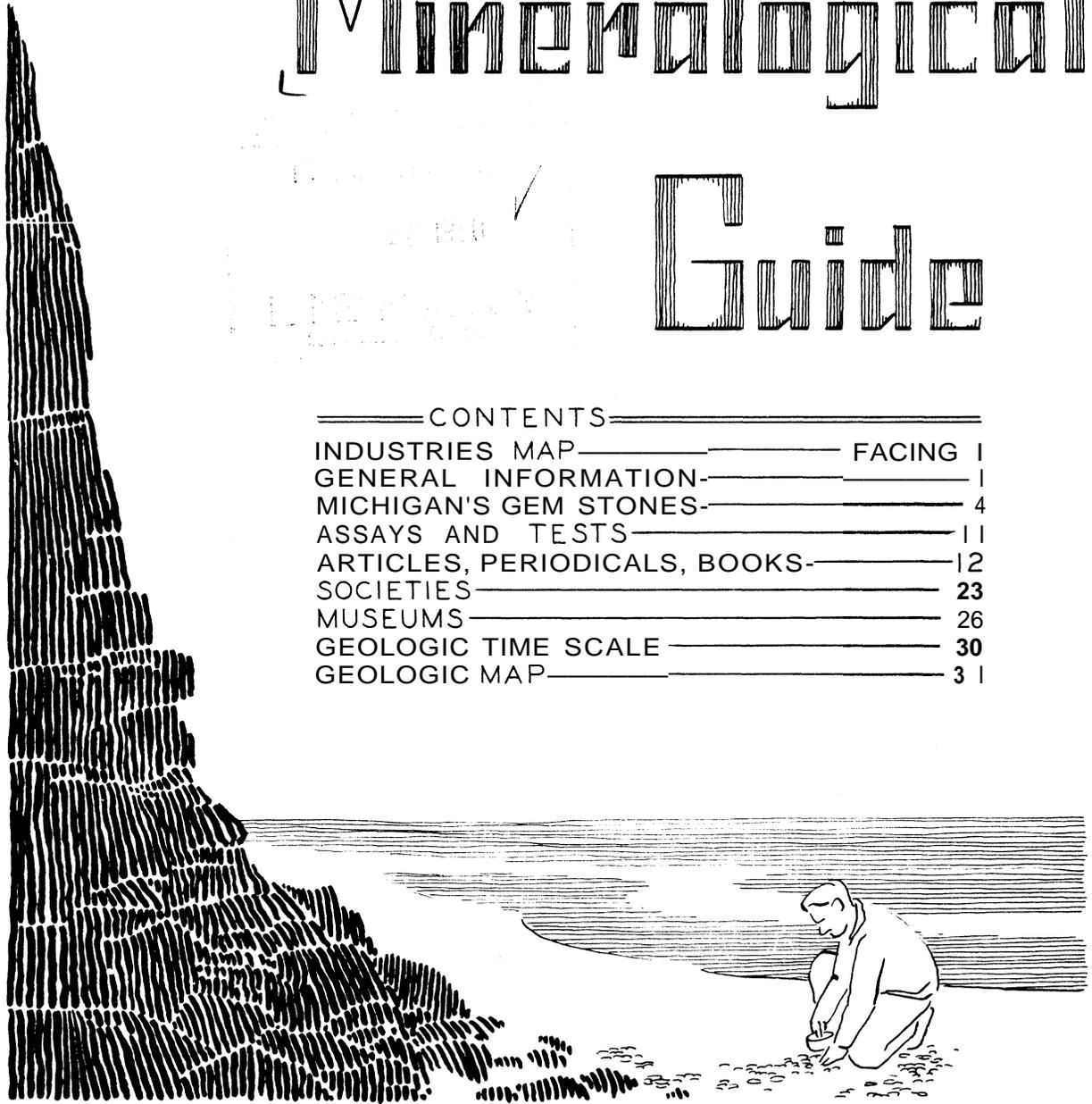


Mineralogical Guide

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MICHIGAN DEPARTMENT OF CONSERVATION
GEOLOGICAL SURVEY DIVISION
1960

FREE DISTRIBUTION ONLY

PREFACE TO THIRD EDITION

The first edition, published in April, 1958 was needed in responding to queries following a mineral show on the Department T-V program "Michigan Conservation". The second edition, July, 1959, was characterized by the addition of the section on gem stones* An abstracted version of the second edition titled "Pebbles to Pendants" was published in the July, 1958 issue of "Michigan Conservation".

The present third edition is another major revision. Among the new materials added are: 1) bedrock geologic map, 2) mineral industries map, 3) rock column and time scale, 4) mineral and fossil sketches, and 5) locality sketch maps. These, along with the cover, were prepared by Jim Campbell of our staff. The book list has been expanded and several titles were added to the articles list. Suggestions received from Arthur Johnstone, of the Michigan Mineralogical Society, were particularly helpful.

Information regarding mineral and lapidary businesses may be found in the appropriate advertising media as well as from many of the clubs.

Robert W. Kelley, Geologist
Geological Survey Division
Michigan Dept. Conservation

March, 1960
Lansing

GENERAL INFORMATION

INTRODUCTION

Interest in collecting minerals and gem stones and in doing lapidary work certainly is on the increase today. More than ever before, these fascinating pursuits are attracting new hobbyists. The rapid growth of this interest is perhaps most apparent to those of us in geological work and associated endeavors. Much can be said in favor of this avocation, too, though there isn't space here to tell the whole story. Suffice it to say that this interest cuts across all walks of life, that there is no greater social leveller, and that the interest once attained is rarely abandoned.

FIRST STEP

If you are interested in minerals, seek and join others having like interests. Your progress will be much more satisfactory if you are able to rub shoulders and swap information with enthusiasts. Reading is desirable but is subordinate or supplemental to personal contacts. Although necessary in the more advanced stages, book learning cannot achieve the true appreciation acquired through observing actual specimens. Visit the museums. The finest materials eventually find their way to these institutions. Then if the bug bites you, subscribe to a periodical and purchase a reference or two. One of your first steps is to join a local mineral club or society because their memberships include many stimulating and hospitable people who will be a source of inspiration.



INSTRUCTION

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.



PHASES OF HOBBY

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 spectacular faceted gems.

There is now much interest in still another activity called "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. These are commonly made up into pendants, earrings, and other **jewelry**.

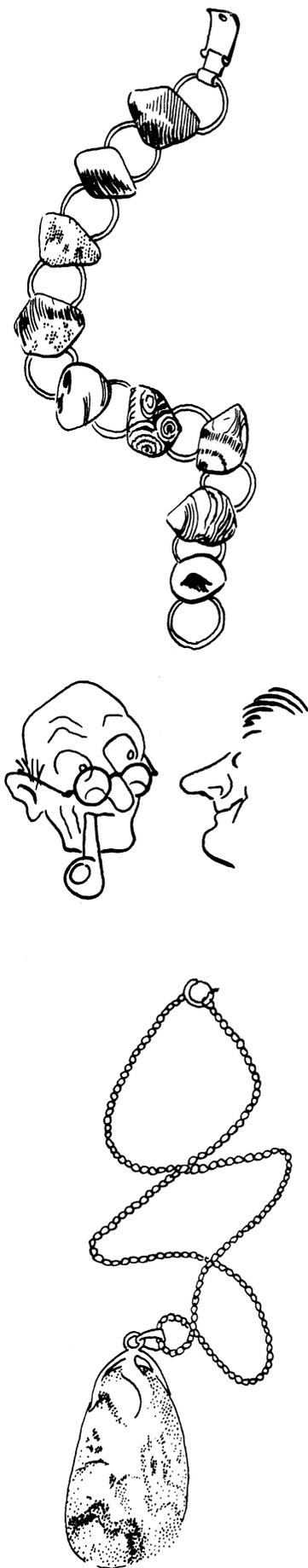
PRINCIPLES AND PREREQUISITES

Precise information on specific collecting sites is acquired only by experience and diligent search, though 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.

Although you will find little published material directing you to a **collector's** paradise, there is a popular book which will help you get oriented to the geology and mineral resources of our state. "Rocks and Minerals of Michigan" (priced at 50¢) will guide you to those areas where you are most likely to find the various minerals. Much of the data on gem stones has been abstracted from it and appears in the next section of this guide entitled "Michigan's Gem Stones". Remember, this is but an abbreviated introduction to the gem hunting grounds of Michigan.

Persons desiring more details should refer to our Publication 50, "An Index to Michigan Geology" (\$2.00) which includes an index of all Michigan Geological Survey publications and maps, an index and chart of



the rock formation names used in Michigan, a list of all reported Paleozoic rock outcrops, and a **comprehensive** list of references to Michigan geology and mineral **resources**. Both of these books are **available** in libraries or may be purchased by writing the Publications **Room**, Michigan Department of Conservation, **Lansing 26**, Michigan.

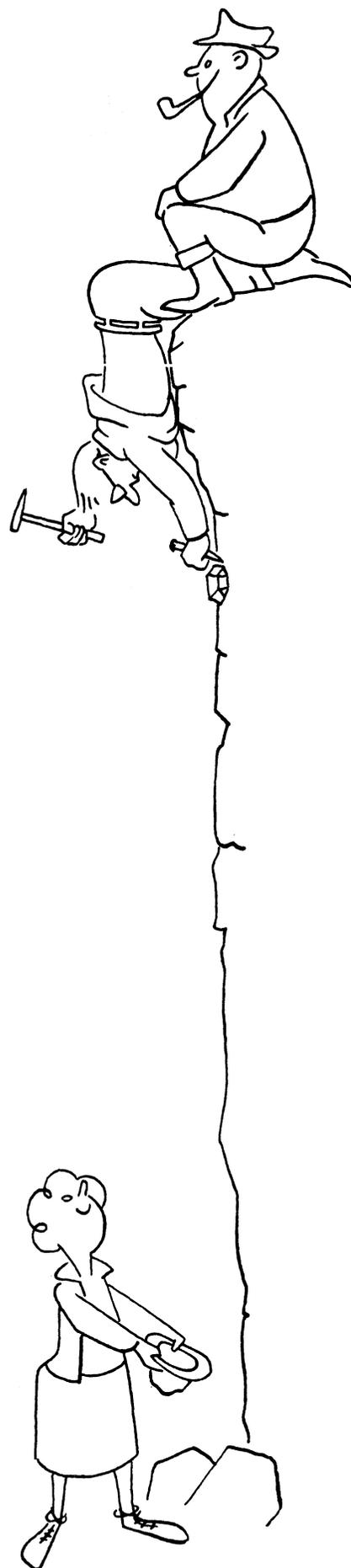
FIELD TRIPS

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 operators are turning against mineral collectors* The entire fraternity is in jeopardy of acquiring a bad name because of thoughtless, **careless**, **irresponsible**, or wanton acts of those who tamper with machinery, enter buildings where they have no business, climb around stock piles and conveyor belts, drop rocks down drill holes necessitating expensive **re-drilling**, sever power and water lines by driving over them, borrow and break operator's tools, or throw garbage around the property. Most of the guilty parties are not members of a responsible group. Mineral societies are working hard at maintaining excellent relations with quarry operators and the community in general. The very principles upon which they have been founded are reminders of the conduct expected of members.

Field gear is something you will work out individually as the result of experience and your own needs and wants, but there are a few things oldtimers strongly advise. One of these is the wearing of safety goggles when hammering rock. Another is the use of a standard geologist's or prospector's hammer or pick. Other types, not specially tempered, are liable to hurl steel splinters that are virtual shrapnel. Chisels are a must and they need to be dressed occasionally 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, whether active or abandoned, there are many hazards. Be especially wary of overhangs and loose rocks on steep slopes. Never get in a precarious position. No specimen is worth the risk. Above all else, remember the cardinal rule of field workers: NEVER WORK ABOVE OR BELOW ANYONE ELSE.



MICHIGAN'S GEM STONES

by

H. J. Hardenberg

Mineral and rock material suitable for lapidary work can be found in a number of areas of Michigan, but ordinarily we think first of the minerals of the Keweenaw Peninsula.

COPPER COUNTRY

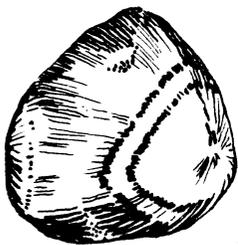
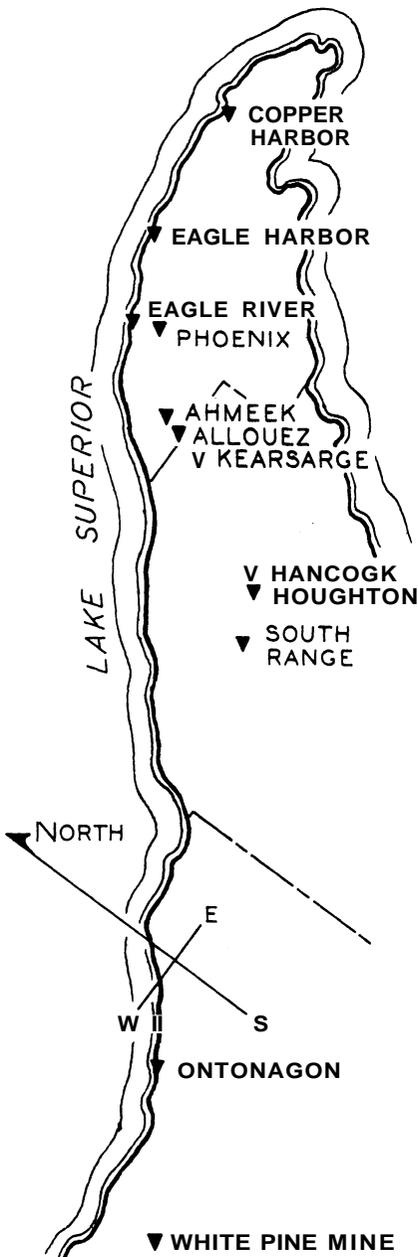
Here can be found a number of minerals which are attractive enough when cut and polished to be classed as gem stones. These minerals are associated with the copper-bearing rocks of the district. Mineralization has taken place in the porous and fragmental tops of lava flows (amygdaloids) and in the conglomerates. The most important economic mineral deposited is copper, but associated with the copper are minerals which have gem value. More than sixty minerals are in this area; and at almost any mine rock pile at least twenty different ones can be collected.

Beaches

Some of the best collecting places are along the shores where the lava flows and conglomerates are constantly being eroded and thus forced to give up their caches of minerals which collect in the wave-piled beach gravel. In the beach rubble the material has been concentrated, cleaned, and frequently polished by wave-action. Some of the most-sought stones are:

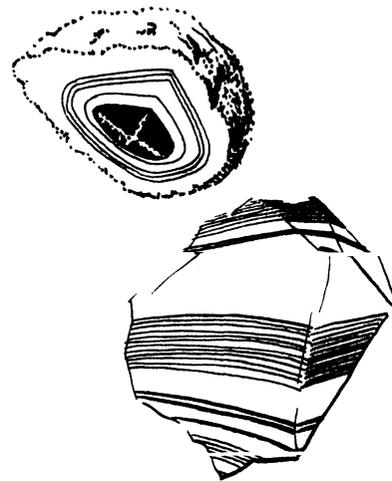
Chlorastrolite--commonly called greenstone--rich light to dark shades of green in a polygonal mosaic pattern referred to as "turtleback". Radiate lines exhibit chatoyancy (as in tiger's-eye). This is distinctly an American gem--and a Michigan gem--that ranks among the most enchanting. Though capable 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--a beautiful pink and white mineral often tinted with shades of green from admixed prehnite and chlorastrolite. Many fine gem stones have been picked from pebble beaches north of Ahmeek.



THOMSONITE X3

Agates--many colors and varieties of agates are found along the Lake Superior shores where the pebbles have been weathered from the amygdaloids by 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 and this materially 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 gem mementoes of a vacation of Lake Superior. There are the serious collectors, too, who "dig" vein agate from the 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.



AGATE

Mines

The old mine dumps of abandoned copper mines afford excellent opportunities. In the past several years, however, the surfaces of many of these piles have been thoroughly picked over by many visitors. Those that are seeking these treasures in earnest, therefore, are 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.



CHLORASTROLITE

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 minerals, they are worthwhile additions to a mineral collection.

From the dumps of the various Isle Royale mine shafts, located about two miles south of Houghton, prehnite and massive epidote can be collected as well as clear quartz crystals one-half inch or more in length. These were deposited in amygdules in the lava and in geodes. On the dump of the Wolverine Mine near Kearsarge, epidote crystals and agates can be found. These are also from the amygdaloidal lava flows.



DATOLITE

Near Allouez, from the dump of a mine which was in a conglomerate, chrysocolla can be collected.

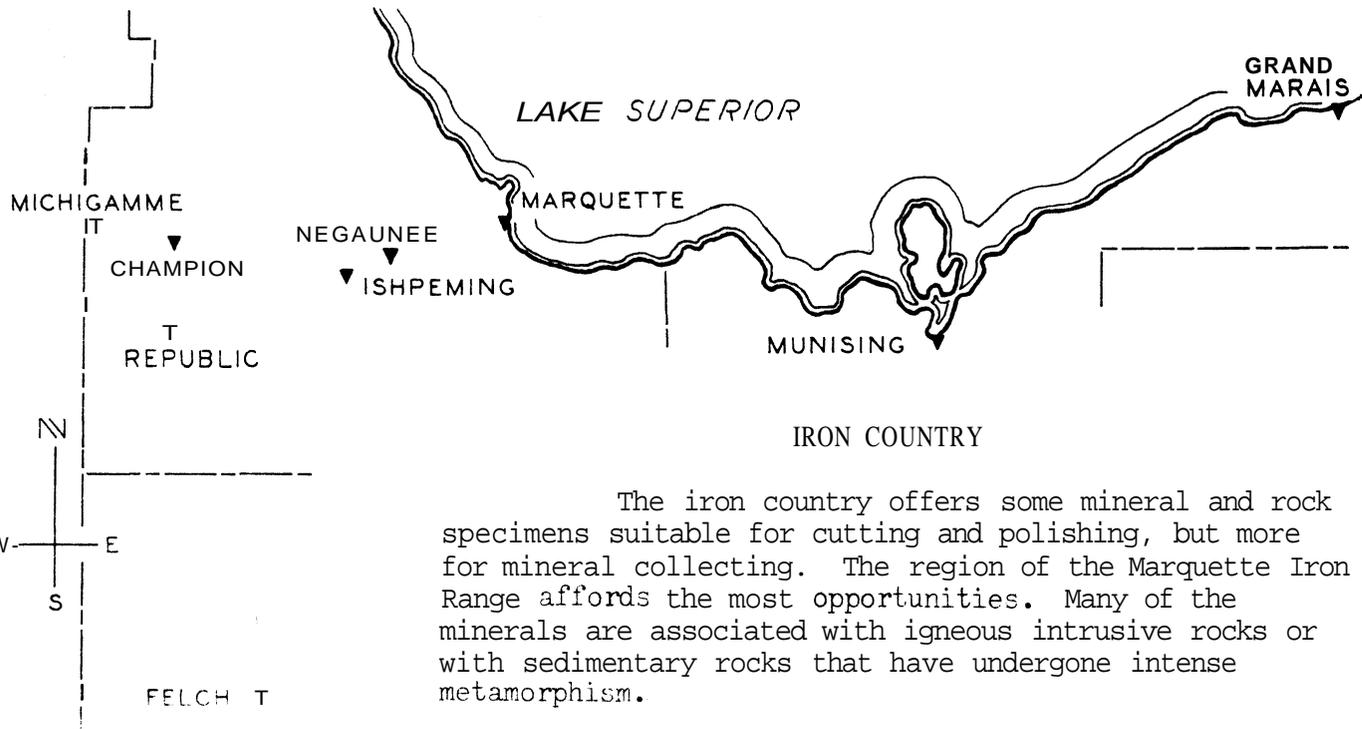


Copper arsenide minerals--domeykite, algodonite and whitneyite - not gem materials - are found on the dumps of the Mohawk, Seneca and Ahmeek No. 2 mines.

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

Near Copper Falls (between Eagle River and Eagle Harbor) an old mine dump contains natrolite, and datolite. The datolite is mostly porcelanic white, but some delicately tinted pink and yellow datolite with copper and silver inclusions may be found. Dato. lite, being very dense and fairly hard, takes an extremely beautiful polish.

Many seemingly uninteresting "stones" from the copper-bearing rocks exhibit beautiful colors when cut and polished, and can fee worked to semi-gem quality. This is particularly true of the many varieties of chert common to the region.



The iron country offers some mineral and rock specimens suitable for cutting and polishing, but more for mineral collecting. The region of the Marquette Iron Range affords the most opportunities. Many of the minerals are associated with igneous intrusive rocks or with sedimentary rocks that have undergone intense metamorphism.

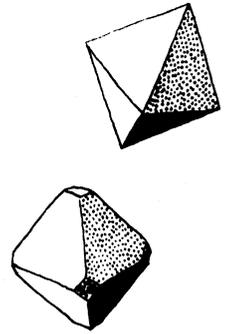
Between Negaunee and Ishpeming a knoll known as Jasper Hill is made of jaspilite--brilliant red bands of jasper alternating with bands of hard, bluish-black, specular hematite. The jaspilite is folded, bent and twisted in a most fanciful fashion. Polished specimens are beautiful.

Several other outcrops of the iron-formation in the Marouette Range furnish interesting rocks for polishing, e.g., banded ferruginous chert.



JASPILITE

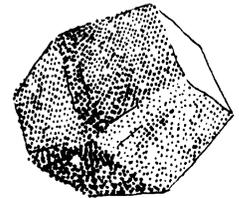
The old dumps and open pits in the area are good collecting spots for iron minerals. Although not suitable for polishing, they should be in **every** Michigan mineral collection. The iron minerals are limonite, goethite and hematite (kidney ore, pencil ore, specular), the manganese minerals manganite, 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.



MAGNETITE

In the Ropes Gold Mine area, north of Ishpeming, verde antique marble can be collected from the old marble quarries. This rock, consisting of serpentine, mottled and streaked with calcite and dolomite, is very attractive when polished.

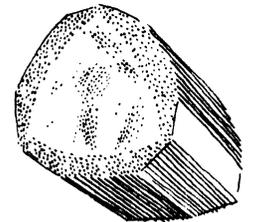
Near Champion, on Beacon Hill at the Champion Mine, the following minerals can be collected: Martite, magnetite, pyrite, grunerite, garnet, siderite, titaniferous hematite, sericite, and tourmaline. Some of the garnets are more than one inch in diameter (at Michigamme, garnets more than two inches in diameter are not uncommon) but are not of gem quality. Black pseudo-garnets are rather common and interesting. They are twelve-sided masses of iron ore which replaced true garnets. The tourmaline is found as slender black prisms embedded in crystal quartz.



GARNET

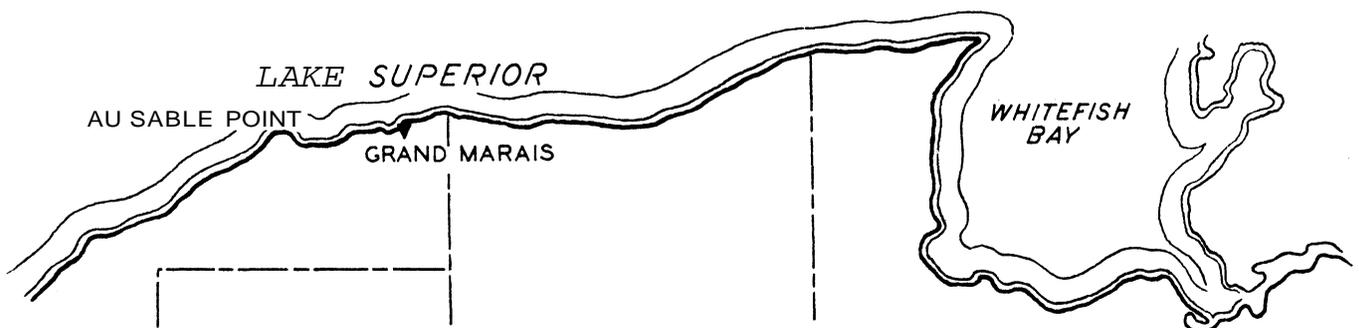
Some pegmatite rocks, such as those found near Republic, contain crystals of quartz, tourmaline, beryl, topaz and other minerals which, if large enough, can be used as gem minerals.

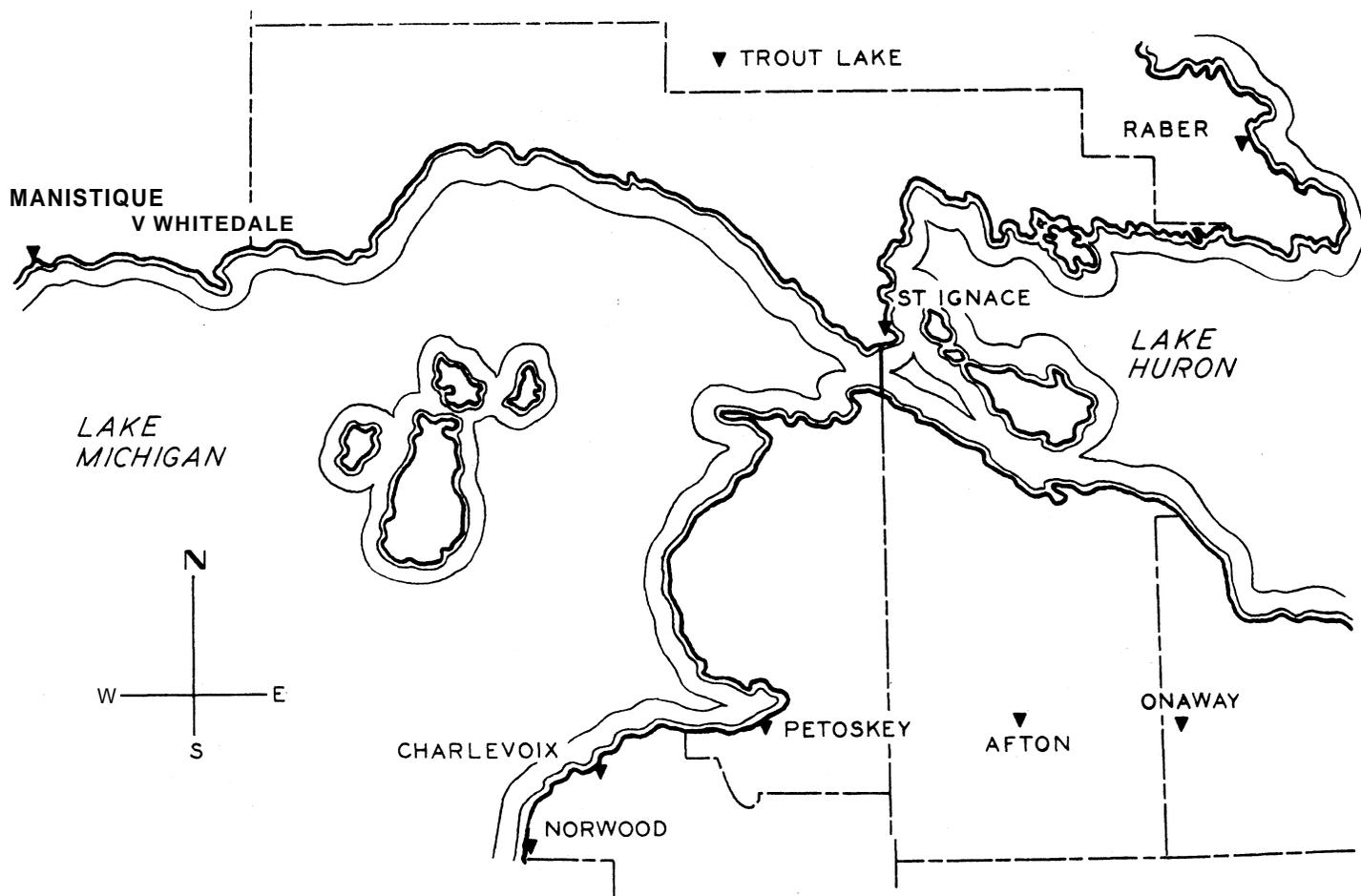
In the marble quarry near Felch, satiny prisms of tremolite and grass-green blades of actinolite are in the white crystalline marble.



TOURMALINE

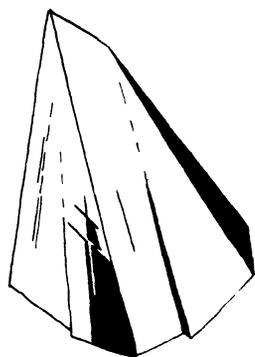
When we leave the western half of the Northern Peninsula, opportunities for collecting minerals and rocks suitable for cutting and polishing generally diminish. Many beautiful agates, however, have been found along the Lake Superior shores of Alger, Luce and Chippewa counties in the eastern end of the Northern Peninsula.





SOUTHERN PENINSULA

The chert, which is in a number of formations, is sufficiently hard to be of interest, 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 Eayport limestone quarries in Arenac and Huron counties. Chert and flint are in the Niagara dolomite in the Northern Peninsula, exposed in Scott's Quarry near Trout Lake, and the old quarries at Manistique.



CALCITE
(DOG-TOOTH SPAR)

Mineral specimens not suitable for polishing 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 selenite in a dolomite quarry near Maybee; celestite and yellow calcite in geodes in the Sylvania sandstone quarry near Rockwood; brown calcite crystals in the Eayport limestone at Bayport, Huron County, and at Omer, Arenac County; and gypsum at Alabaster, National City and Grand Rapids.

LAKE HURON

In the numerous gravel pits in the Southern Peninsula can be found both rock and mineral specimens which make excellent polishing material. 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 have other minerals, such as tourmaline. Some of the rocks found in these gravel pits also polish very well.

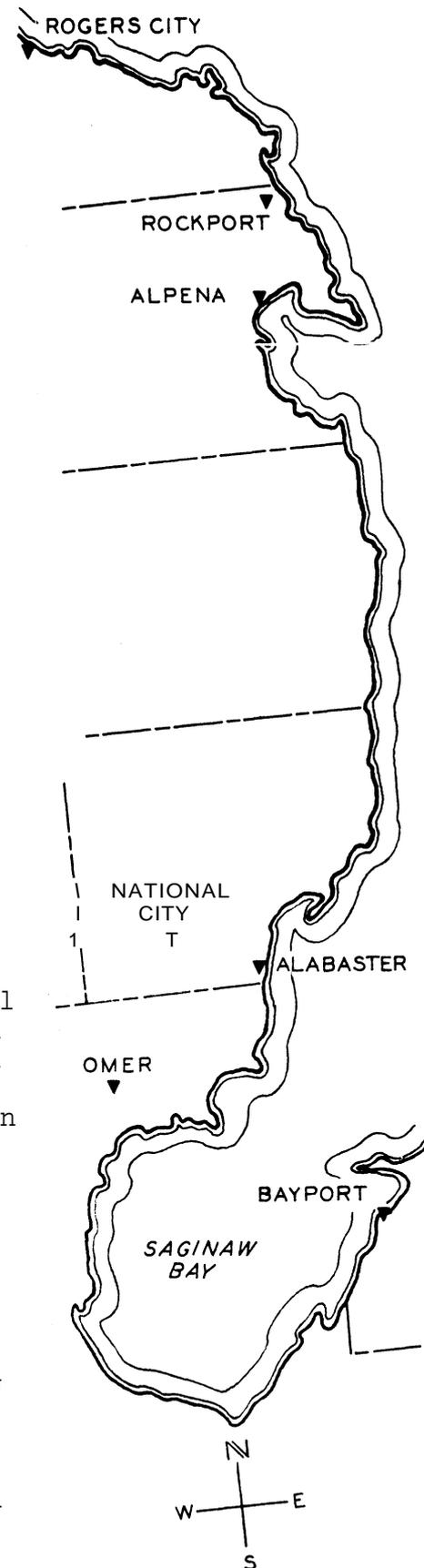
FOSSILS

Other material in this state which should prove of interest to those engaged in cutting and polishing is the wealth of fossils in some of our sedimentary rocks. 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 in the Traverse formation. The attractive appearance of the Petoskey stone is due to the internal structure of the coral. 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 Bay 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 to the south.

On the east side of the state, the same fossil can be collected from Traverse outcrops and quarries in Alpena County and in the Afton-Onaway area in Cheboygan and Presque Isle counties. The best place to collect them here is the old Rockport Quarry dumps, about eleven miles northeast of Alpena, just south of the Presque Isle County line along Lake Huron.

In addition to Hexagonaria, another colonial coral known as Favosites should furnish polishing material. This is the common "Honeycomb" coral. They are especially abundant in the Alpena area.

Simple (solitary) corals also make interesting cutting and polishing material. These are the cup or horn corals, which may be found in nearly all the Traverse outcrops, but the easiest collecting place is the old Rockport Quarry dumps. Both cross-sections and longitudinal cuts of the simple and compound corals could be made.



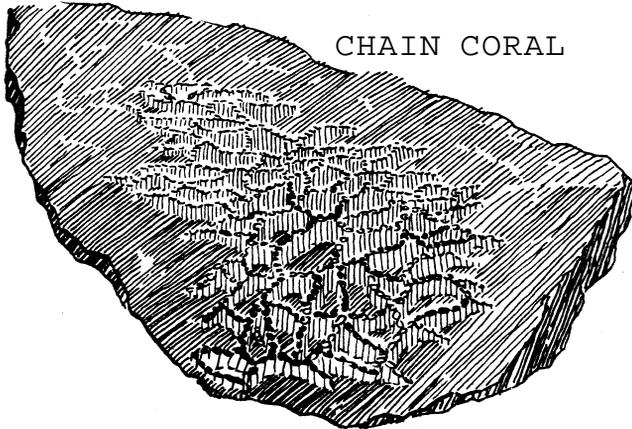
Other fossil forms in the Traverse are massive bryozoans and stromatoporoids (extinct coral-like organisms).

The Niagara dolomite has a large assemblage of fossil corals that have been silicified. These are harder to work but 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.

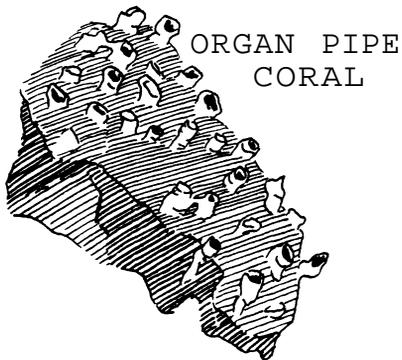
Other formations contain less abundant fossils such as corals and **bryozoa** which might be acceptable material for cutting and polishing.



CUP CORAL



CHAIN CORAL



ORGAN PIPE
CORAL



PETOSKEY STONE

ASSAYS AND TESTS OF MINERALS

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, or through 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.



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PERIODICALS

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Edited by Prof, L. S. Ramsdell, published by University of Michigan, Ann Arbor, Michigan. Bi-monthly @ \$6.00 per year.
- THE DESERT MAGAZINE - Geologic subjects and mineral localities in southwestern U. S. Edited by Randall Henderson, Gems & Minerals, Palm Springs, California. Monthly @ \$4.00 per year.
- EARTH SCIENCE DIGEST - Official publication of the Midwest Federation of Mineralogical Societies. "Rockhound's National Magazine". Fossils, gems, jewelry and geology. Edited by Ben Hur Wilson, Earth Science Pub. Co., Inc., Box 1357, Chicago 19, Illinois. Bi-monthly @ \$2.00 per year.
- GEMS AND GEMOLOGY - Technical publication for lapidary hobbyists.
541 S. Alexandria Ave., Los Angeles 5, California. Quarterly @ \$3.50.
- GEMS & MINERALS - Official magazine of the California Federation of Mineralogical Societies, American Fed. of Mineralogical Societies, and Texas Fed. of Mineralogical Societies. Hobby magazine on gem cutting, silver work, minerals and geology. Edited by Don MacLachlan, Gems & Minerals, P. O. Box 687, Mentone, California. Monthly @ \$3.00 per year.
- THE LAPIDARY JOURNAL - A national hobby magazine for collectors, gem cutters, and jewelry craftsmen. Edited by Leland Quick, Lapidary Journal, Inc., 1237 Hiway 101, Del Mar, California. Bi-monthly @ \$3.00 per year (subscription includes the annual "Rockhound Buyers Guide" issue).
- THE MINERALOGIST - National semi-technical magazine on mineralogy, gem cutting, and collecting. Edited by H. C. Dake, The Mineralogist Publishing Co., 329 S.E. 32nd Avenue, Portland 14, Oregon. Six issues @ \$2.00 per year.
- NATIONAL PROSPECTOR'S GAZETTE - Includes "Gem Hobby News", "Junior Gem Journal", and "Treasure Trove News". Prospecting, mining, and lapidary, Edited by D. C. Miller, Gazette Publishing Co., Bellflower, California. Bi-monthly @ \$1.00 per year.
- NORTHWEST MINERAL NEWS - Official publication of the Northwest Federation of Mineralogical Societies. Minerals, rocks, gems, artifacts. Edited by Kent K. Freeman, 5606 Mount Tacoma Drive, S.W., Tacoma, Washington. Bi-monthly @ \$2.00 per year.
- ROCKS AND MINERALS - Official journal, Rocks and Minerals Association. Covers entire field of rocks and minerals. Edited by Peter Zodac, Rocks and Minerals, Box 29, Peekskill, New York. Bi-monthly @ \$3.00 per year.

MINERALOGICAL BOOKS

- ADVENTURE BOOK OF ROCKS, by Eva Knox Evans
For the young reader. Paper bound version accompanies a boxed kit of 25 specimens of rocks and minerals. Cloth bound copy without kit at same price.
Capitol Publishing Co., Inc., New York (Distributed by Simon and Schuster). \$2.95
- AGATE BOOK, by H. C. Dake (1951)
Handbook for agate collector and cutter.
Jo D. Simpson Co., Spokane, Washington. \$2.00 paper.
- ART OF GEM CUTTING, by Ho C. Dake (1956)
Instructions on all types of cutting and finishing.
J. D. Simpson Co., Spokane, Washington. \$2.00 paper.
- ART OF THE LAPIDARY, by F. J. Sperisen (1950)
Covers all phases of the lapidary interest.
Bruce Publishing Co., Milwaukee, Wisconsin. \$7.00
- CHAMBERS' MINERALOGICAL DICTIONARY (1957)
Descriptions and occurrences of over 1,400 minerals with 200 in color.
W. and R. Chambers, London, England. \$4.75.
- CRUST OF THE EARTH - an introduction to geology, edited by S. Rapport and H. Wright (1955)
A Mentor Book. Collection of articles by well-known geologists. Geologic processes, record of living things, the composition and history of the earth.
New American Library of World Literature, Inc., N.Y. \$.50 paper.
- CRYSTALS AND CRYSTAL GROWING, by A. Holden and P. Singer (1960)
Theory and practice of crystallography and how to grow some types at home.
Science Study Series. Doubleday & Co., Inc., Garden City, N. Y. \$1.45 paper.
- DANA'S MANUAL OF MINERALOGY, by E. S. Dana and C. S. Hurlbut, Jr. (1959)
The properties and identification of minerals and crystals at the intermediate level.
John Wiley & Sons, Inc., New York. \$11.50
- DANA'S TEXTBOOK OF MINERALOGY, by W. E. Ford (1932)
Includes treatise on crystallography and is generally more advanced than Dana's Manual.
John Wiley & Sons, Inc., New York. \$8.00

- DICTIONARY OF GEMS AND GEMOLOGY, by R. M. Shipley (1951)
 Glossary of more than 4,000 terms.
 Gemological Institute of America, 11940 San Vincente, Los Angeles, California. \$5.50
- DIRECTORY OF GEOLOGICAL MATERIAL IN NORTH AMERICA, by J. V. Howell, A. I. Leversen with R. H. Dott and J. W. Wilds (1957)
 Where to obtain geological information.
 American Geological Institute, 2101 Constitution Ave., N.W., Washington 25, D. C.
- EARTH FOR THE LAYMAN, by M. W. Pangborn (1957)
 Annotated list of 1,400 popular books on geology and related subjects for lad, lass, and layman.
 American Geological Institute, 2101 Constitution Avenue, N.W., Washington 25, D. C. \$1.00
- EXCITING WORLD OF ROCKS AND GEMS, by Elsie Lee (1959)
 Treats all phases of hobby in popular style and with illustrations.
 Book No. 187, Trend Books Inc., 5959 Hollywood Blvd., Los Angeles, 28, California. \$.75
- FIELDBOOK OF COMMON ROCKS AND MINERALS, by F. B. Loomis (1956)
 Identification, origin, and meaning of the rocks and minerals of the United States.
 Putnam's & Sons., Inc., New York. \$2.95
- FIELD GUIDE TO ROCKS AND MINERALS, by F. H. Pough (1955)
 Illustrated pocket volume useable anywhere.
 Houghton Mifflin & Co., Boston Massachusetts. \$3.95
- FIRST BOOK OF STONES, by M. B. Cormack (1950)
 Done in large type especially for the young reader, age 6-11 years.
 Franklin Watts, New York. \$1.95
- FLUORESCENT GEMS AND MINERALS, by H. C. Dake (1949)
 Descriptions and localities for the collector.
 This title out-of-print. Revised in 1953. See URANIUM AND FLUORESCENT MINERALS, by H. C. Dake.
- FOSSIL BOOK - A RECORD OF PREHISTORIC LIFE, by C. L. & M. A. Fenton (1958)
 Profusely illustrated and popularly written encyclopedia of ancient life.
 Doubleday & Company, Inc., Garden City, N. Y. \$12.50
- GEMCRAFT, by L. Quick & H. Leiper (1959)
 How to cut and polish gem stones including carving, mosaics, and intarsia and bibliography.
 Chilton Co. (Book Division), Philadelphia, 39, Pa. \$7.50

- GEM CUTTING, A LAPIDARY'S MANUAL, by J. Sinkankas (1955)
Comprehensive work covering all phases of the lapidary interest.
D. Van Nostrand Co., Inc., Princeton, N. J. \$8.95
- GEM CUTTING, by J. D. Willems (1952)
How to make equipment and prepare finished stones.
Charles A. Bennett & Co., Inc., Peoria, Illinois. \$4.50
- GEM HUNTERS' GUIDE, by R. P. Macfall (1958)
Description of 1,355 localities in the U. S. for collecting
precious, and semi-precious stones.
Science and Mechanics Publishing Co., 450 E. Ohio St., Chicago,
11, Illinois. \$3.95
- GEM MATERIALS DATA BOOK, by C. J. Parsons and E. J. Soukup (1958)
A complete compilation for collectors, cutters and gemologists.
Gems & Minerals, P. O. 687, Mentone, California. \$2.00
- GEMS AND GEM MATERIALS, by E. H. Kraus & C. B. Slawson (1947)
Complete data on ornamental stones.
McGraw-Hill Book Co., Inc., New York. \$6.75
- GEMSTONES, by G. F. H. Smith (1958)
For advanced hobbyists.
Pitman Publishing Corp., 2 W. 45th St., N. Y. 36, N. Y. \$12.50
- GEMSTONES OF NORTH AMERICA, by John Sinkankas (1959)
The geology and mineralogy of all gems including details on
localities and deposits.
Do Van Nostrand Co., Inc., Princeton, New Jersey. \$15.00
- GEM STONES OF THE UNITED STATES, by D. M. Schlegel (1957)
Geology and occurrence of 50 major gems.
U. S. Government Printing Office, Washington 25, D. C. \$.25
paper.
- GEM TUMBLING AND BAROQUE JEWELRY MAKING, by Arthur and Lila Victor
(1957)
J. D. Simpson Co., Spokane, Washington. \$2.00 paper.
- GEOLOGY, by Cooper, Spivey, Ball, Branson (1953)
Summary of geological science prepared for the Merit Badge Series.
Boy Scouts of America. 25¢ paper.
- GEOLOGY OF THE GREAT LAKES, by J. L. Hough (1958)
A study of the pre-glacial and glacial history with emphasis
on the latter. For both student and layman.
University of Illinois Press, Urbana. \$8.50

- GETTING ACQUAINTED WITH MINERALS, by G. L. English and D. E. Jensen (1958)
 Illustrated introductory book with mineral descriptions and rock classification, and the preparation, storage, and display of specimens.
 McGraw-Hill Book Co., Inc., New York. \$6.95
- GLOSSARY OF GEOLOGY AND RELATED SCIENCES, edited by J.V. Howell (1957)
 The dictionary of earth sciences.
 American Geological Institute, 2101 Constitution Ave., N.W. Washington 25, D. C. \$6.00
- HANDBOOK OF ROCKS AND GEMS, by DeWitte Hagar (195?)
 How to identify, cut, and polish rocks and gems. Includes nationwide locations.
 Trend Books, Inc., 5959 Hollywood Blvd., Los Angeles 28, California. \$.75 paper.
- HANDBOOK OF GEM IDENTIFICATION, by R. T. Liddicoat, Jr. (1957)
 Detailed information for gemologists and collectors.
 Gemological Institute of America, 11740 San Vincente, Los Angeles, California. \$6.00
- HOW AND WHY OF PICKING AGATE, by R. R. and H. C. Minton
 Booklet on agate hunting. (no other information) \$1.50 paper.
- HOW TO CUT GEMS, by D. and M. O'Brien (1959)
 Booklet for the beginner.
 Dan and Marie O'Brien, 116 N. Wilcox Avenue, Hollywood 389 California. \$1.00 paper.
- HOW TO KNOW THE MINERALS AND ROCKS, by R. M. Pearl (1957)
 "A Signet Key Book". Illustrated guide to important gems, ores, and minerals.
 New American Library of World Literature, Inc., New York.
 \$.50 paper (also available in hard cover by McGraw-Hill, 1955, for \$3.75).
- HOW TO POLISH ROCKS AND GEMS, by Michael Sheriden
 (No other information) \$.75 paper.
- HOW TO PROSPECT FOR URANIUM, by Harry Kursh (1955)
 Fawcett How-To Book 279. Instructions on the use of counters, staking claims and getting information on assays, maps, laws, etc.
 Fawcett Publications, Inc., Greenwich, Connecticut.
- KEY TO PRECIOUS STONES, by L. J. Spencer (1946)
 Basic scientific text and reference.
 Emerson Books, New York, N. Y. \$3.95

- LAKE SUPERIOR AGATE - THE RAINBOW IN ROCK, by TV C. Vanasse (1958)
Description, origin, and occurrence of Lake Superior agates*
The Spring Valley Sun, Spring Valley, Wisconsin. \$2.50 paper.
- MIDWEST GEM TRAILS, by J. C. Zeitner (1956)
Field guide for touring hunter of gems and minerals.
Jo Do Simpson Co., Spokane, Washington. \$2.00 paper.
- MINERAL COLLECTORS HANDBOOK, by R. M. Pearl (1947)
How to collect, classify, and preserve minerals. Includes
source directories.
Mineral Book Co., Colorado Springs, Colorado. \$3.75
- MINERALS AND HOW TO STUDY THEM, by E. S. Dana & C. S. Hurlbut (1949)
Introductory but complete reference work in description,
classification, and identification.
John Wiley and Sons, Inc., New York. \$5.75
- MINERALS FOR ATOMIC ENERGY, by R. D. Nininger (1956)
What, where, and how to look for uranium, thorium, and
beryllium
Do Van Nostrand Co., Inc., Princeton, N. T. \$8.50
- MY HOBBY IS COLLECTING ROCKS AND MINERALS, by D. E. Jensen (1958)
Illustrated book for age 11 up, covering every phase of hobby.
Children's Press, Chicago, Illinois. \$3.95
- OUR MINERAL RESOURCES - AN ELEMENTARY TEXTBOOK IN ECONOMIC GEOLOGY,
by C. M. Riley (1959)
Where mineral deposits are found and how they were formed.
In non-technical language.
John Wiley & Sons, Inc., New York. \$6.95
- PETRIFIED FOREST TRAILS, by J. E. Ransom (1955)
Guide to petrified forests of America, including directions
to localities.
J. Do Simpson Co., Spokane, Washington. \$2.00 paper.
- POPULAR GEMOLOGY, by R. M. Pearl (1948)
Illustrated survey of gemology in popular style.
Alan Swallow, 2679 York St., Denver, Colorado. \$4.00
- POPULAR PROSPECTING, by H. C. Dake (1955)
Data on gem materials and important commercial minerals for
the part-time prospector.
J. D. Simpson Co., Spokane, Washington. \$2.00 paper.
- PRACTICAL GEMOLOGY, by R. Webster (1952)
How properties and value of gem minerals are determined.
N.A.G. Press, Ltd., London \$3.50

- PROSPECTING FOR URANIUM, by Atomic Energy Commission (1957)
The geology, identification, laws, tests, and sale of uranium ores.
U. S. Government Printing Office, Washington 25, D. C. \$.55
- QUARTZ FAMILY MINERALS, by H. C. Dake, F. L. Fleener & B. H. Wilson (1938)
A handbook for the mineral collector.
McGraw-Hill Book Co., Inc., New York. \$4.75
- ROCKS AND MINERALS, by R. M. Pearl (1955)
"Everyday Handbook". The origin, occurrence, uses, and identification of rocks and minerals. Includes glossary and book list.
Barnes & Noble, Inc., New York. \$1.95 paper.
- ROCKS AND MINERALS, by Zim, Shaffer, and Perlman (1957)
"Golden Nature Guide". Color illustrated pocket book on minerals, rocks, gems, and mineral resources.
Simon and Schuster, New York, N. Y. \$1.00 paper (\$2.50 in hard cover).
- ROCK BOOK, by C. L. and M. A. Fenton (1940)
Elementary discussion of rocks and the substances found in them.
Doubleday and Co., Inc., Garden City, N. Y. \$7.50
- ROCK CLUB MANUAL, by K. Von Mueller (1956)
Guide for organizing and operating gem, mineral, prospecting, and lapidary groups.
Gazette Publishing Co., 45397 Airport Station, Los Angeles 45, California. \$2.00 paper.
- ROCKHOUND BUYERS' GUIDE (1958)
Annual encyclopedia for the rock hobbyist.
The Lapidary Journal, Inc., 1237 Hiway 101, Del Mar, California.
\$1.00 to persons who are not subscribers to the Lapidary Journal.
- ROCK-HUNTER'S FIELD MANUAL, by D. K. Fritzen (1959)
"A guide to identification of rocks and minerals". Color key developed by the author. Brief discussion of the occurrence and uses of minerals.
Harper & Bros. Publishers, New York \$3.50
- ROCKS AND THEIR STORIES, by C. L. and M. A. Fenton (1951)
Origin and identification of rocks for young collectors and beginners.
Doubleday & Co., Inc., Garden City, N. Y. \$2.75

- ROCKS AND MINERALS OF MICHIGAN, by H. M. Martin, O. F. Poindexter & S. G. Bergquist (1951)
How to identify the rocks and minerals of Michigan and where they are found. In popular style and illustrated.
Geological Survey Division, Michigan Dept. of Conservation.
Lansing. \$.50 paper.
- STONE CUTTING AND POLISHING, by O. Bowles (1958)
Techniques and equipment for cutting and polishing stones for architectural, memorial, jewelry and other varied uses.
U. S. Gov't. Printing Office, Washington 25, D.C. \$.25 paper.
- STORY OF EARTH SCIENCE, by H. Go Richards (1959)
Introduction for the novice, age 14 up, to the pleasures of collecting rocks, minerals, and fossils along with relationship to geologic setting.
Lippincott \$3.75
- STORY OF GEMS - A POPULAR HANDBOOK, by H. P. Whitlock (1946)
The occurrence, identification, and use of gems for the layman.
Emerson Books, New York. \$5.95
- SYSTEM OF MINERALOGY OF JAMES D. DANA AND EDWARD S. DANA, by Co Palache, H. Berman, and C. Frondel (1944-1951)
Treatise for professional mineralogist. In two volumes, third volume in preparation.
John Wiley & Sons, Inc., N. Y. Vol. 1, 1944 - \$14.00. Vol 2, 1951 - \$16.00
- URANIUM AND FLUORESCENT MINERALS, by H. C. Dake (1953)
Title of first edition was FLUORESCENT GEMS AND MINERALS.
Same book but with section on uranium minerals added.
J. Do Simpson Co., Spokane, Washington. \$2.00 paper.
- WORKING WITH AGATE, by M. L. Kathan (1957)
How to collect, saw, grind, polish, color, tumble and display agate.
M. L. Kathan, 316 N.E. 44th Avenue, Portland 15, Oregon. \$1.00 paper.
- WORLD OF JEWEL STONES, by M. Weinstein (1958)
Survey of the properties and values of the chief gem minerals and aimed at the general reader.
Sheridan House, Inc., 257 4th Ave., New York 10, N. Y. \$10.00
- WORLD WE LIVE IN, by J. W. Watson (editor) (1956)
Special edition for young readers adapted from the original version of Life magazine. Contains many color illustrations showing the formation of land and sea. Traces the web of relationships between living things and their environments.
Simon and Schuster, Inc., New York. \$4.95

1001 QUESTIONS ANSWERED ABOUT THE MINERAL KINGDOM, BY R. M. Pearl
(1959)

Question and answer technique covering rocks, meteorites,
radioactive minerals, the metals, gems, industrial materials,
fuels, mining, and milling, water resources, and collecting.
Dodd, Mead & Co., N. Y. \$6.00

MINERAL AND LAPIDARY SOCIETIES*

BLUE WATER LAPIDARY SOCIETY

Liaison Representative: Mrs. Betty Pepper, President,
3356 Strawberry Lane, Port Huron.
(No other information).

CENTRAL MICHIGAN LAPIDARY AND MINERAL SOCIETY (Founded 1957, Inc.)

Meetings: Walter French Junior High School, 1900 S. Cedar St.,
Lansing; 3rd Thurs., except July and August, 7:30 P.M.
Liaison Representative: Clarence E. Kirkby, 1401 Greenview Ave.,
East Lansing. Telephone ED 2-6809.
Other information: 187 members; publish "Central Michigan
Rockhound News".

CLINTON VALLEY GEM SOCIETY (Founded 1954)

Meetings: Civic Center, 65 E. Broadway, Mt. Clemens; monthly.
Liaison Representative: Mrs* Steven Porter, 45265 Fairchild Rd.,
Mt. Clemens.
Other information: 40 members.

FLINT ROCK AND GEM CLUB (Founded 1956)

Meetings: Department of Geology, Flint Junior College, Room 224,
Mott Bldg., Flint; 3rd Thurs., except July and August.
Liaison Representative: Mrs. Marion R. Gingery, 4481 Mollwood,
Flint 6.
Other information: 65 members, conduct lapidary classes, publish
"Flint Rock and Gem Club News"; exchange publications
and lecturers.

GRAND RAPIDS MINERAL SOCIETY (Founded 1958)

Meetings: Grand Rapids Public Museum; 2nd Wednesday, 8:00 P.M.
Liaison Representative: R. R. Rozema, 1355 Hollywood, N. W.,
Grand Rapids.
Other information: About 160 members; publish "The Glacial
Drifter".

HURON VALLEY GEMS AND MINERALS SOCIETY, at Milford.

Liaison Representative: Clarence Travis, 1018 Atlantic, Milford.
(No other information).

HURON VALLEY LAPIDARY GUILD (Founded 1959)

Meetings: 2nd Wednesday, September through May.
Liaison Representative: Mildred C. Perry, 3074 Creek Drive.
Ann Arbor.
Other information: 15 members.

*Assistance in organizing clubs may be obtained from the Midwest
Federation of Mineralogical and Geological Societies. C.R. Markert,
107 West Ridge St., Ishpeming, Michigan, is currently president of
that organization.

ISHPEMING ROCK AND MINERAL SOCIETY (Founded 1952)

Meetings: National Ski Hall of Fame, Ishpeming.

Liaison Representative: R. K. Richards, 205 E. Case St., Negaunee.

Other information: 88 members, maintain exhibits, publish "The Jaspilite"; adult education lapidary course in Public Schools. Will be host for the 1960 Midwest Convention Field Trip, July 1-4.

KALAMAZOO GEOLOGICAL AND MINERAL SOCIETY (Founded 1957)

Meetings: Upton Hall, Kalamazoo College, Kalamazoo; 1st Monday, 7:30 P.M.

Liaison Representative: Archie Nevins, 2335 Springhill Drive, Kalamazoo.

Other information: Approx. 120 family memberships; publish "Gems".

LENAWEE GEM GUILD

Liaison Representative: Mrs* C. Handy, 4391 Comfort Rd., Tecumseh.
(No other information).

MICHIGAN GEM AND MINERAL SOCIETY (Founded 1954, Inc.)

Meetings: Cafeteria, West Intermediate School, Jackson; 1st Thurs., except July and August, 7:00 P.M.

Liaison Representative: William Barnhouse, 6517 Mapledale Rd., Jackson.

Other information: 130 members, class instruction; publish "Michigan Gem News".

MICHIGAN LAPIDARY SOCIETY (Founded 1950, Inc.)

Meetings: Community Bldg., 400 E* Nine Mile Road, Ferndale; 3rd Thursday, except July & August, 7:30 P.M.

Liaison Representative: Mr. Jesse Hatch, 17376 Edinborough, Detroit 19. Telephone KE 1-6444.

Other information: 174 members; publish "The Bulletin of the Michigan Lapidary Society".

MICHIGAN MINERALOGICAL SOCIETY (Founded 1935, Inc.)

Meetings: Cranbrook Institute of Science, Bloomfield Hills; 2nd Monday, except July and August, 8:00 P.M.

Liaison Representative: Arthur Y. Johnstone, 996 Larkmoor, Berkley.

Other information: 400 members; conducts classes in various phases of earth sciences; publishes "Conglomerate" (monthly) and an Annual.

MID-WEST MINERALOGICAL AND LAPIDARY SOCIETY (Founded 1957, Inc.)

Meetings: McFadden-Ross Museum, 915 Brady Street, Dearborn; 3rd Tuesday, September through June, 7:30 P.M.

Liaison Representative: Louis J. Cox, 1214 Queen, Dearborn. Telephone LO 1-7445.

Other information: 50 members; publish "The Rockpile".

MOUNT CLEMENS MINERAL CLUB

Liaison Representative: Terry Kowalski, 23797 Linne Drive.
(no other information)

MUSKEGON COUNTY ROCK AND MINERAL ASSOCIATION (Founded 1958)
Meetings: McGraft Park Community Bldg., last Monday, 7:30 P.M.
Liaison Representative: Russell Greer, 1554 Pine St., Muskegon.

NORTHWESTERN MICHIGAN MINERAL CLUB (Founded 1948)
Meetings: 13726 West Bay Shore Drive, Traverse City; 2nd Wed.
Liaison Representative: James Co Moulton, above address,
Telephone WI 6-4130.
Other information: 10 members.

RANGE ROCKS AND MINERAL CLUB (Founded 1948)
Meetings: Public Library, Ironwood; 2nd Thursday.
Liaison Representative: Lawrence Eddy, 359 Midland Avenue.
Ironwood; Telephone 1194-M.
Other information: 36 members.

ROCK EXCHANGE CLUB (Founded 1955, Inc.)
Meetings: Square Deal Hall, Middlebelt Road, 1 block north of
Ford Road, Garden City; 1st and 3rd Friday, 8:00 P.M.
Liaison Representative: Eber E. Stewert, 955 Lilley Rd., Rt. 2,
Plymouth, Telephone PA 1-0597.
Other information: 80 members.

ROSCOMMON

Plans for a club are being formulated. Organization by spring,
1960 is anticipated. For information, contact
John R. Hood, Roscommon.

TRI-COUNTY ROCKS AND MINERALS SOCIETY (Founded 1957)
Meetings: Saginaw Savings and Loan Bldg., 4815 State St., Saginaw
1st Thurs., 7:30 P.M., September-June.
Liaison Representative: Earl Mitchell, 5340 Kerby Drive, Saginaw.
Other information: 138 members, publish "News Letter". Will be
host to Midwest Federation of Mineralogical and
Geological Societies "Giant Gem and Mineral Fair"
featuring displays covering all phases of the earth
sciences, June 29-July 2, 1960

GEOLOGICAL EXHIBITS IN PUBLIC MUSEUMS

- A. E. SEAMAN MINERALOGICAL MUSEUM (Founded 1937)
Michigan College of Mining and Technology
Houghton
Hours: Weekdays 8-12, 1-4; Sato 8-12; and on request
Minerals: 81 cases, 20,000 specimens (many Lake Superior minerals and ores); Fossils: 1 case.
- CHILDREN'S MUSEUM (Founded 1917)
Detroit Public Schools
67 East Kirby Avenue, Detroit 2
Hours: Weekdays 1-5; Sato (Oct.-May) 9-4:30.
Other information: Minerals and fossils not on display now, but geological exhibits are available for loan to Detroit teachers. Planning a geology room in the near future.
- CON FOSTER MUSEUM (Founded 1935)
Municipal Department of Parks and Recreation
Clinch Park, Traverse City
Hours: 10-9 (June-Sept.); rest of year by appointments with organized groups.
Minerals: 39 cases, 1,000 specimens; Fossils: 1 case, 30 specimens.
- CRANBROOK INSTITUTE OF SCIENCE (Founded 1930)
Bloomfield Hills
Hours: 2-5 daily
Minerals: 115 cases, 2,500 specimens displayed (10,000 in collection)
Fossils: 6 cases, 60 displayed (2,000 in collection)
Other information: Conduct lapidary classes, sell minerals and literature, publish booklet on opal, newsletter for members.
- EXHIBIT MUSEUM (Founded 1928)
University of Michigan
University Museums Building
Washtenaw at North University, Ann Arbor
Hours: Weekdays 8-5; Sundays 2-5°
Minerals: Several cases.
Fossils: 200 cases, 3,000 specimens (including vertebrates)
Other information: Guided tours by arrangement; Sales counter for specimens and literature.
- FORT WILKINS HISTORICAL AND NATURAL MUSEUM
Michigan Department of Conservation
Fort Wilkins State Park, Copper Harbor
Hours: Summer only
Minerals: Exhibits of Lake Superior minerals and ores.

GEOLOGY DEPARTMENT

Michigan State University
Natural Science Bldg., East Lansing
Hours: Daily 8 A.M. - 10 P.M., Sat. 9 A.M. - 10 P.M.
Sunday 1-6.
Minerals: 12 cases, 655 specimens
Fossils: 5 cases, 1.20 specimens

GRAND RAPIDS PUBLIC MUSEUM (Founded 1854)

City of Grand Rapids
54 Jefferson Avenue, S.E.
Hours: Weekdays 10-5; Sundays & holidays 2-5
Minerals: 17 cases, 850 specimens; Fossils; 2 cases, 100 specimens
Other information: Staff geologist performs educational work; minerals, books, equipment available at sales counter; visual education department; field trips for members.

JENISON TRAILSIDE MUSEUM (Founded 1951)

Michigan Department of Conservation
Bay City State Park, on M-47, 5 miles north of Bay City
Hours: Weekdays 10-6 (Wed.-Sun. and all holidays);
summer months only*
Minerals: 2 cases, 150 specimens; 2 poster boards
Fossils: 1 case, 50 specimens

KALAMAZOO PUBLIC MUSEUM (Founded 1929)

Board of Education
315 South Rose St., Kalamazoo
Hours: 9-6 daily except Sunday
Other information: Geological displays in planning stage.
Loan collections of rocks and minerals and fossils available to Kalamazoo Public Library card holders.

KENSINGTON METROPOLITAN PARK

Milford
Nature Center Exhibit Room
(Temporary display of minerals, may become permanent).

KINGMAN MUSEUM OF NATURAL HISTORY (Founded 1870)

Battle Creek Public Schools
Leila Arboretum, Battle Creek
Hours: Weekdays 8-5; Sat. 8-12, 1-5; Sun. 2:30-5
Minerals: 6 cases, 1,500 specimens, fluorescent display;
Fossils: 8 cases, 2,000 specimens (including vertebrates).
Other information: Classes by appointment; "Kingman Museum News".

MICHIGAN HISTORICAL MUSEUM (Founded 1913)
Michigan Historical Commission
505 N. Washington Avenue, Lansing
Hours: Weekdays 10-5; Sun. 2-5, closed Saturdays & holidays
Minerals: 2 cases, 75 specimens
Fossils: 15 specimens.

MINERALOGY MUSEUM
University of Michigan
Department of Mineralogy
Natural Sciences Building, Ann Arbor.

NATIONAL SKI HALL OF FAME
Ishpeming
Minerals: 2 cases displayed by Ishpeming Rock and Mineral
Club.

PORT HURON PUBLIC LIBRARY MUSEUM (Founded 1904)
Port Huron Public Library
1115 Sixth Street, Port Huron
Hours: Saturdays 11-12
Minerals and Fossils: 3 cases

SAGINAW MUSEUM
Bristol and N. Michigan, Saginaw
Hours: 1-5 P.M. Daily except Monday
Minerals: 165 specimens - 3 cases.

THE MUSEUM
Michigan State University
East Lansing
Hours: Weekdays 9-5; Sat., Sun., and holidays 1-5
Minerals: 5 cases, 115 specimens
Fossils: 17 cases, 100 specimens (including vertebrates)
Other information: Guide service.