of one that seems most useful. You might also browse in a bookstore. If the book you want is not in stock, most stores will order it. Keep in mind when you purchase a book whether or not you wish to use it for field work. If so, you might want a smaller, thin book that will fit readily into a pack. Remember, too, that hardbound books cost more but last longer. Whatever your choice, select one you will use.

Hobby-oriented magazines supply good supplementary reading. These magazines can keep you up to date on many aspects of the hobby that do not lend themselves to books. Collecting localities and helpful "how to" articles are commonly found in these magazines.

## Cataloging

All specimens should be labeled as soon as possible. Something that is familiar to you today may draw a blank later on. You might think a specimen is common material, but, it could become more important to you later. Specimens with labels are worth much more educationally and monetarily than inadequately labeled or unlabeled specimens.

Labeling and cataloging go hand in hand. Specimens can be numbered using a system you feel appropriate. You might want to use numbers or a combination of letters and numbers to code your specimens. If you keep your system simple, it will be easier to change, if necessary, as your interests change. The most important rule of cataloging is to do the specimens as they are obtained.

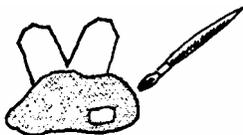
It is easy to put identification numbers on your specimens. Paint a white spot on the specimen. After the paint has dried, put the code number on the spot with black India ink. Then, to protect the number, cover it with a clear coating. To be safe, test the combination you choose to see that the coating does not dissolve the paint or cause the ink to run.

Now that the specimen has been coded, record what you know about it. Your catalog could be on index cards, in a book or part of a computer program. Each entry should contain the following types of information: code number, specimen identification (name, classification, formula, etc.), size of specimen, when found, location (as detailed as possible), who found it, who sold it to you, the price paid. Any additional information, old labels or other details should be recorded. This may seem like a lot of work, but the information you record today will be priceless to you and other collectors tomorrow.

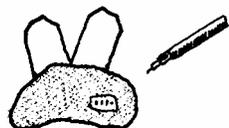
## Field Trips



How to catalog a specimen



Paint a white spot on some area not visible from the 'front'



Write your catalog code on the white area



Allow the ink to dry and cover it with a clear coating

Code	_____
Name	_____
Local	_____
other	_____
Photo	_____

Enter the information into your cataloging system

Code	_____	Photo	_____
			
Name	_____		

Photograph, digital images and or video tape are all good means for further documenting your specimens

Photographing your specimen adds another dimension to the hobby. You might want to photograph only particularly pleasing or valuable specimens. This will provide a legal record of the specimen as well as allow you to share it with friends without undo handling. Photographs should be coded and included in your catalog.

Some of the best collecting is done in quarries. Because most quarries are on private property, entry requires permission from the owner. During working days, there is a lot of activity: stripping, shoveling, hauling and blasting. Therefore, field excursions are generally planned on weekends. Your chances of getting in are better when you are with a recognized mineralogical group.

A quarry is a good place to collect specimens. Get permission and follow safety guidelines



Recent experience indicates that many operators are turning against rockhounds because of the thoughtless, careless, irresponsible or wanton acts of a few persons. These people tamper with machinery, enter private buildings, climb around stock piles and conveyor belts, drop rocks down drill holes, cut power and water lines by driving over them, borrow and break operator's tools, throw garbage around the property, or disregard closed areas. Most of the guilty parties are not members of a responsible group. Mineral societies are working to improve relations with quarry and mine operators and the community in general. The principles upon which these societies are founded signify the type of conduct expected of responsible collectors.



A chisel tipped 'mason's' or 'soft rock' hammer



A pick tipped 'hard rock' hammer

Field gear can be worked out individually according to your own needs and experience. A few things are strongly advised: one is use of safety glasses; another is use of tempered hammers. Non-tempered steel tools can hurl harmful steel splinters. Cold steel chisels are a must and need occasional dressing to keep the shoulders free of ragged knurled edges and the cutting edges sharp. In a quarry, a small sledge is often more useful than a hammer. Many painful foot and ankle bruises and scrapes can be prevented by wearing sturdy, high-topped safety shoes. Finally, it should be kept in mind that, besides being a valuable safety item, hard hats are required in many collecting areas.

In quarries and at mine waste rock piles, whether active or abandoned, many hazards exist. Be especially wary of overhangs and loose rock on steep slopes. Avoid dangerous positions. No specimen, however valuable, is worth risking your life. Above all, remember the number one rule of field workers:

**NEVER WORK DIRECTLY ABOVE OR BELOW ANYONE ELSE!**

## The Rock Collector's Code of Ethics

The following rules were adapted from the Code of Ethics of the Midwest Federation of Mineralogical and Geological Societies. These rules are heartily endorsed by the State Geologist and his staff and should be observed at all times when collecting minerals, fossils and any other materials on public or private land in Michigan. Let us enjoy our great natural heritage to the fullest and not spoil it.

- Respect all property, private or public. Do not collect on privately owned land without permission from the owner.
- Observe all laws, rules and regulations governing collecting on public lands.
- Observe boundary lines of property on which you collect.
- Do not use firearms or blasting materials in collecting areas.
- Do not cause willful damage to fences, signs, buildings or any other property.
- Leave all gates as you found them, open or closed.

- Build fires only in designated safe areas, and be certain they are extinguished when you leave.
- Do not discard matches, cigarettes or other burning materials.
- Leave all collecting areas clean, do not litter.
- Fill in excavations when you are finished.
- Do not contaminate wells, creeks, rivers, ponds or lakes.
- Do not cause damage to collecting material or take home more samples than you can use. Leave something for the next collector.
- When on a field trip, cooperate with the leader and others in authority.
- Report to a museum or local university any archaeological remains, vertebrate fossils, meteorites, petrified wood or other unusual specimens found on public lands. Depending on the find considerable work may be needed before, during and after the specimens are collected. Also properly reconstructing and displaying some specimens requires specialized resources. Properly done, such finds can more completely serve educational and scientific purposes.
- Observe the "Golden Rule". Use good outdoor manners and conduct yourself in such a way as to add to the stature and public image of rockhounds.
- Appreciate and protect our heritage of mineral resources.

## Safety for Better Rockhounding

Wear protective equipment: safety glasses, safety shoes or boots, hard hat, and gloves. Plan your work in advance and follow the plan. This will help minimize accidents and make your trip more enjoyable. Obtain the services of someone who knows the particular collecting area.

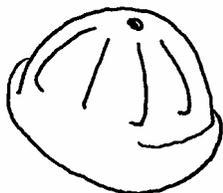
This person will not only make your trip safer, but will save you time finding the best collecting areas. Do not work alone. Let someone else know your schedule. If you get lost or hurt, help can be dispatched more quickly. Obtain permission wherever you collect. Know the area you are working in. Learn the location of emergency aid and telephone — (this could mean the difference between life and death if an accident should occur. Carry a first aid kit; know how to use it.

Watch out for others, particularly small children and inexperienced adults. Never work directly above or

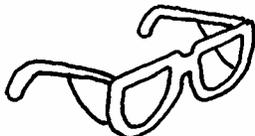


Jim Campbell

below anyone else. Do not work near steep or high vertical walls. The chance of rocks falling is great, and no specimen is worth injury or death.



Hard hat



Safety glasses



Steel toed, over the ankle boots

Do not enter abandoned mines, buildings or equipment. Most are unsafe. Do not work near deep water without a life preserver. A slip or fall could result in injury – or even death by drowning. Do not swim in flooded quarries. The water is usually too cold, and danger of drowning cannot be over-emphasized.

### Further Hints for the Collector

- Buy and use a good reference book.
- Encourage organized study and work to improve meetings you attend.
- Become acquainted with other collectors in your area.
- Visit museums and other hobbyists' collections.
- Start your collection in a general way, then specialize as you learn.
- Keep upgrading your collection.
- Keep good written records.

- Plan a cataloging system.
- Learn how to identify, clean and prepare specimens properly.
- Wrap specimens in the field, with identification, to avoid damage and loss of information.
- Plan for proper storage and display of your specimens. Do not ruin a specimen in attempts to identify it. Learn to use a hand lens. Look at but don't touch other collector's specimens.

Acquire and use good references



### Equipment

A good way to plan a field trip is to use a check list of essential equipment. By using a list, you are less likely to forget an important item. You should know where you are going, how long you will be there, and what weather conditions may be encountered. Then revise the "Field Equipment Checklist" below for your needs. Store your equipment in a convenient area, to save time and frustration.

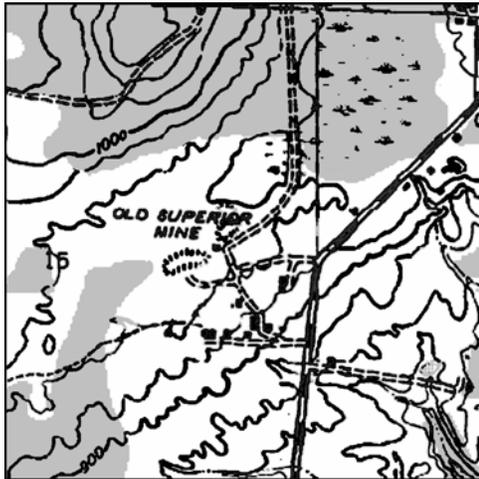
### Field Equipment Checklist

Books	First Aid kit	Knapsack	Rain gear
Brush	Fishing gear	Labels	Safety glasses
Camping gear	Flashlight	Lunch	Safety shoes
Chisel	Gloves	Magnet	Shovel
Clothing	Hammer	Maps	Specimen bags
Compass	Handlens	Matches	Water
Field guides	Hard hat	Notebook	
	Insect repellent	etc.	
		Permission	

### Maps

One of the best guides to a collecting area is a topographic map. These maps have information about locations, elevations and possible routes to the localities. Localities may be quarries, mines, gravel pits, roadcuts, peat bogs or others. Each is marked by

its own symbol on topographic maps. By learning how to read topographic maps you can more readily evaluate the possibilities of a collecting area. All of Michigan is mapped. An index is available upon request from the Michigan Department of Environmental Quality, Geological and Land Management Division, Box 30256, Lansing, Michigan 48909-7756.



A portion of a topographic map from the Chassel quadrangle map

## Geology of Michigan

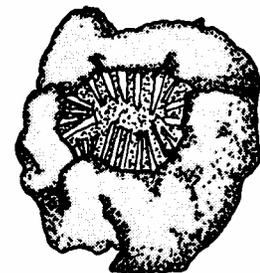
Geographically, Michigan is divided into two areas, the Northern and Southern peninsulas, which are also geologically distinct. The western part of the Northern Peninsula is composed of Precambrian and Cambrian rocks. This is where Michigan's vast metallic mineral resources are found. The eastern part of the Northern Peninsula and the entire Southern Peninsula are made up of Ordovician to Jurassic rocks. In this series of rocks are found gypsum, limestone, salt and petroleum, all of which are important natural resources. The differences between these areas have been hidden by a blanket of gravels, sands and clays left by the Pleistocene glaciers.

With the above brief outline in mind, you can better understand the differences in the petrology (rocks), mineralogy (minerals) and paleontology (fossils) of the various areas of Michigan. When the rockhound learns to interpret the stories told in the languages of geology, the hobby and the science will take on new depth and meaning.

## Copper Country

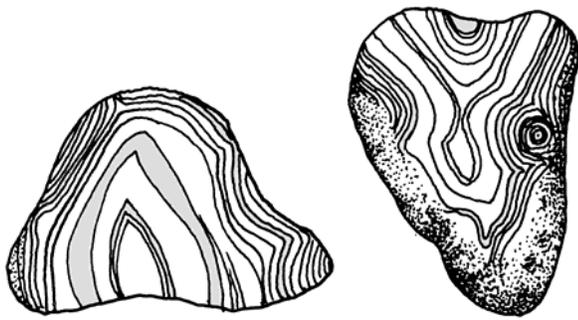
Rock and mineral specimens can be found in many areas of Michigan. The foremost area is the Keweenaw Peninsula, the Copper Country, where a large variety of material occurs. Here, a wealth of minerals is found associated with the extraordinary native copper deposits. Mineralization has taken place in the porous and fractured tops of basaltic lava flows (amygdaloids) and in between the pebbles of interflow conglomerates. The most important economic mineral is copper. Associated with the copper deposits are minerals of interest to both collectors and lapidaries. More than 75 minerals have been reported in the Copper Country, and in some local areas as many as 20 different minerals might be collected.

Some of the best collecting can be done along the shores of Lake Superior. Here the basalts and conglomerates are eroded and give up their minerals, which then mingle with other beach stones. These materials may become concentrated and tumbled by wave action. The most prized finds include agates, Isle Royale Greenstone (chlorastrolite) and a group of minerals called zeolites which includes thompsonite and others.



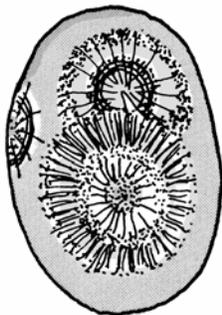
Zeolites in a vug

AGATES. Many colors and varieties of agate can be found along the shores and in gravel throughout the Lake Superior region. The agates filled in the gas-formed holes, or amygdaloids, in the tops of the numerous basalts. Typically, the agates show very fine concentric banding and are relatively hard. Most specimens are rather small, but large agates are found occasionally. Remember, the rough agate does not look like the cut and polished stone. Most Lake Superior agates are rounded or oval-shaped in outline and look much like a pock-marked potato on the outside. After the first one has been found, the hunting becomes easier. Agate can also be found in veins in the bedrock far inland from beaches.



Lake Superior Agates showing typical banding

CHLORASTROLITE. A variety of the mineral Pumpellyite, and a beautiful lapidary material. The name means green-star-stone. It is also called greenstone, but the term "greenstone" also applies to a common metamorphic rock. Chlorastrolite specimens are usually bean-sized with a light to dark green or blue-green color. The distinctive feature of this mineral is its turtleback pattern. Turtle-backing is the result of complex crystal growth and inclusion of impurities in the needle-like crystals. The result is a change of color, or chatoyancy (as in tiger-eye), as the stone is moved in the light. This distinctive material was officially designated Michigan's State Gem in 1973. Though capable of taking a high polish, chlorastrolite scratches easily. Careful search of the basalts in the Keweenaw Peninsula will yield good specimens. Specimens can also be found on Isle Royale, but the National Park Service has rules about collecting. There, as elsewhere, hobbyists should obtain permission before collecting.



Thompsonite

THOMPSONITE. One of the zeolite minerals that can also be found on the beaches. The beautiful pink and white eyes at times are found mixed with prehnite or chlorastrolite. The green variety of Thompsonite is called Lintonite. Many fine specimens have been found on the beaches north of Ahmeek.

Near Rockland and Mass, COPPER and DATOLITE are found in old mine waste rock piles.

Datolite nodule that has been cut using a diamond blade saw



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 BORNITE, CHALCOCITE, and CHALCOPYRITE.

From the dumps of the various Isle Royale Copper Company mine shafts, about one mile south of Houghton, massive EPIDOTE and PREHNITE can be collected. Also clear QUARTZ crystals one-half inch or more in length occur in amygdules in the basalts, 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 yield copper-nickel arsenide minerals, of which the most common is WHITNEYITE. 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 becomes readily apparent when the rock is cut, making it a most attractive lapidary material.

From the dumps of the fissure mines in the vicinity of Phoenix, Delaware and Mandan, COPPER and PREHNITE can be collected.

Near Copper Falls (between Eagle River and Eagle Harbor) one of the minerals found in an old mine dump is NATROLITE, a zeolite mineral.

The Clark mine and Star explorations have yielded some nice specimens of DATOLITE. Of all the minerals of the Lake Superior district, this is surely one of the loveliest. It is prized because its high density and good

hardness yield lustrous polished surfaces. Most datolites are porcelain-white to buff-white; they may be shaded slightly grey, pink or very pale green, and peppered with red to brown specks. Sometimes there are copper, and rarely silver, inclusions. Pure green or yellow specimens are considered 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 consideration. This 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, with a few 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 is discussed here. Additional locality information can be found in THE MINERALOGY OF MICHIGAN, by Heinrich.

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 rock formation is folded, bent and twisted in a 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. This is excellent material for bookends or other uses not requiring a harder material.

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 and HEMATITE (and its several varieties: grape ore, needle ore, and specular hematite), the manganese minerals MANGANITE, PSILOMELANE, PYROLUSITE and associated minerals APATITE, BARITE and others. Bright red crystals of QUARTZ colored by iron oxide may be found in some mine dumps.

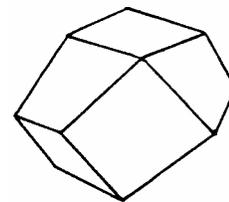
Hematite variety  
'Needle Ore' one of  
the many iron  
minerals



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 polished. Veins of low grade ASBESTOS also cut the formation.

On Beacon Hill at the Champion Mine, the following minerals can be collected: GARNET, GRUNERITE, HEMATITE, MAGNETITE, PYRITE, SERICITE, SIDERITE, TITANIAN MAGNETITE and TOURMALINE. Some of the garnets are more than one inch in diameter. Black pseudomorphs (replacements) of garnets are rather common and interesting. They are typical 12-sided, rhombic forms (dodecahedrons) of garnets. The garnets have been replaced by a different mineral which would not crystallize in that form. Tourmaline is found as slender black triangular cross-sections or needle-like prisms embedded in quartz.

Distorted by  
metamorphism, a  
pseudomorph, or  
replacement, after  
garnet



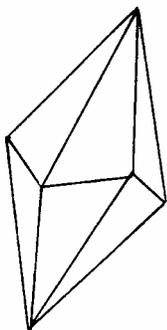
Pegmatites, very coarsely crystalline igneous rocks, near Republic contain crystals of BERYL, GARNET, QUARTZ, TOPAZ, TOURMALINE and other minerals

which make good display pieces. In central Dickinson County the pegmatites become a rock called "graphic granite", consisting essentially of flesh-colored microcline feldspar and smoky quartz.

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.

## Sedimentary Rocks & Minerals

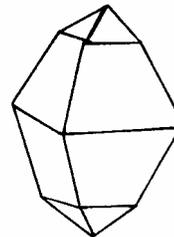
All of the minerals discussed so far are native to the Precambrian and Cambrian bedrock formations in the western Northern Peninsula. These rocks are buried by younger formations in the eastern part of the Northern Peninsula. Nevertheless, beautiful AGATES and colorful CHERT have been found along the Lake Superior shores of Alger, Luce and Chippewa counties. These stones were brought southward thousands of years ago by great continental glaciers that covered much of North America, and formed the Great Lakes.



Calcite

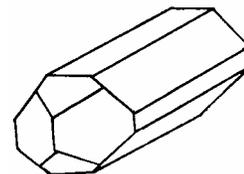
CHERT and FLINT are in the Silurian age dolomites in the Northern Peninsula, exposed in Scott's Quarry near Trout Lake, and the old quarries at Manistique. Chert in some formations in the Southern Peninsula is sufficiently hard for some lapidary uses, but most of it lacks color. Perhaps the most attractive 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.

Sulfur



Other minerals include display specimens of PYRITE from the Antrim shale near Alpena and from the Bell shale near Rogers City; CALCITE crystals (dogtooth spar) in the dolomite quarries near Monroe; crystals of CALCITE, CELESTITE, SELENITE and SULFUR in the dolomite quarry near Maybee; yellow CALCITE and CELESTITE 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; CALCITE, MARCASITE and PYRITE from the Bayport limestone in the quarry at Bellevue, Eaton County; and several varieties of gypsum, including ALABASTER and SELENITE, from the gypsum quarries in Iosco and Arenac counties, and the mines at Grand Rapids.

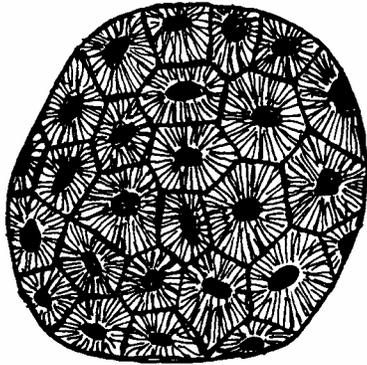
Celestite



A variety of hard and colorful stones is available in the numerous gravel pits throughout the state. Many polish very well. Many forms of QUARTZ are abundant: clear crystalline quartz, rose or smoky quartz, agate, banded chert, jasper, or puddingstone (jasper conglomerate). Some boulders contain a number of minerals.

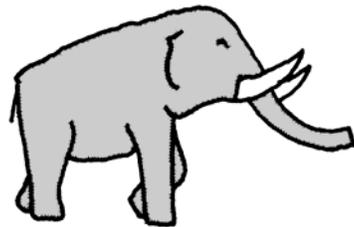
## Fossils

Michigan's sedimentary rock formations contain a wealth of fossils that are interesting and educational. You can find fossil plants, invertebrates and vertebrates. Many of the fossils are marine and are commonly preserved as calcite. Although calcite is relatively soft, many specimens can be cut and polished. Michigan's State Stone, the PETOSKEY STONE,



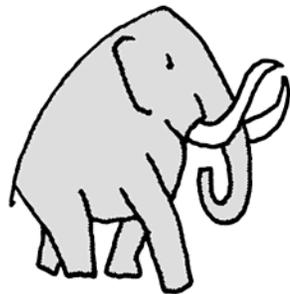
Petoskey stone  
*Hexagonaria pericarinata*

the State Stone

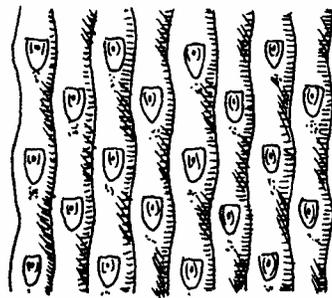


American Mastodon  
*Mammut American*

the State Fossil



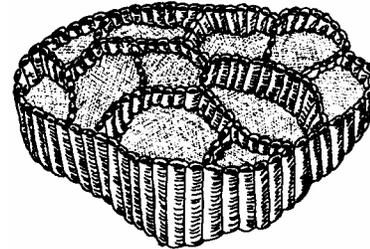
Mammoth genus  
*Mammuthus*



Pattern from a *Sigillara* trunk



A brachiopod



A colonial or 'chain coral'



A straight shelled or orthocone cephalopod

is an excellent example. Petoskey stones are the Devonian age fossil colonial coral scientifically called *Hexagonaria pericarinata*. Their internal structure is striking. The polygonal outline marks the boundary of each individual (corallite) in the colony. Closer inspection reveals a radiating pattern of the support structures called septae (singular is septa). Further inspection will reveal even more detail. Petoskey stones are common beach rubble along the south shore of Little Traverse Bay from Petoskey to Charlevoix, and

may also be found in gravel pits and road cuts in Charlevoix and Emmet counties. Unweathered specimens can be collected in limestone quarries along the shore bluff where the rocks outcrop.

Another popular fossil hunting area is located on the opposite side of the Southern Peninsula around Alpena. Guides to the Alpena and Petoskey areas are available which list localities and the fossils reported from the outcrops. Some of the more common marine fossils are on the MICHIGAN FOSSILS poster

Plant fossils are found in the central part of the Southern Peninsula. Most are associated with the Pennsylvanian age coal deposits. Localities and descriptions can be found in the book GEOLOGY OF MICHIGAN, by Dorr and Eschman.

On April 8, 2002 the American Mastodon, *Mammut americanum* was designated as the official state fossil. There is a list of State symbols at the back of this book.

Occasionally, fossil vertebrates, animals with back bones, are found. These are rare and are most commonly found in bogs. A wide variety of vertebrates have been found in Michigan. The most common and most familiar fossil is the American Mastodon, *Mammot americanum*, or the Jefferson Mammoth, *Mammuthus jeffersoni*. These are commonly confused or interchanged, but they are in fact different animals. Other vertebrates varying in size from small mice to large whales are found in Pleistocene deposits. Vertebrate fossils are found in older rocks as well, usually limited to early forms of fish and preserved as a bony plate. Rarely, a nearly complete individual may be found. If you should happen to find a vertebrate fossil, contact a local museum or university as soon as possible. More information about Michigan's ice age and fossil vertebrates can be found in GEOLOGY OF MICHIGAN, by Dorr and Eschman.

When a fossil or mineral is found that you cannot identify, someone with more expertise should be contacted. This may be a rock club member, someone at a museum, or a geologist with the DEQ. Please exercise the courtesy of contacting the person before taking him the specimen. You might have to leave the specimen for a period of time, depending on schedules and whether tests must be made. Many outstanding specimens, some unique, have been found by amateurs, and many advanced collectors or professionals will help you with identification. But you should make every effort to identify your specimens first.

## Getting More Information

"Geology of Michigan" by John A. Dorr, Jr. and Donald F. Eschman - 1970, 8-1/2 x 11. 488 pgs. 159 pages of photographs, 128 line illustrations, cloth bound. ISDN 0-472-08280-9  
University of Michigan Press, Ann Arbor, Michigan.

"Mineralogy of Michigan" E. W. Heinrich, updated and revised by George Robinson, A. E. Seaman Mineral Museum Michigan Technological University, 2004, 250 pages, many color photographs of Michigan minerals.

Michigan Department of Environmental Quality, Geological and Land Management Division, on the web at Geology in Michigan  
[www.michigan.gov/deggeologyinmichigan](http://www.michigan.gov/deggeologyinmichigan)  
all lower case - no spaces

Mineral Information Institute @ [www.mii.org](http://www.mii.org)

information about rock and mineral clubs, programs, resources and or 'shows' in your area go to the Midwest Federation of Mineralogical and Geological Societies web site @ [www.amfed.org/mwf/](http://www.amfed.org/mwf/)

Earth Science Week <http://www.earthsciweek.org/>

US Geological Survey - Michigan information (and MORE)  
<http://geology.er.usgs.gov/states/midwest.html>

Canadian Rockhound Geological Magazine  
[www.canadianrockhound.com/links\\_educational.html](http://www.canadianrockhound.com/links_educational.html)

And many, many, many, more - try [www.google.com](http://www.google.com) to search for topics of interest

Questions, comments, corrections . . . please contact

Steven E. Wilson - ([wilsonse@michigan.gov](mailto:wilsonse@michigan.gov))  
MI DEQ  
GLMD  
525 West Allegan  
Lansing, MI 48913

## Museums and Exhibits

### Featuring Rocks, Minerals and Fossils

The following list is alphabetical by city, and includes a wide variety of collections, exhibits, and tours that may be of interest: Call to confirm scheduling and location. This list is based on the more extensive list found in the 2004 revision of MINERALOGY OF MICHIGAN.

#### **Albion:**

- Albion College  
telephone (517) 629-0486 or 629-1000
- Brueckner Museum  
telephone (517) 629-5591

#### **Alma:** Alma College

telephone (517) 463-7191 or 463-7198

#### **Ann Arbor:**

- University of Michigan, Department of Geological Sciences - telephone (734) 764-1435
- University of Michigan, Museum of Natural History telephone (734) 764-0478

**Battle Creek:** Kingman Museum of Natural History  
telephone (616) 965-5117

**Bloomfield Hills:** Cranbrook Institute of Science  
telephone (248) 645-3200

**Calumet:** Keweenaw National Historical Park  
telephone (906) 337-3168

**Caspian:** Iron County Museum  
telephone (906) 265-2617 or 265-3942

**Chelsea:** Gerald E. Eddy Discovery Center  
telephone (734) 475-3170

**Copper Harbor:** Fort Wilkins State Park  
telephone (906) 289-4215

**Dearborn:** University of Michigan, Dearborn  
telephone (313) 436-9129

**Delaware:** Delaware Copper Mine Tours  
telephone (906) 289-4688

**Detroit:** Wayne State University Department of Geology, telephone (313) 577-2510 or 577-2506

**Eagle River:** Keweenaw County Courthouse  
telephone (906) 337-2229

**East Lansing:** Michigan State University Museum  
telephone (517) 353-4572

**Grand Marais:** Gitche Gumee Agate and History Museum  
telephone (906) 494-2590

**Grand Rapids:** Grand Rapids Public Museum  
telephone (616) 456-3977

**Greenland:** Adventure Copper Mine and Campground  
telephone (906) 883-3371

**Hancock:** Quincy Mine Hoist  
telephone: (906) 482-3101

**Hillsdale:** Hillsdale College Museum  
telephone (517) 607-2607

**Houghton:** A. E. Seaman Mineral Museum MTU  
telephone (906) 487-2572

**Iron Mountain:** Cornish Pump and Mining Museum  
telephone (906) 774-1086

**Ironwood:** Ironwood Area Historical Society Museum  
telephone (906) 932 - 0287

#### **Ishpeming:**

- Tilden Mine, Empire mine tours:  
telephone (906) 486-4841
- Cliffs Shaft Museum  
telephone (906) 485-1882

**Kalamazoo:** Western Michigan University Department of Geosciences - telephone (616) 387-5485

**Lake Linden:** Houghton County Historical Museum  
telephone (906) 296-4121

#### **Lansing:**

- Michigan Historical Museum  
telephone (517) 373-3559
- DEQ Geological and Land Management Division,  
telephone (517) 241-1515

**Marquette:** Marquette County Historical Museum

**Midland:** The Hall of Ideas at the Midland Center for the Arts  
telephone (989) 631-5930 or 800-523-7649

**Milford:** Kensington Metropolitan Park  
telephone (248) 685-0603

**Mt. Pleasant:** Musuem of Cultural and Natural History telephone (517) 774-3829

**Muskegon:** Muskegon County Museum telephone (231) 722-0278

**Negaunee:** Michigan Iron Industry Museum telephone (906) 475-7857

**Ontonagon:** Caledonia mine tours telephone (906) 884 - 2488):

**Port Huron:** Port Huron Museum telephone (810) 982-0891

**Rogers City:** Calcite Quarry Observation Booth telephone (517) 734-2136

**Sault Ste. Marie:** C. Ernest Kemp Mineral Resources Museum - (906) 632-9537 or 635-2267

**South Haven:** Liberty Hyde Bailey Birth Site Museum telephone (616) 637-3251

**South Range:** Copper Range Historical Society Museum telephone (906) 482-6125

**Traverse City:** Grand Traverse Heritage Center telephone (231) 995-0314

**Vulcan:** Iron Mountain Iron Mine telephone (906) 563-8077 or 774-7914

**Wakefield:** Wakefield Historical Society Museum telephone (906) 224-8151

## Michigan's State Symbols

Do you call yourself a Michigander or a Michiganian? Both words mean you are from Michigan and proud of it. Michigan's mottos are:

*E Pluribus Unum* (from many, one),

*Tuebor* (I will defend) and

*Si Quaeris Peninsulam Amoenam Circumspice*

(If you seek a pleasant peninsula, look about you).

**STATE FLOWER**, 1897, Apple Blossom, *Pyrus coronaria*.

**STATE BIRD**, 1931, American Robin, *Turdus migratorius*.

**STATE TREE**, 1955, White Pine, *Pinus strobes*.

‡ **STATE STONE** Petoskey Stone, *Hexagonaria pericarnata*. On March 31, 1966, Act 89 of 1965 adopted the Petoskey stone as the state stone. The Petoskey stone is a fossilized colonial coral that existed about 375 million years ago in what is now the northern Southern Peninsula.

**STATE FISH**, 1988, Brook Trout, *Salvelinus fontinalis*.

‡ **STATE GEM** Chlorastrolite, "greenstar stone". March 30, Act 56 of 1972 adopted chlorastrolite as the state gem. Commonly known as greenstone or as Isle Royale greenstone, chlorastrolite ranges in color from yellow-green to almost black. It formed in rocks found in the western Northern Peninsula.

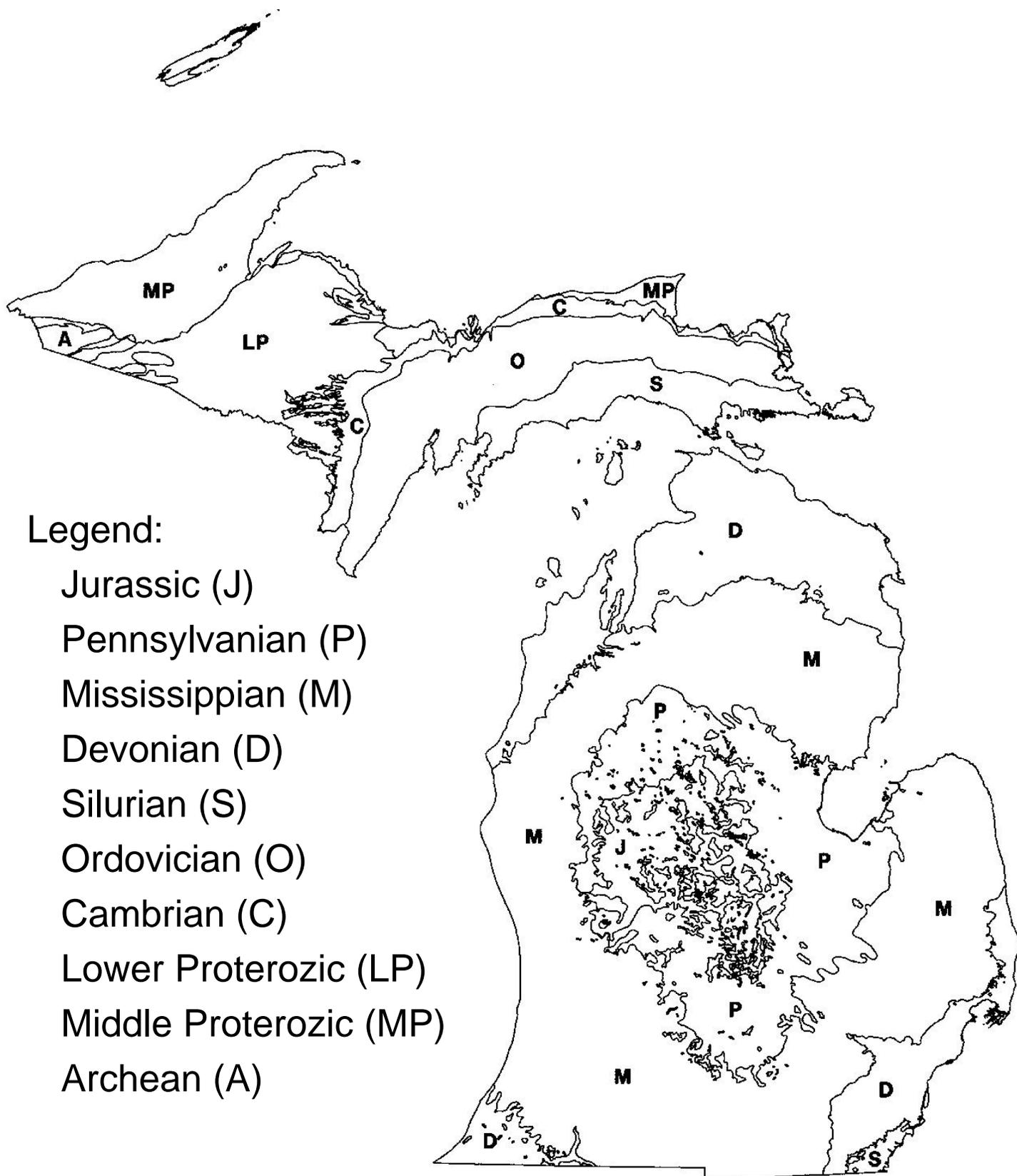
‡ **STATE SOIL** Kalkaska Sand, December 14, Act 302 of 1990 designated the Kalkaska soil series as the official state soil. First identified as a soil type in 1927, Kalkaska sand ranges in color from black to yellowish brown. It is one of more than 500 soils found in the state. Unique to Michigan, Kalkaska sand covers nearly a million acres in 29 Northern and Southern Peninsula counties.

**STATE REPTILE**, 1995, Painted Turtle, *Chysemys picta*.

**STATE GAME MAMMAL**, 1997, White-Tailed Deer, *Odocoileus virginianus*.

**STATE WILD-FLOWER**, 1998, Dwarf Lake Iris, *Iris lacustris*.

‡ **STATE FOSSIL** American Mastodon, *Mammot americanum*. April. 8, Act 162 of 2002 designated the mastodon as the official fossil of this state. Fossil remains of this prehistoric mammal have been found in many locations in the Southern Peninsula of the state.



Legend:

- Jurassic (J)
- Pennsylvanian (P)
- Mississippian (M)
- Devonian (D)
- Silurian (S)
- Ordovician (O)
- Cambrian (C)
- Lower Proterozoic (LP)
- Middle Proterozoic (MP)
- Archean (A)