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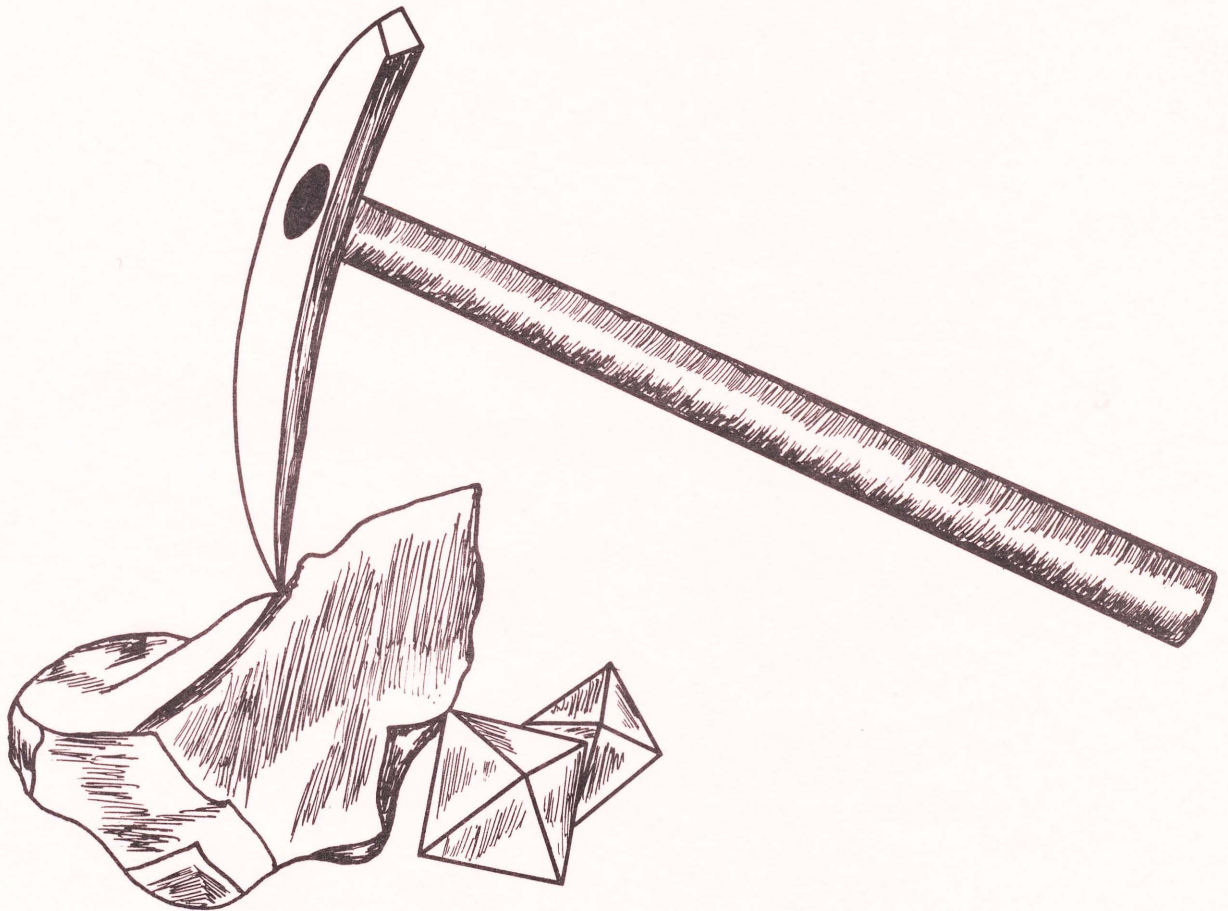
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Rocks and Minerals
Michigan State University Cooperative Extension Service
4-H Club Bulletin
Robert W. George, Conservation Education
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ROCKS and MINERALS



Michigan State University
Cooperative Extension Service
4-H - Youth Programs

NOTE: LEADERS AND MEMBERS

This project series is designed for basic knowledge and understandings about rocks and minerals and learning about our earth. Normally the age level for project I and II is for the 12 - 14 age level.

However, if local interest and understandings indicate a need for lowering the age level to include 10 - 12 age members, this can be done most effectively by:

- (1) Reducing requirements from 20 to 15 specimens.
- (2) Recognizing age level by calling your project Jr. I or Jr. II.

This project guide is a cumulative result of many county trial programs and the incorporation of some of the most progressive ideas for effective project work in rocks and minerals to instill conservation concepts in the minds of young people.

Robert W. George
Extension Specialist
Conservation Education

4-H ROCKS AND MINERALS

PROJECT I Things To Do:

1. Collect at least 20 different Michigan specimens and identify.
(Use specimen identification tag for each specimen in the exhibit.)
2. Identification sheets may be completed if desired but are not required.
3. Learn and Practice Safety Precautions.

Exhibit: At least 10 different specimens. (For second year of work in this series exhibit at least 10 different, additional specimens from first year.) Exhibits may be placed in vegetable exhibit box. If the member desires he may construct the Show Case in which to show his exhibit, however, this is not mandatory.

PROJECT II Things To Do:

1. Collect at least 20 different specimens and identify.
(Use specimen identification tag for each specimen in the exhibit.)

Include at least: 5 metamorphic rocks, 5 igneous rocks,

5 sedimentary rocks, 5 fossils.
2. Fill out identification sheet for each specimen. Make a notebook of the identification sheets. See last page - - - Sample A.
3. First Year Junior Geologist - Write a story on how fossils are formed and add to the notebook of identification sheets.

Junior Geologist - Undertake and write a report on at least one of the suggested activities; add the report to your notebook of identification sheets.

4. It is more fun and more profitable to find your own rocks. Only a minimum of traded or bought rocks should be used.

Exhibits: At least 20 specimens, identification sheets and story in notebook.

The exhibit should be shown in suitable case or box. You may wish to construct a show case as part of a 4-H Handicraft Project.

PROJECT III Things To Do:

1. Collect at least 25 different specimens and identify.
(Use specimen identification tag for each specimen in the exhibit.)

 Include at least: 5 specific minerals, 5 metamorphic, 5 igneous
 5 sedimentary, 5 fossils.
2. Fill out identification sheet for each specimen. Make a notebook of the identification sheets.
3. Polish by hand and exhibit a rough stone (suggest a Petoskey stone).
4. Undertake and write a story on at least one of the suggested activities, or any other activity. Include the story in the notebook.
5. It is more fun and more profitable to find your own rocks. Only a minimum of traded or bought rocks will be accepted.

Exhibit: At least 25 specimens and notebook of identification sheets.

The exhibit should be shown in suitable box or case. The Senior Geologist may wish to construct a show case as part of the 4-H Handicraft project.

PROJECT III Special Option

Make one of the following collections:

- a. 12 ores, with name, composition and metals
- b. 15 rock-forming minerals, with name and
- c. 18 common sedimentary, igneous and metamorphic rocks -- name of important minerals in each
- d. 20 different fossils

Display your collection, properly labeled.

Try to collect specimens no smaller than the size of an egg.

"HOW TO BE A ROCK HOUND"

Excerpts from The Golden Book of Nature Crafts

TYPE OF EQUIPMENT

Prying small chunks from cliffsides, or working delicate minerals out of bedrock, calls for the use of tools and some skill. Hand in hand with a strong hammer, use a cold chisel (all metal, for chipping stone) from $\frac{1}{4}$ - to 1-inch wide. These can be bought at hardware and some dime stores. You'll need a pocket magnifier or small hand lens for examining specimens bought at stationery or some cutlery shops or through some mail-order catalogs.

A collecting sack can be made at home of any sturdy fabric. Used Army-and-Navy store Musette or gas-mask bags are also good.

It's a good idea to have a supply of newspaper for wrapping up specimens and a small pad and pencil with which to record data in the field. After specimen is pried loose, write name, if you can identify it, on a piece of paper, along with the date and locality. Then wrap this with the specimen in newspaper and tuck into your collecting sack.

SIZE OF SPECIMENS

Try to keep stones you pry out about the size of a walnut. If it's a piece of crystal or a type of rock occurring in a narrow vein, it will very often be smaller. And you'll find that some pebbles and rock fragments will be so small you won't have to use any tool on them.

WHERE TO GO

The best sources are excavations in bedrock for the foundations of new buildings; road-cuts through solid rocks; mine dump heaps; quarries; mountains and hills with exposed bedrock; boulders left behind by glaciers, which are scattered throughout our northern regions.

Always obtain permission to collect on private property, including mines or quarries. Never collect in national, state, or city parks. Always be careful when you climb mountains, and remember to watch out for snakes.

WHAT TO COLLECT

For the most fun, collect with a purpose; for color and texture, on a geographical basis, or for something specialized, such as ores or semi-precious stones.

Whatever the purpose, keep a record, and make sure your identification is correct. Good hand books will help you to identify your finds. Also, comparison of these with museum collections will be useful.

CARE OF COLLECTION

As the number of specimens increases, you will want a place to keep them. Safekeeping is necessary, as some minerals are softer than others and cannot be jumbled together without being scratched or marred.

So, early in this game, get a compartmented box or tray. There are various kinds. One might be the drawers of an old chest, which you can partition with masonite, beaverboard, or plain cardboard. Spaces should be about 2 inches by 3 inches and about 3 inches high.

Another kind might be a cabinet bought from a junk or secondhand shop or inexpensive plastic compartmented trays or boxes. If you are handy with tools, make the tray exactly as you want it.

KEEP ROCKS IN ORDER

Since you'll want to refer to your collection as new specimens are added and show it to others (part of the fun), you'll want to keep your rocks in neat order. Paste a number, typed or printed in ink, on each rock. Or print consecutive numbers on a strip of adhesive tape; cut off, one at a time, to stick on each specimen.

In each compartment, along with the numbered specimen, put a neatly lettered or typed label on a small white card, about $1\frac{1}{2}$ inches by $2\frac{1}{2}$ inches. This will give you enough space to put on it specimen number, date, and locality.

* * * * *

SUGGESTED ACTIVITIES - 4-H ROCK AND MINERAL PROJECT

1. Field trip to collect stones.
2. Trip to museum.
3. Trip to mine.
4. Trace course of glacier and its effect on Michigan.
5. Where do meteors and meteorites come from and what are they?
6. Development of soils from rock.
7. Tour of a tile factory.
8. Visit an adult "rock hound" club.
9. Investigate how rocks are polished.
10. Use your imagination.

ACTIVITIES FOR DEVELOPING

UNDERSTANDINGS OF MINERAL RESOURCES

Activities to Show How Minerals Are Classified:

1. Collect sample pieces of metals such as iron, copper, aluminum, zinc, lead, chromium-plated material, nickel-plated material, gold and silver jewelry, silverware, or coins.
2. Collect samples of rock such as sandstone, limestone, shale, quartzite, rock salt, slate, marble, granite, and basalt (lava). Rock and mineral collections also may be purchased.
3. Collect coal, a bottle of some liquid fuel (kerosene, fuel oil, or other petroleum derivatives). Natural gas may be available. If not available, distill some crushed coal in a test tube and ignite the gas which is given off.
 - . Examine the collected materials. Decide how to separate them into their proper categories.
 - . What is the difference between metals and nonmetals?
 - . What is an ore? In what form do ores occur naturally?
 - . Why are fuels placed in a separate category?

Activities to Show Physical Characteristics Which Determine Classification of Minerals:

1. Compare outward appearance.
2. Scratch each specimen with a nail file.
3. Strike with a hammer. Bend.
4. Expose to flame.
5. Feel their surfaces.

Discussion questions:

1. Which materials have a shiny luster?
2. Which ones lend themselves to shaping?
3. Which ones break up into granular or dust material?
4. Which ones burned?
 - . Group the materials collected and tested in three major categories, namely; metals, nonmetals, and fuels.
 - . What are some of the problems in classifying minerals? Where would you place water? brines? uranium? petroleum? mercury? peat? marl?

SAFETY PRECAUTIONS AND PERSONAL EQUIPMENT FOR FIELD TRIPS

(4-H ROCK AND MINERAL PROJECT)

I. Safety Precautions:

- (a) Avoid overhanging rocks.
- (b) Keep to base of steep stock piles from old mines.
- (c) Do not collect directly above other collectors on mine dumps (stock piles), hills, etc. One rock cascading to the bottom of stock pile, hill or other inclines can seriously injure or cripple a person.
- (d) Keep out of barb wire enclosures. An old mine shaft of several hundred feet in depth may be inside this barb wire enclosure and covered with just old rotten timbers or planks.
- (e) In case a dangerous area is discovered or found, by all means report it to your adult leader or advisor so that arrangements can be made to make the area safe.
- (f) Wear safety goggles when chipping with hammer.
- (g) Wear gloves to avoid cuts from chips and sharp needles.
- (h) Wear good sturdy shoes.
- (i) Always have at least one first aid kit available on a field trip.

II. Other Precautions and Considerations:

- (a) Respect personal property.
- (b) Receive permission to enter personal property from owner.
- (c) Limit your collection of rocks and minerals to just what you require.
- (d) Handle specimens properly. Some specimens require special handling.
- (e) Always follow instructions of your 4-H club leader or advisor at meetings and on field trips.

III. Personal Equipment Required for Rock and Mineral Project:

- (a) Safety goggles.
- (b) Properly tempered steel hammer - so chips will not fly.
- (c) Gloves - to avoid cuts from chips and needles of rocks and minerals.
- (d) Good sturdy shoes preferred.
- (e) Canteen of drinking water.
- (f) First aid kit - club should have at least one on all field trips.

FIELD ACTIVITIES

1. Look for rocks in:
 - (a) Camp area
 - (b) Along Roads
 - (c) At gravel pit
 - (d) Along shore lines
 - (e) In stream beds
2. Venture a guess as to:
 - (a) What kind of a rock (at least igneous or sedimentary or metamorphic)
 - (b) Where it came from
 - (c) How it got there
 - (d) Why it looks like it does
3. Classify your rocks according to:
 - (a) Color
 - (b) How carried; stream, wave
 - (c) Type (igneous, sedimentary, metamorphic)
4. Break some rocks, and:
 - (a) Compare fresh broken surface with weathered surface
 - (b) Note color differences
 - (c) Note crystalline structure
5. Look for rocks about to crumble (rocks that you can fragment in the hand).
Look for stories in the rocks -- what do they tell you?
 - (a) Angular rocks
 - (b) Rounded rocks
 - (c) Flattened rocks
 - (d) Life long ago as depicted by fossil rocks
 - (e) Colors in the rock
 - (f) Crystals in the rock

NOTE: Large crystals mean slow cooling
Small crystals mean rapid cooling
6. Find early history in the making, for example:
 - (a) Stone fences
 - (b) Stone foundations
 - (c) Stone houses (field)
 - (d) Tomb stones

What kind of rocks did they use in each of the above uses? Venture a guess and see if you know why they used a particular kind of rock.

See if there is any noticeable difference in weathering in the rocks.
7. At the gravel pit, be sure to:
 - (a) Look for stratification (water sorting); and,
 - (b) Look for non stratified deposits (generally a hodge-podge) glacial deposition.
8. General Considerations:
 1. Is there water in the pit? This is probably the level of the water table in the area. Why?
 2. What are the varied uses of rocks in and about camp, school, or the area in which you find yourself?
 3. What special values can you recall?
 4. What special problems might they pose?
9. Keep a diary of your "ROCK" field trips.
10. Record highlights by taking pictures of special "Rock-Hound Sites"!

4-H ROCKS & MINERALS

Things To Do:

- I. Collect at least 10 minerals: (Must be collected by the member taking the project - no credit will be given for minerals that have been purchased.) The chemical content may be found by looking up your sample in most any book on rocks and minerals. You will find listed areas where each may be found. Most can be found in other areas, also. "Rocks and Minerals of Michigan." This Publication #42, is available for 50¢ from the Michigan Department of Conservation, Lansing, Michigan 48926

	Chemical Content	Where Collected	When Collected
1. Apatite			
2. Biotite			
3. Calcite			
4. Epidote			
5. Feldspar			
6. Garnet			
7. Hematite			
8. Jasper			
9. Muscovite			
10. Pyrite			
11. Pyrolusite			
12. Quartz			
13. Tourmaline			
14. Copper			
15. Gypsum			
16. Halite (Rocksalt)			

Extra Specimens Collected:

17.			
18.			
19.			
20.			

- II. There are many other minerals found in Michigan besides those listed. Credit will be given for any others that you find. If you are unable to find the required number of minerals from the above list, but do find some others, you may substitute, but check with your leader first.
- III. Pick out at least two of your minerals and write out a report on how each is formed, what rocks it is found in and formed from, and where you found it. Is there very much of it in the state of Michigan? What is its economic value?

ROCK AND MINERAL IDENTIFYING SHEETS

Specimen Number _____

Name of Specimen - Common _____ Scientific _____

Date Collected _____ Found _____ Traded For _____ Bought _____

Where Obtained - State _____ County _____

Township _____ Place Found (Name - Park, Quarry, Farm, etc. _____

Check: Sedimentary; Igneous; Metamorphic

Other Identify _____

Color _____

Luster _____

MOH'S Hardness - Circle one 1 2 3 4 5 6 7 8 9 10

Other Characteristics _____

Economic use, if any _____

May or may not be applicable:

Streak _____

Crystal form _____

Cleavage _____

Fracture _____

Magnetic Yes No

Member's Name _____

SPECIMEN IDENTIFICATION LABELS

Specimen Number _____ Date Collected _____ Where Collected _____ _____ Common Name _____ _____ Scientific Name _____ _____	Specimen Number _____ Date Collected _____ Where Collected _____ _____ Common Name _____ _____ Scientific Name _____ _____	Specimen Number _____ Date Collected _____ Where Collected _____ _____ Common Name _____ _____ Scientific Name _____ _____
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ROCK IDENTIFICATION SHEET

- 1. Date Collected _____
- 2. Where found _____

- 3. Probable Type (check): Igneous _____
 Sedimentary _____
 Metamorphic _____
- 4. Economic Use: if any _____

- 5. Name (if possible) _____

Refer to:

Rocks & Minerals of Michigan
Michigan Geological Survey
Publication 42 - 50¢

"Eighteen Common Rocks & Minerals of Michigan"
Rock Kit - 50¢

Available from:

Michigan Department of Conservation
Lansing, Michigan 48926

REFERENCES

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Michigan Department of Conservation
Stevens T. Mason Building
Lansing, Michigan 48926
2. For Pebble Pups
Field Museum of Natural History
E. Roosevelt Road at S. Lakeshore Drive
Chicago, Illinois 60605
3. Gem Stones
U.S. Department of the Interior, Bureau of Mines
Superintendent of Documents
U.S. Government Printing Office
Washington, D. C. 20402
4. The Agate Book
H. C. Dake
Mineralogist Publishing Co.
329 S.E. 32nd Avenue
Portland, Oregon 97214
5. Golden Book of Rocks and Minerals
6. Stories Read From the Rocks (60¢)
Harper and Row Publishers
2500 Crawford Avenue
Evanston, Illinois 60201
7. Rocks and Minerals
Zim and Shaeffer (\$1.00), A Golden Nature Guide
8. How to Know the Minerals and Rocks
By Richard M. Pearl,
A Signet Key Book (50¢)

ROCK AND MINERAL IDENTIFYING SHEET

Name _____ Year of Project _____

1. Date Collected _____

2. Where found. (State) _____

(County) _____

3. Check: Sedimentary _____; Igneous _____;

Metamorphis _____; Other (identify) _____

4. Color _____

5. Luster _____

6. Streak _____

7. Mohs' Hardness Scale (circle one) 1 2 3 4 5 6 7 8 9 10

8. Crystal form _____

9. Cleavage _____

10. Fracture _____

11. Magnetic Yes No (circle one)

12. Other characteristics _____

13. Economic Use, if any _____
