



Kansas 4-H Geology Leader Notebook

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Field Trip Preparations

General — Geology, Level I

What members will learn ...

About the Project:

- How to get ready to go on a field trip.
- How to be safe on a field trip.
- How to collect usable specimens.

About Themselves:

- How to plan and prepare for an event.
- Safety habits.

Materials:

- Paper and Pencil
- Member Handout 37 (two pages), *Geology Field Trip Guidelines*
- One set to show whole group:
 - Suitable clothing & shoes
 - Containers and labels for specimens
 - Identification Aids
 - Hammer and/or chisel
 - Gloves & safety glasses
 - First aid supplies

Activity Time Needed: 30-45 minutes

Activity

We are making plans for a geology field trip. I will divide you into small groups. Use the sheet of paper and pencil to list all of the things you will need to take on the field trip to collect some possible samples for your collection boxes. Circle the three most important items you will need. When you are finished with your lists, we will talk about what we will need and why. Are there any items we have forgotten?

Now we are going to list on the back of our sheets safety tips that we need to remember while we are on our field trip. Mark what you feel are the three most important safety tips.

Let's look at this suggested list of things to take on a field trip and also the safety tips to see how many items you listed.

Next, let's talk about what type of clothes you should wear on a field trip. What type of shoes would be best? Why? Will you need long pants, a jacket, or gloves?

Leader's Notes:

Before going on first field trip, give an introductory session to project members and parents on what to expect. Some new members may not have any idea of how to dress or what to bring.

Distribute Member Handout 37 (two pages), *Geology Field Trip Guidelines*. Go over it and compare it with the members list. Discuss the differences. Show suitable items to take, or have a demonstration on proper items.

Mention that rock hammers are not absolutely necessary, that they are used mainly to produce a fresh unweathered surface for identification, climbing banks, steadying things, and only occasionally for getting samples of rocks.

Individual first aid supplies can take care of minor injuries, but leaders should have larger kits available if they are sponsoring a large group.

Give members the *Collecting Tips* portion of the Member Handout.

What tools do you think you will need? Rock hammers can be used to lift or break rocks. When lifting a rock, always lift the side away from you until you know what is under it. There may be snakes or other critters under the rock. When breaking a rock, always wear safety glasses or wrap the rock with cloth before hitting it with your hammer

We will talk about what to look for at each site and what size of specimen you will need. How do you plan to protect and label your specimens until you get home?

Let's talk about this list of *Collecting Tips*. Are these the things you thought about? Why is it important to keep the specimens from each stop separate? How can we emphasize marking locations and mark or label each sample?

Dialogue for Critical Thinking:

Share:

1. What field trip materials did you think of? Why?
2. What new collecting tips did you know?

Process:

3. Why should you use a rock hammer instead of a carpenter's hammer?
4. What is the best way to record where you found a specimen? Why?

Generalize:

5. What other times is it important to wear safety glasses?
6. What other times is planning and preparation important?

Apply:

7. Why is planning a field trip important?
8. What safety habits would apply to field trips other than geology? Why?

Going Further:

1. Have an older project member or Junior Leader present part or all of this lesson. Consider developing a demonstration in a bag for the older members to present to the entire group.
2. Play a game to demonstrate importance of lifting rocks away from you with a hammer so wildlife can escape without harming you. Hide a small toy snake and/or scorpion under one of three or more rocks. Members take turns lifting rocks correctly with hammer until they find the snake. Then that person hides the snake for the next person.
3. Make an inexpensive rock hammer for yourself and maybe extras for others. Find a railroad spike and have someone weld a short length of pipe to it at a 90-degree angle near the middle of the spike for a handle. A welding chip hammer may also be used.

References:

Jones, H.E., *Exploring the World Through Geology*, 1971, Cooperative Extension Service, Kansas State University, Manhattan, Kansas, 32 pgs.

Pabian, R.K., *Minerals and Gemstones of Nebraska, A Handbook for Students and Collectors*, 1993, Educational Circular No. 2, Conservation and Survey Division, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, Nebraska, 80 pgs.

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Field Trip Preparations

Member Handout 37,
Geology Field Trip
Guidelines

General — Geology, Level I

Materials Needed:

- Suitable clothing and shoes
- Pencil and paper
- Containers and labels (sacks, small bottles, plastic bags, etc.)
- Soft material to wrap delicate samples (rags, facial tissues, newspaper, etc.)
- Field trip guide or maps
- Identification aids (books, drawings, charts, etc.)
- Hammer and/or chisel
- Gloves & safety glasses
- Water and food
- First aid supplies, sun screen & insect repellent
- Full tank of gas and spare tire (if using cars)

Rules and Safety Tips

1. Be on time and stay with the group or you might get left behind.
2. When getting out of cars along roads, exit on the passenger side.
3. Be careful when coming out from behind parked cars.
4. Cross roads with adults and be careful at all times when near roads.
5. Stay away from open shafts, pits, mines, equipment and wire.
6. Don't swing or throw rock hammers.
7. Use some type of eye protection if you hammer on a rock. (This includes the people near you.)
8. Take extra care around steep slopes, stream banks, sink holes, quarry walls and piles of material. The footing may not be good and they all offer places for snakes and other animals to be unexpectedly found.
9. Watch out for people below you on out-crops; rocks that you dislodge may injure someone!
10. Do not throw, roll or push other material down hills, cliffs or material piles.
11. Don't try to lift BIG rocks.
12. When looking under rocks, use a hammer to lift the side away from you, and pull it toward you. This allows snakes and other critters a chance to escape.
13. Take plenty of drinking water.
14. Bring a change of clothing, including comfortable, sturdy shoes. (Preferably high-tops)
15. Leave wildlife alone. Let them enjoy their own freedom and space. When returning from a field trip check for ticks and other unwelcome guests.



Field Trip Preparations

Member Handout 37,
Geology Field Trip
Guidelines, cont.

General — Geology, Level I

Collecting Tips

1. Collect with purpose, don't try to bring home every rock, mineral, or fossil that you find.
2. Always label specimens promptly with the stop number and location.
3. Collect Specimens that are as close as possible to the size that you will be using in your exhibit.
4. If possible, collect samples that are not connected to another rock. These may already be in good shape to exhibit without your having to try to remove the sample from the rock.
5. If it is necessary to remove a specimen from the rock, do so with care. Remember a careless blow with a hammer can ruin the best of specimens. If the rock is small enough, take it home and take your time in removing the specimen. However, if the specimen must be removed from a large rock, use a coal chisel to remove rock from a trough around the specimen (not right next to the specimen, but a little distance away), then use the chisel to undercut the specimen and pop it free. Most specimens obtained in this way will need additional trimming or removal of the excess rock to get it ready for display.
6. When specimens are collected, they should be wrapped in newspaper or other material and placed in some container to provide maximum protection. No one likes to get home and find a bunch of pieces to remind them of how hard they worked to collect the samples.
7. If you collect carbon-film fossils, consider using clear plastic spray to stabilize the fossil. This may need to be applied to the fossil before it is completely dry. However, try it on a sample that is not a prime specimen first, before spraying that one in a million find. Use several thin coats as needed instead of one thick, runny, coat.
8. If you feel that a specimen needs to be cleaned up, try brushing or washing first. This will be okay for most specimens.
9. If you feel that a specimen needs to be removed from other material, check appropriate references for the proper procedure.



Preparing Specimens For Display

General — Geology, Levels I-II

What will members learn ...

About the Project:

- How to properly label and prepare different types of specimens.

About Themselves:

- Value of patience and preparation.

Materials:

- Water in suitable container for washing specimens
- Towels
- A little mild detergent like dish washing soap
- Strainers, or screen
- Small pieces of paper and pencils
- Soft brushes, like old toothbrushes
- Hard brushes, like a wire brush
- Examples of different kinds of rocks, including:
 - One soft, like chalk (expendable)
 - One dissolvable in water, like shale (expendable)
 - One very hard, like Barite
 - One delicate carbon imprint, if you will be collecting those within a year or so, or other shale or delicate piece to spray
 - One in a soft matrix
 - One limestone fossil
- Specimens to be cleaned for display (tell members ahead of time to bring some of their own)
- Small scraping tools, like dental picks or screwdriver (not too sharp)
- Vinegar in a container large enough to soak specimens
- Clear acrylic spray; obtained where spray paint is sold
- Old newspapers
- Magnifying glass, if using small specimens

Activity Time Needed: 30 minutes, depending on the amount of fossils to be cleaned

Leader's Notes:

If they use their own specimens, it will increase their application of what they have learned, but if it gets too distracting, have them put their specimens away until you are ready to wash them.

Demonstrate whichever steps you want them to use. When they are washing their own, the water may need to be changed frequently. You may prefer to have them wash at home.

Omit this if you like; it is used less frequently.

Activity

Today, we are going to prepare the specimens we have collected for display in your geology boxes or wherever else you want to display them. You will get better ribbons on them and they will show their features off better if they are prepared right. Most specimens don't need very much preparation. Do each of you have some specimens you think look pretty good without cleaning them up?

Yes, those do look good. Now, one or two might look even better if we worked on them a little bit. Now can you show me one that will look very good without help? OK. But I'll bet some of those will look pretty good when you are finished cleaning them. As we are talking, I want each of you to be thinking of specimens you have collected, and deciding which of the methods I show you are the best for the things that you have.

The method you use to prepare your specimens depends on the characteristics or features of the specimen. If the specimen is looking pretty good, and just has a little dust on it, you will not have to do much. You can wash it or brush to remove the loose dirt. First I will show you how to brush it. Here is a **soft brush**, actually an old toothbrush. You can just gently brush all sides of the rock with it until the rock is clean. This should work for most pieces. If a piece is very fragile, and might break, then don't do this. Be careful not to drop the piece.

Here is a **hard brush**. It is useful for very hard pieces like this Barite. See how it brushes the loose stuff off of the barite? Let's try the hard brush on this soft piece of chalk. Oops! It is scratching badly. Don't use a hard brush on any pieces that are not very hard. Do you have any pieces that need a hard brush?

Another very useful method is to **wash** the specimen. That method works well for most things. We have set up a washing area here and you can do your own later.

First, you put your specimens in this strainer and lower it into the water. Swish them around with your hand until the mud washes off. I have put a few drops of soap in the water to make it work better. When you think the specimens are clean, lift them out of the water in the strainer and hold them above the water pan for a while to drip. Then you can spread them on the towel to dry. Do not mix your specimens in with someone else's, and remember to keep specimens from different locations separate and keep a sign with them. Let them dry completely before you pack them up again. What kind of specimens should you not wash? Let's try washing this piece of shale. Look, it all crumbled away in the water. What else would you not want to wash? What would happen if you washed a piece of salt? You also shouldn't leave pyrite or marcisite damp very long. Any very fragile pieces also shouldn't be washed or they may break. Do you have any pieces that shouldn't be washed?

Once in a while, you will have a fossil that has a little extra limestone around it. **Vinegar** is a weak acid and dissolves limestone. It might also dissolve the fossil, so don't try it on your best one first. I am going to put this in here and leave it until the end of the meeting to see what it does. You may each try one also. Remember, not your best one! It sometimes takes a long time for this method to work, like a day or two.

The next method I am going to show you is carefully **scraping** away extra rock to show more of the specimen. This works best in soft rock like

chalk. Put the pieces you are working on, on a table, and use some small tool that is a little sharp. It depends on what you have, and how hard the area around it, called matrix, is. For soft rock, you could even use a table knife. Dental tools, a needle, a screwdriver or ceramic tools work well on most rock for small areas. See how I am carefully scratching off just a little at a time? You need to be careful when you work, and if you are doing it at home, you might want to do it while you are listening to music. As more of the part you are saving shows, be careful not to scratch it, especially if it is soft. Some people paint something on the part they have already uncovered to make it harder. You should try to wait for it to dry before you work on it again. There are also products you can buy, called hardeners.

Now here are some specimens that require special treatment. Do you know what these are? Yes, they are leaf prints of fossils, and they are very delicate. These are in shale, which breaks easily, and if you have carbon leaf imprints they could also flake off. It is best to **spray** these with a clear spray.

I will show you. First, you lay it carefully on a large piece of newspaper. Several pieces can be grouped together. Then you shake the spray can hard for a little while. Now, I am spraying them evenly and making sure to cover every part. Now you have to let the pieces dry a little while. It is a good idea to give them another coat of spray, and some people even spray the back to help it dry evenly. Be sure to store them carefully, and let them dry slowly and completely. Shale is less likely to break if it dries slowly. Do you have any pieces that need spraying? If you do, please have your parents do the spraying, as it is very messy if you touch it and a bit tricky and smelly.

Let's look at the pieces in vinegar. Do you see a change yet? When we are through soaking the pieces, you will want to wash the vinegar off with water.

Now, which of your specimens do you want to work on first, and what will you do to them? You may need to take turns, if one area gets crowded. I'll bet your all going to have great looking specimens, with a little work and patience on your part.

Dialogue for Critical Thinking:

Share:

1. What methods had you used before?
2. Which method did you like best? Why?

Process:

3. Which process produces clean attractive specimens?
4. What method was the easiest? Messiest?
5. What are advantages and disadvantages of each method?

Generalize:

6. Which preparation method required the most patience? Why?

Apply:

7. What other things do you do that require lots of preparation and patience?

Homemade hardeners can be made by mixing glue with water.

Krylon is a popular brand name. It is a good idea to take a spray can to your collecting area.

Older members could spray their own.

Going Further:

1. Investigate other methods that are especially appropriate for things collected in your area.
2. Make an educational display for the fair showing different cleaning methods and examples of things you have cleaned by each method.
3. Arrange a behind-the-scenes tour of a museum and have them show you how they prepare their specimens. Which of their methods could you use on your specimens?

Source for Commercial Stabilizers and Adhesives (not an endorsement)
Paleo-Bond

Uncommon Colnglomerates, Inc.
287 East 6th Street
St Paul, MN 55101
Phone: 1-800-323-4545

References:

- Brocardo, G., translated by Woodward, L., ed. Smith, D.A., *Minerals & Gemstones of the World*.
- Devon, David & Charles, *Naturetrek Guide*, 1994, pgs. 36-43.
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Show It: Geology Display Box

General — Geology, Level II

What members will learn ...

About the Project:

- Proper display methods.
- How categories work to divide rocks, minerals and fossils and other sub-divisions.
- Correct names and spellings for specimens.
- How geology boxes are evaluated.

About Themselves:

- Self-confidence in learning to identify specimens and achieving goals.
- Categorizing helps organization.
- Importance of neatness and correctness.
- Evaluation is an important part of the learning and growing process.
- I am responsible for the decisions and effort I make that affects the finished product and my rewards.

Materials:

- Member Handout 38 (two pages), *Making a Geology Display Box*
- Member Handout 39, *Geology Display Case*
- Member Handout 40, MG18, *Scorecard for Judging Geology Exhibits*
- Member Handout 41, MG20, *Rock, Mineral and Fossil Labels for Geology*
- Activity Sheet 63, *Geology Display Box Checklist*
- Specimen card prepared correctly; and one prepared sloppily
- Local and State exhibiting rules
- Any demonstration materials you may need showing how to prepare a geology display box
- Completed display box (have members bring one first-year box and one or two more advanced boxes)
- Names and addresses of anyone in your area who makes boxes for sale

Activity Time Needed: 40 minutes

Activity

You've learned a lot this year, and collected a lot of good specimens. Most of you have gone on several field trips and have a lot of nice specimens to display. Now let's learn how to exhibit them so the judge and others can see what you have done.

Leader's Notes:

If your county has a collection for younger members, bring a suitable box and review the introductory requirements.

Recognize that not all members will choose to exhibit their specimens at all.

You may want to have one of the members present the demonstration on making the box.

Go over your county's requirements thoroughly as this is a prime spot for misunderstandings.

If your county doesn't have this category, skip this section.

Go through the handouts, integrating appropriate fair rules and your own experiences. Show the boxes and how to do each step. Be sure to emphasize that their plexiglass should fit in the box **from the top** so it will not fall out when the box is moved.

Distribute Member Handout 40, MG18, *Scorecard for Judging Geology Exhibits*.

Show the correctly and incorrectly completed cards, and pass them around.

If you just want to display your specimens for your own enjoyment, that is fine. Many people use a plastic box to sort their specimens into compartments and store them. If, however you want to compete at the fair, you will need to meet the requirements.

For most categories, you will need to display your specimens in a wooden display box. Some counties have a class for younger, newer, members that doesn't require a box. If you are eligible for that class, you should consider it. Remember, that class does not go to the state fair, even if you win a purple ribbon because you must be 10 years old before January of the current 4-H year to exhibit at the Kansas State Fair.

The same box can be used for at least two years' worth of specimens. Who will need a handout giving directions for building the box? Here is how you set the box up when you get the box itself assembled. I will hand out this sheet with some ideas on setting up the box, and we will go over the steps necessary to set it up. You need to group specimens by rock, mineral or fossil. This makes an orderly, attractive box, but also allows you to learn as you assemble your box. This is a general way to do it. Many members have thought of ways to personalize their boxes for a unique display that they prefer based on previous years of experience.

Now we will look at the Judges Score Sheet. You have to make a lot of decisions when you set up your box, and now you can see how those decisions can add up to make a box that shows well. What is the largest category on the judging sheet? Why is that important? Each of the other categories count for points also. You can make your box look better by making a neat display that will catch the judge's eye and look appealing to people who view your box. Masking tape helps remove lint from boxes and lint free towels help clean the plexiglass. Here are two cards with specimens on them. Which of these cards would you rate better if you were a judge? Under which section would these points come off?

Now, each person can be a judge for a few minutes. Choose one of the boxes and use the score sheet to rate it for each section. Then add up the totals to see how that box rated.

Dialogue for Critical Thinking:

Share:

1. What do you think is the most important feature of a geology display box? Why?
2. What is the most difficult aspect of displaying a specimen? Why?

Process:

3. What is the most important item when judging a geology exhibit? Why?
4. What are the major categories for classifying geology specimens?

Generalize:

5. Why is it important to set goals?
6. How can another person's (judge) evaluation help you learn?

Apply:

7. Where else might you use the skills of neatness and organizing?
8. If you have a display geology box, what do you plan to change for next year? Why?

Going Further:

1. After members have their boxes finished (and hopefully before the fair) have each member exchange “peer” judging with two others so that each person has some ideas of what to improve in their box.
2. Display your geology box at club meetings, project fairs, gem and mineral shows, schools, or downtown window display to promote the project.
3. Geologists often put a number on each specimen. They use a little white paint on an inconspicuous spot. When that is dry they write the specimen number on that spot. What are the advantages and disadvantages of that procedure? You could do that for your specimens also.
4. Go to a Gem and Mineral Society show. You may be able to enter your box if they have a youth category. How is it different from 4-H fairs?
5. Investigate other means of display. What do museums do that you could adapt? Ask someone who has been collecting a long time what methods they use.

References:

Exploring the World Through Geology, Cooperative Extension Service, Kansas State University, Manhattan KS. 1971

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Show It: Geology Display Box

Member Handout 38,
Making a Geology
Display Box

General — Geology, Level II

Collecting rocks is fun, and showing off rocks you've collected is also fun. When you make them into a display, it helps you organize them and learn their names. It also shows other people what interesting things can be found in our state and is more attractive and convenient to look at than a pile of rocks.

If you are not planning to show your display for competition, you could display your collection by any of a variety of methods. One way is to put each one in one section of an egg carton. Another is to get a plastic box with dividers in it (like for fishing tackle or sewing supplies). You could also glue your samples to a board or poster. Be sure you have each sample labeled with where you found it and what it is.

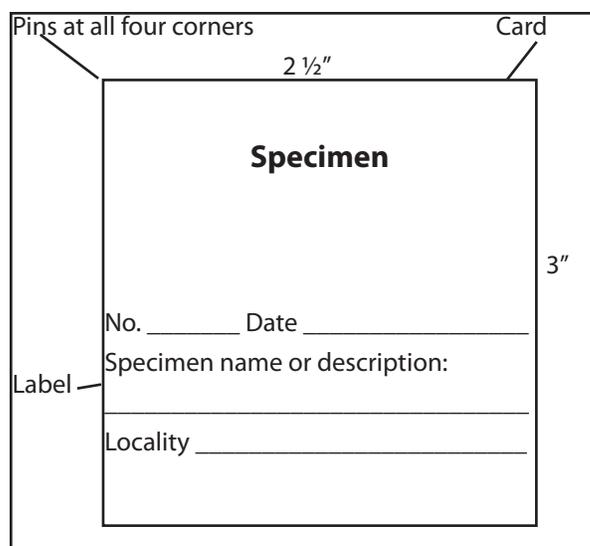
If you are going to be exhibiting at the state fair and most classes of the county fair, however, there are strict rules that you will need to follow to qualify. There are several variations of rules that do not meet the requirements. You might want to consider the ones you have seen used. Here is a basic guide to producing a top-notch geology display box.

Select your specimens carefully. Reread the rules in the fair book to make sure you have met the requirements. Most classes require you to have 15 new specimens collected in the current year in Kansas. Another member of your family or the group could have actually found the specimen as long as you were at that stop. You want specimens that are approximately 2 inches or less in size. If you have one or two really great larger specimens, that is OK also. If you have several small fossils, see if you can make a grouping with an odd number (three, five or seven) of them on the card (like putting seven fusulinids on one card). Make sure your identifications are correct. If you have a specimen you can't get a positive I.D. on, leave it out if you can.

The box used for geology is a wooden box 18 inches by 24 inches with a plexiglass top; the same as an entomology box. You can get directions for making it from your 4-H leader or the extension office, or from your geology leader. Put something in the bottom of the box, like ceiling tile or cork, that pins can penetrate; and cover it with some attractive fabric like felt that will not detract from your specimens, nor show dirt (medium color). Each box can hold up to approximately 30 specimens.

Each specimen must be labeled with the following correctly spelled information: date collected, name of specimen and location (county) where it was found. The label also calls for a specimen number. When you return from a field trip, each specimen should be given a number. For example, one of the specimens you collected on the first stop of your first field trips would be No. 1. The next year, you start numbering where you left off. You should also show whether it is a rock, mineral, or fossil by putting a capital R, M or F in the upper right hand corner of your label. For fossils, genus and species names should be underlined, or typed in italics, if you are using any of those designations. If possible, have your labels typed. If someone else types the labels, you should be the one to write out the information and check the spellings. Then they just need to type them. Labels may be obtained from your county extension office, or you could format your own on the computer, etc. It is a handy idea to print them off on gummed labels.

Instead of mounting your specimens directly in the box, you may want to mount them on a small piece of cardboard so that it is easy to remove them and take them out. Half of an unlined 3-inch-by-5-inch recipe card is a good size for most specimens. The regular label also fits across the 2-inch dimension of it with only





Show It: Geology Display Box

Member Handout 38,
Making a Geology
Display Box, cont.

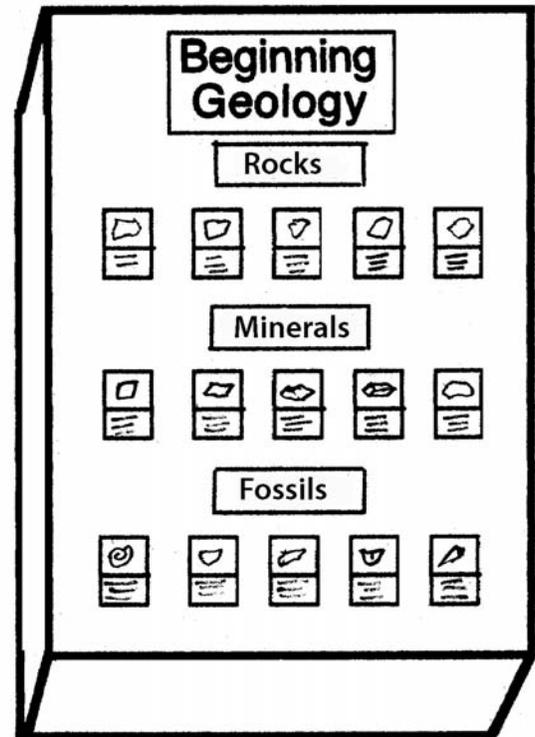
General — Geology, Level II

minor trimming. Glue your specimen firmly to it about $\frac{1}{3}$ of the way down the card (leaving room for the label) without any extra glue showing. A glue gun is handy for larger specimens. Elmer's Glue types also work but be sure to allow it to fully dry in a flat position, or your specimens may slide from position. Glue the proof-read label on the bottom $\frac{1}{3}$ of the card. You may need to neatly trim the label to match the card.

Your box needs a title that tells in what phase of geology you are enrolled (Example: BEGINNING GEOLOGY). Make smaller labels for the categories. You will need labels for at least rocks, minerals and fossils, and maybe more for later years. Arrange your box neatly and logically, grouping the cards with specimens under each category. As you do this, look at each category and see if you can tell how they are alike. Put larger, heavier specimens toward the bottom of the box. Straighten the rows, using a ruler or straight edge for a guide. Then pin the cards and labels down, pushing the pins in all the way. Sequin pins, available at some fabric or hobby stores, are good to use as they are not as long as regular pins. It usually takes a pin in each corner to hold the card flat.

Now your box is finished. Look at it carefully, pretending you are the judge. Did you follow all the requirements? Is your box neat and attractive? Are your identifications correct? Use a checklist, if you have one. It is a good plan to review it also. Correct any errors that are found. Then pack it carefully and enter it in the fair. No matter what award you get, you will know that you have done a good job, and have completed a project you can be proud of.

Fig. 1: Example of completed display box.

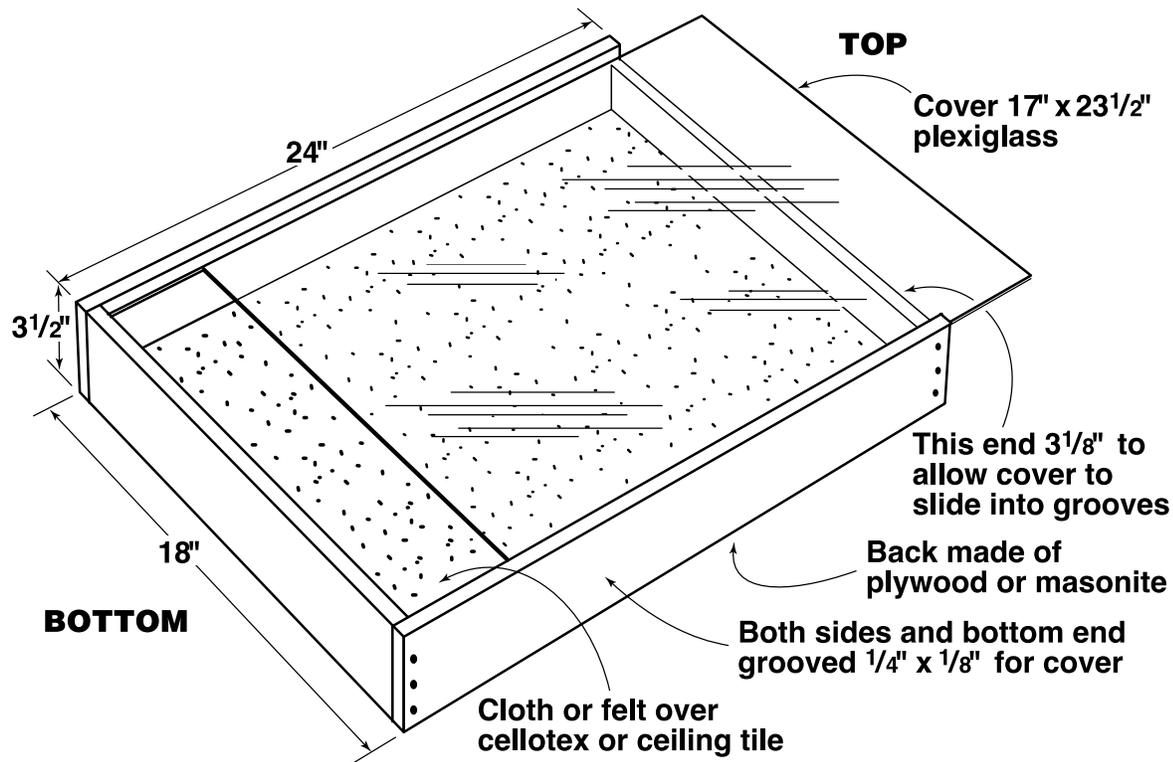




Show It: Geology Display Box

Member Handout 39,
Geology
Display Case

General — Geology, Level II



Geology Display Case

18 X 24 inches

Materials List:

1. Bottom $\frac{1}{4}$ " X 18" X 24" plywood or $\frac{1}{8}$ " x 24" tempered masonite
2. Two side pieces of pine $\frac{3}{4}$ " x $3\frac{1}{2}$ " x 24" groove to accept cover $\frac{1}{4}$ " x $\frac{1}{8}$ "

3. One end piece of pine $\frac{3}{4}$ " x $3\frac{1}{2}$ " x $16\frac{1}{2}$ " groove to accept cover $\frac{1}{4}$ " x $\frac{1}{8}$ "
4. One end piece of pine $\frac{3}{4}$ " x $3\frac{1}{8}$ " x $16\frac{1}{2}$ "
5. One cellotex or ceiling tile $\frac{1}{2}$ " x $16\frac{1}{2}$ " x $22\frac{1}{2}$ ". Cover bottom so pins will stick.

6. One piece of cloth or felt to cover bottom, about 18" x 24"
7. One plexiglass for cover $\frac{1}{8}$ " or more x 17" x $23\frac{1}{2}$ "

At the State Fair the top of the box should be the short end (18") from which the cover is to be removed for inspection. Otherwise there is a chance that the cover will fall out when the boxes are placed upright in the display racks. Any lettering or labeling in the exhibit should be right side up for reading with the cover removal end up.

For exhibiting at the State Fair, the specimens must be displayed in cases $3\frac{1}{2}$ " x 18" x 24" in size similar to the case shown above. It is not necessary to have the cover inserted in grooves as shown in the diagram, but the cover must be removable. The reasons for asking for display cases of this size and construction are simple. The covers allow the judges to examine the specimens. The display racks hold the cases with the long side (24") up and down, and cases too long or too short may not fit in the racks.

Adapted from the 1975 Exploring The World Through Geology Leaders Notes.



Show It: Geology Display Box

Member Handout 40,
MG18, Scorecard for
Judging Geology
Exhibits

General — Geology, Level II

_____ County _____ Contestant's Name _____ Class No. _____ Placing (ribbon color)

Scoring Guide

		Points
Specimens	Correct Identification _____ (2 points off each incorrect — limit 35 points)	35 _____
	Condition (identifying characteristics easily seen) (1 point off each undesirable specimen — limit 15)	15 _____
Labels	_____ (1 point off each incorrect or incomplete label — limit 20 points)	20 _____
Minimum Requirements	Has at least minimum number of specimens for Class (2 points off for each specimen less than required — limit 15 points)	15 _____
Showmanship	(neatness, arrangement, placement, background, lettering, etc.)	15 _____
		Total 100



Show It: Geology Display Box

**Member Handout 41,
MG20, Rock, Mineral,
and Fossil Labels
for Geology**

General — Geology, Level II

No. _____ Date _____ Specimen name or description _____ Locality _____	No. _____ Date _____ Specimen name or description _____ Locality _____	No. _____ Date _____ Specimen name or description _____ Locality _____
No. _____ Date _____ Specimen name or description _____ Locality _____	No. _____ Date _____ Specimen name or description _____ Locality _____	No. _____ Date _____ Specimen name or description _____ Locality _____
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Show It: Geology Display Box

Activity Sheet 63,
Geology Display Box
Checklist

General — Geology, Level II

- __1. I have read the requirements in the fair rule book for geology exhibits, know entry times, and have read the rules for the class I am exhibiting in.
- __2. I have attached the box labels as specified in the rule book and have set up my box so that the plexiglass slides in from the top, not the bottom.
- __3. I have chose specimens for my box that are good examples of their kind, and show that I have learned about a variety of things.
- __4. I have grouped my specimens into rocks, minerals and fossils, and have labeled the groups.
- __5. I have counted that I have the right total number of specimens, and no more than 2 extras; and that I have the required number of new ones from this 4-H year, and the required number in each category.
- __6. I have checked that I have no duplicate specimens or numbers in my box.
- __7. I have eliminated specimens that are controversial such as ones showing characteristics of several groups, ones whose names can't be agreed upon, or ones that are so unusual not even a judge can verify them.
- __8. I have typed (preferred) or neatly written my labels and have proof-read them (or someone has typed them for me and I have proof-read them).
- __9. I have double checked all spellings and identifications.
- __10. I have underlined or put in italics the genus and species, and only the genus and species.
- __11. I have listed the phylum for each fossil
- __12. If required for my class, I have indicated whether rocks are igneous, metamorphic or sedimentary.
- __13. I have lined up my specimens neatly using a ruler or other straight edge.
- __14. If this is not the first time I am exhibiting this box, I have made changes suggested by previous judges.
- __15. I have cleaned my box, and given it one final check over.



Do You Want To Be a Geologist?

General — Geology, Level II

What Members Will Learn ...

About the Project:

- Geology is the study of the earth.
- Geology careers are many and varied.
- Geology careers are interesting and exciting.

About Themselves:

- Geology career choices.
- Decision-making skills.
- How to ask a good question.

Materials:

- Activity Sheet 64, *Geology Careers Match-up*
- Pencils for each person

Activity Time Needed: 15 -20 minutes.

May combine with another lesson or make longer by doing one of the activities under the Going Further section.

Activity

What do you want to be when you grow up? Well, today we are going to find out about career possibilities in geology. Geology is the study of the earth, but there are many specialties within that. Who can name some geology careers? What do those people do?

Many geologists now combine their interest in the earth with their interest in the environment. They might help to clean up some pollution, using what they know about geology to help them, for example.:

What do you think geologists need to learn in school to make them good geologists? They need to learn lots of things about the earth and science in general, but they also need to learn about computers and math. To tell others about their ideas, they will need good writing and speaking skills from classes like English and Speech.

This activity sheet has descriptions of some of these careers with pictures. Draw lines matching the careers with the pictures. We'll use it to get ideas for a game and to put in your geology notebook.

Now, We are going to play "What am I?" One person who is "It" will think of one of these jobs. Everyone else will ask Yes or No questions until they guess the job. Then that person will be "It" for the next round until

Leader's Notes:

May want to generate the list on a flip chart or wallboard.

Hand out Activity Sheet 64, *Geology Careers Match-up*.

Encourage them by asking "What about the people who study volcanoes?" etc., if they don't start out strong. This should only take a short time.

Go over right answers when done:
(in order of pictures, top to bottom):
Marine Geologist, Seismologist,
Volcanist, Mineralogist, Petroleum
Geologist, Geochemist, Engineering
Geologist, Paleontologist.

Remind them to ask only yes-no
questions, and give an example of
broad questions like "Do you work
outside?"

Allow them to give some answers.

everybody has been "It." If somebody guesses right twice, they may
choose somebody to be "It" for them.

What kind of questions should you ask first, broad ones or narrow ones?

Dialogue for Critical Thinking:

Share:

1. What was the hardest job to guess? Why?
2. Did any of the jobs sound exciting to you?

Process:

3. What kind of questions in the guessing game made it easiest to guess the careers?
4. What do all the careers have in common?

Generalize:

5. What things about being a geologist do you think you might like? Dislike?
6. What things do you do that would make you a good geologist? Do you like to investigate things? Work outside?

Apply:

7. For what other decisions besides choosing a career would it be wise to consider lots of different choices?
8. What other geology careers do you know of, and what do they do? [*A. Hydrologist (Water), Teacher, Planetary Geologist, Geophysicist, Mathematical Geologist, Environmental Geologist (as with remediation) etc.*]
9. Which geology career do you think you would like best? Why?

Going Further:

1. Play Pictionary, Charades or Lemonade with geology occupations.
2. Have a geologist in to speak to the group about what he or she does and about geology careers in general.
3. Make an educational poster about a geology career and display it at your group's meeting. Is there a category at the fair for that also?
4. Make a collage about geology careers.
5. Make a word search of terms associated with geology careers.
6. Order geology career materials from the Level 4 Careers unit references, or look up geology careers in the encyclopedia.

REFERENCES:

Teacher's Packet of Geologic Materials, U.S. Geological Survey, 907 National Center, Reston, Virginia 22092 :

Careers in Geology. American Geological Institute: 4220 King Street, Alexandria, Virginia 22302. American Association of Petroleum Geologists: 1444 South Boulder 74119-3604, P.O. Box 979 74101-0979, Tulsa, OK

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Do You Want To Be A Geologist?

Activity Sheet 64,
Geology Careers
Match-Up

General — Geology, Levels III

Draw a line from the career name and description to the picture, matching up all the pictures and names.

Engineering Geologist

Advise engineers on building dams, houses, etc. so their construction will have a good foundation.

Geochemist

Studies the chemical materials in the rocks.

Marine Geologist

Studies the ocean floor and the actions of the ocean on the shore.

Mineralogists

Study, classify, and describe minerals.

Paleontologists

Use fossils to describe the development of life through time.

Petroleum Geologists

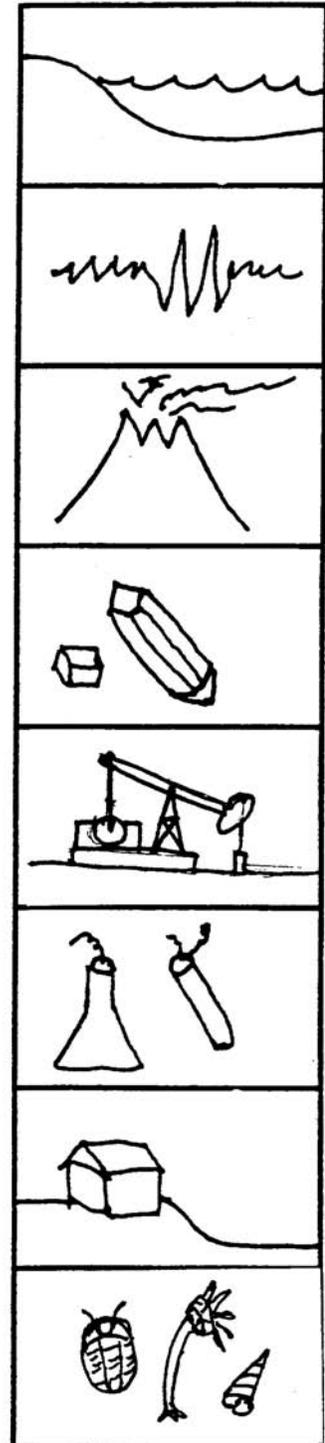
Locate locations to drill for oil and other petroleum products.

Seismologists

Earthquake specialists.

Volcanologists

Study volcanic activity.





Log It

General — Geology, Levels III

What members will learn ...

About the project:

- How to make a professional style road log.
- Important geological features of your area.

About Themselves:

- How to keep accurate records.
- How to analyze features for importance.
- How to follow directions.

Materials:

- Pencil
- Paper – A steno notebook or spiral notebook works well
- Member Handout 42, *Example Road Log*
- Copies of map showing area of your field trip (optional)

Activity Time Needed: 15 minutes each, before and after field trip; plus field trip time

Activity:

Geologists often make a road log of a field trip. It tells where to go and what is interesting along the way. Even years later, someone else can enjoy the same things with just this log to guide them. Here is an example of a pretend road log.

Let's look at the road log and tell me what some of the features are that might be helpful if you were following it.

Here is how to make your own road log. Practice on your next field trip, and then compare your logs at the next meeting to see if everybody thought the same things were important.

First, you will need to keep track of the mileage. This is much easier if the vehicle you are driving in has a trip odometer. Simply reset it to zero at the start of the trip. If not, you will have to read the odometer that tells your mileage at the beginning and at each feature and subtract the smaller number from the larger to get the miles traveled. Write the number of miles traveled since the start of the trip at the left side of your paper in the margin. At each feature, you want to write down the mileage and why that feature is interesting. You may even want to do some research on the geology of the area to include something in your log that you couldn't learn just by being there.

Leader's Notes:

Do this lesson in connection with a field trip you would take anyway.

Provide Member Handout 42, *Example Road Log*.

You might want to supply copies of maps of the field trip area.

Here are some ideas of things to include in your road log:

1. Turns and driving instructions
2. Your collecting stops: What can be found there and landmarks to find the right area.
3. Major road intersections and landmarks so that someone who loses their place can start up again.
4. Geologic features, even if you are not stopping at them. Ex., a house built of a locally quarried stone.
5. Major rivers and something about them.
6. Major formations, especially the ones at which you collect.
7. A geologic column, if desired
8. A map of the area. You could copy a highway map on a copier, cut out the area of your trip, and draw in stops and the route.

Dialogue for Critical Thinking:

Share:

1. Have any of you ever used a road log before?
2. Compare your road log to someone else's. What did they do differently? Think about the difference. Which do you think would be a better way to do it? Remember not to argue, just try to think of the best way.

Process:

3. What is the difference between a road log and a field trip guide?
4. Why is it important to keep a road log?

Generalize:

5. What will happen if you don't follow directions carefully when using a road log?
6. What features of your log would prevent people from getting lost?

Apply:

7. When else is it important to follow directions carefully?
8. Why is it important to keep accurate records?

Going Further:

1. In cooperation with your leader, make a road log ahead of time of a field trip your group plans to take. Make it as accurate and informative as you can. Give copies to your group.
2. Get road logs that someone else has made and follow one. Enjoy your trip, but also analyze the log. How did the person making that log do things differently than your log? Which way do you think works best? Why? Was the log easy to follow? Why or why not?
3. After studying the lesson on section, township and range, find that information for each of your collecting stops and add it to your road log. Why does that make it better?

References:

Kansas Geology by Rex Buchanan (1984) contains a road log along Interstate highway I-70 across Kansas.

Road logs of geology field trips may be obtained through the State 4-H Geology Project Web page (www.kansas4-H.org).

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Log It

**Member Handout 42,
Example Road Log**

General — Geology, Levels III

Rock County Field Trip

Mileage	Description
0	Start trip at Rock County extension office at Third and Main Street in Diamond, Kansas. Turn South (right) on Main.
1.5	Turn left (East) on County Road 34.
2.6	You are driving over Little Muddy Creek. It's dark color and name come from all the soil its water has picked up as it runs over cultivated fields on its way to the river.
4.0	Collecting stop. This area has nice quartz-lined geodes. Look for round rocks that seem light weight for their size. Look in the road cuts on both sides of the road (watch for traffic). You are collecting from the Diamond Limestone, named for Diamond, Kansas. Elevation: 2510 feet.
4.5	Turn right on gravel road.
5.7	Cross Muddy River again. Notice how much larger it is here. That is because it has joined with the Big Muddy River.
6.8	Notice the large quarry on your left. It supplies limestone gravel for roads in this county.
7.3	Collecting stop for fossils. You will find invertebrate fossil in this area from the Permian Age 220 million years, or more, ago. You will be collecting from the Bartley Shale, the gray shale layer beneath the thick limestone layer. Fossils you may find include Derbyia, Neospirifer, Crinoid, and maybe trilobites. The elevation here is 2420 feet. We are 90 feet lower than our last stop and in older layers than at our last stop.

Here are some ideas of things to include in your own road log:

1. Turns and driving instructions.
2. Your collecting stops — What can be found there and landmarks to find the right area.
3. Major road intersections and landmarks so that someone who loses his place can start up again.
4. Major geologic features, even if you are not stopping at them. Ex. — a house built of a locally quarried stone.
5. Major rivers and something about them.
6. Major formations, especially the ones at which you collect.
7. A geologic column, if desired.
8. A map of the area. You could copying a highway map, cut out the area of your trip, and draw in stops and the route.



Geology as a Career

General — Geology, Level IV

What Members Will Learn...

About the Project:

- Geology careers are varied and interesting.
- Geology careers require preparation.

About Themselves:

- Their unique skills and interests.
- How to gather information to make decisions.
- Their needs and wants in a career.
- The value of education in career preparation.

Materials:

- Career materials as needed for research (available in libraries, etc.)
Occupational Handbook is recommended for general careers.
American Geologic Institute (AGI) has geology career materials.
- Pencils, pen, paper, envelopes and stamps
- Activity Sheet 65, *Geology Career Interview*
- Activity Sheet 66, *Geology Careers Chart*

Activity Time Needed: Extremely Varied

Activity

Geology careers are many and varied, from atmospheric scientist to volcanologist, from finding oil wells to teaching. If you want to get a general overview of the possibilities, you can review the Level 2 lesson that tells about the different career possibilities. Not all those jobs are available in all areas of the country, but you will be surprised at the variety in just our state.

You may not have decided on a career yet, and that is fine. Even if you end up going into some other area, your life can be richer for knowing about geology and its careers. Also, the same general principles apply in evaluating all career possibilities, and most employers look for good workers who are well prepared. With your 4-H background, you will have a number of skills that can make you a good employee. You know that working hard gives you good results. You know that record keeping is important, even if not always fun. You have a lot of information on a number of projects and have had a lot of hands-on experience that you can use in a job. You have developed leadership skills in working with others.

Leader's Notes

This lesson is designed to be used directly by the members. Leaders should work closely with members and provide support where needed.

Analyze Yourself

It is important to choose a career that suits you, not your parents or your leader. Think about what you like to do, and what your strengths are. If it is hard for you to do this, you can ask others what they feel are your strengths. You also can ask your guidance counselor at school for career programs (some are even on computer). They will ask you to consider things like: Do you like to work outside or in? Do you like to work with people or things? How much school are you planning to take? How much money would you like to make? Most of us would like an easy job with great pay, but there aren't many of those around. What skills have you developed in 4-H? What was your favorite 4-H project and why?

Decide on Level of Involvement

How involved do you want to get in checking out a career right now? You can do one thing, and then proceed onto the next if it seems "right." Here are some common types of career involvement:

Job Research

Look up careers in books and pamphlets and find out what geologists do in those careers, what the pay is, etc. The Occupational Handbook is a good resource as are the pamphlets from the American Geological Institute. This is a good way to get some facts to start your investigation.

Interview

Talk to a geologist and ask questions. You can ask questions not in the books, and usually you will get to see where the geologist works as well, and maybe get to tour the company. This takes only a short time.

Shadowing

Follow a geologist around as though you are a shadow. This can be as short as a few hours or a day or two. You get to see what they REALLY do. Even so, it might not be a typical day.

Mentoring

A geologist works with you, answering your questions, helping you with your educational project and identification of specimens, giving you ideas that you might find interesting, taking you places, and providing you with resources and opportunities. This may be combined with other involvement.

Get a Job in the Company

This is a great way to earn some money while evaluating a job. It also might lead to a better job there later. Usually entry level jobs are monotonous, and you may have to spend most of your time doing things like filing or answering the phone, instead of learning about geology.

Internships

You work at a place (often for free or low pay) as a learning experience. Usually, someone is responsible for you, and sees to it that you are provided with interesting opportunities to learn about geology and about the career. Considerable time is involved, but rewards are greater. You should be able to do some hands-on geology things and get to really know the careers of the people working there.

Get Set

Go to your library or send for materials. If your chosen level of involvement involves a geologist, here are some tips for finding and choosing one:

Finding a Geologist

Maybe this is easy and you already know who you want to work with. If so, skip this section. If not, look at these ideas, and talk to your leader for ideas.

Universities and colleges — Often have at least one geologist, full or part time, on staff.

Phone Book — Look under Geologist or Geological Services in the yellow pages.

Commercial Companies — Many companies employ at least one geologist. Consider oil exploration companies, engineering companies, etc.

Government Agencies — Departments of Transportation, Health and Environment, Water Resources, Natural Resources, etc. all employ geologists. Each water management district has at least one geologist on staff. Most states have regulatory agencies for oil and gas drilling and mining. In Kansas, it is the Kansas Corporation Commission. Most states have a Geological Survey, usually located at one of the state's major universities. In Kansas, it is associated with the University of Kansas.

Contact the geologist and introduce yourself. Tell them you have been taking the geology project in 4-H and are interested in finding out more about geology as a career. Explain what you would like to do and ask if they are available for that. If so, arrange a convenient time and as where you should meet. If not, ask if they could refer you to someone else. Your leader can also help you with this phase.

At the Career Site:

Think about the career opportunity ahead of time. What do you most want to find out? Use the activity sheet *Geology Career Interview* to record a conversation with someone in a geology related job. If you never quite get around to doing what it is that you really want to learn about, it would be all right to politely ask for that. For example, "Sometime, I'd really like to see how you drill the holes that give you that information." Geologists are not mind readers, and clear communication is essential.

Normal common sense and courtesy will pay off for you. Be polite and considerate. Arrive on time and dress neatly and appropriately. You may not need to be as dressy as the office personnel, but neither should you wear casual shorts to most offices, or to heavy construction sites. It is not polite to ask directly what someone earns, but you might ask what a geologist starting out in this profession might make.

At the end of the interview, or whatever project you are doing, thank the geologist, and, if you wish to do more, ask if you may do that. Write a thank you note promptly, mentioning specifically at least one thing you really enjoyed or found interesting.

If you are doing an internship, keep a daily, or weekly log or journal documenting the time you spend there, what you did, and what you learned.

Evaluating the Career

You can use the worksheets to help you decide if geology is the right career for you. Rate each area of each career as it fits you on the activity sheet *Geology Careers Chart*. By adding up the scores in the small shaded boxes for each career on the *Geology Careers Chart* you can get a number to help you decide. You could also make up your own similar matrix with what you think is important.

Think about what you have learned. Was there anything that surprised you? Especially think about how the job fits you. Do the job requirements match with your abilities? Would you enjoy that kind of work? Are you prepared to get the required job preparation? A college degree is required to become a professional geologist. How are your grades in school? If you don't feel you have enough money for college; scholarships, grants, and loans are available. Statistics show that college graduates earn about twice as much as high school grads- usually over a million dollars during their working years- so a little effort now can pay off big later. If you don't feel that you can swing a college degree, don't despair. You could become a technician. They have less training than a geologist and do some of the less complicated geology tasks. There are other related careers that involve geology, like working on an oil drilling rig. Geology careers are many and varied. If this one wasn't quite right, consider all of the possibilities.

Choosing a career can be exciting, but difficult. You can usually go to two years of college before you really have to make a final decision on a career. Talk to your parents, leaders, and guidance counselor at school. Geology has many good possibilities for interesting and exciting careers.

Dialogue for Critical Thinking:

Share

1. Which job experiences have you already done?
2. What did you like most about your career experience? Why?

Process

3. What makes geology jobs important?
4. What process helped you learn most about a possible job?

Generalize

5. What makes geology especially appealing to you?
6. What did you learn about making important decisions that you could use when making other decisions?
7. How do you compare advantages and disadvantages when studying jobs?

Apply

8. Do you think there is only one job that is right for you, or could there be several?
9. Do you think it is worth going to four years of college to increase your chances of earning twice as much?
10. How would your job choice affect the other areas of your life?

Going Further

1. Go to professional meetings. They often have good speakers on a variety of topics and you would get to meet other geologists. Some groups are specialists such as engineering or petroleum geology, and some are more general. See addresses in reference section or ask your geologist.
2. Find out what people look for when hiring a geologist. Your work in 4-H should be a plus, especially if you have done an internship.
3. Contact the Earth Science Field Corps on being a long term Volunteer. They are currently working on mapping activities, revising geologic maps in your area. Scholarships and college credit are available after many hours of service. See address below.
4. Some states license geologists. What are the advantages and disadvantages? Check the requirements for Kansas.

References:

- “Finding Work as a Petroleum Geologist: Hits for the Job Seeker”
American Association of Petroleum Geologists; Box 979, Tulsa, OK
74101
- “Careers in Geology” and “Careers in Geoscience Information;” American
Geological Institute; 4220 King Street, Alexandria, Virginia 23302
- “Career Choices in the Natural Gas Industry,” American Gas Association,
1515 Wilson Boulevard, Arlington, Virginia 23302
- “Engineering Geology,” “Marine Geology,” “U.S. Geological Survey:
Earth Science in the Public Service,” Publications of the U.S.
Geological Survey; Western Distribution Branch. U.S. Geological
Survey, Box 25286, Federal Center, Denver, CO 80225
- “Careers in Oceanography,” “Careers in Geophysics,” American
Geophysical Union, 200 Florida Avenue, N.W., Washington D.C.
20009
- “Careers in Exploration Geophysics,” Society of Exploration
Geophysicists, Box 3098, Tulsa, OK 74101
- “Earth Science Field Corps” (contains application form), Earth Science
Corps, MS 513, U.S. Geological Survey, Reston, Virginia 22092,
Phone:800-254-8040, Fax: (703) 648-6265, Internet:escorps@usgs.
gov.

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Geology as a Career

Activity Sheet 65,
Geology Career
Interview Form

General — Geology, Level IV

Here are some ideas of things to find out when you interview someone about a geology job, or participate in a job shadowing or internship program. There is room to write your own questions at the bottom.

Date _____ Name of person I talked to _____

Occupation _____

1. What are the primary tasks of this job?
2. Does this job require you to work most with ideas, data, people or things?
3. What do you like most about your job?
4. What do you not like about this job?
5. Compare the amount of paper-work to time spent out in the field.
6. What kind of training and education is required for this job?
7. What is the approximate beginning salary for this job? Do pay increases come regularly?
8. What are the physical requirements and the personality traits needed for this job?
9. Is there much stability in this job? Do needs for it vary seasonally or from year to year?
10. What are your questions?



Geology as a Career

Activity Sheet 66,
Geology
Careers Chart

General — Geology, Level IV

Fill in the spaces below for as many careers as you would like to investigate. You may rate each on a scale of 1 (lowest) to 5 (best) and put that number in the small box. When you are done, add up the score for each occupation. You may add in twice any trait that you feel is especially important.

Areas	Career No. 1	Career No. 2	Career No. 3
Primary Tasks List what this job basically does	<input type="text"/>	<input type="text"/>	<input type="text"/>
Salary What is the salary range for this occupation? Are there extra benefits?	<input type="text"/>	<input type="text"/>	<input type="text"/>
Preparation What education and training are required? Licensing?	<input type="text"/>	<input type="text"/>	<input type="text"/>
Working Conditions Indoor/Outdoor Physical demands and activities Environment Travel	<input type="text"/>	<input type="text"/>	<input type="text"/>
Job Outlook Stable or fluctuating? Future?	<input type="text"/>	<input type="text"/>	<input type="text"/>
Work with: People? Things? Data? Ideas?	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other List additional things you think are important	<input type="text"/>	<input type="text"/>	<input type="text"/>

