AMERICAN FEDERATION OF MINERALOGICAL SOCIETIES

Future Rockhounds of America Merit Badge Program

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American Federation of Mineralogical Societies
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MISSION STATEMENT

Future Rockhounds of America is a nationwide nonprofit program within the American Federation of Mineralogical Societies that develops and delivers quality youth activities in the earth sciences and lapidary arts in a fun, family environment. Our underlying goals are to foster science literacy and arts education through structured activities that are engaging and challenging and by which kids—and the adults who mentor them—learn while having fun.

Overview

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I propose the American Federation of Mineralogical Societies sponsor a youth program through the Future Rockhounds of America that rewards kids on an on-going basis as a means of encouraging and cultivating their interest in the earth sciences and lapidary arts. Through this, we'll uphold our chartered goals as nonprofit, educational organizations by actively seeking to foster and develop science literacy and arts education among our youngest member.

My guiding philosophy has two underpinnings. First, we learn by doing. Book knowledge is great, but reading 1,001 books won't create a cab. You've got to roll up your sleeves, slice a rock, and watch your thumbnails disappear as you shape and grind that first special gem! Second, we are motivated by goals that are attainable and that offer tangible rewards and recognition, especially if we're given a clear roadmap and consistent support and guidance toward reaching those goals. With kids, this means encouraging supportive adult-youth relationships through adult mentors who pledge a relatively long-term commitment. The best program would be one in which children, youth, and adults work, learn, and grow together. The importance of fostering—and *maintaining*—supportive relationships cannot be stressed enough. A basic expectation of clubs enrolling kids in FRA should be genuine, active, and sustained commitment on the part of the individual youth leaders and the entire club in order to foster strong relationships between adults and young people and young people and their peers.

It's with these thoughts in mind that I'd like to establish an AFMS/FRA series of guided activities modeled after the Boy and Girl Scouts merit badge systems. In the following pages, I describe clusters of activities children and youth could do either on their own or at club meetings or workshops and the badges they can earn as a result. For instance, one is a Rocks & Mineral cluster that involves building one's own mineral ID kit with readily available tools and then demonstrating how to use it to identify several common minerals. Another cluster revolves around Lapidary Arts and requires planning and crafting a project such as a cab, wire-wrapped necklace, soapstone sculpture, etc., while also learning the basics of shop tools and safety.

In this packet, I lay the groundwork for nine badges covering the full spectrum of our hobby, including:

- Rocks & Minerals
- Earth Resources
- Fossils
- Lapidary Arts
- Collecting
- Showmanship
- Communication
- Field Trips
- Leadership

Local youth leaders are encouraged to adjust the level of each activity to match the age range of the kids involved. Take, for instance, the mineral identification project. Very young children might be taught only the basics of color and hardness, and the youth leader could guide them through a hands-on session with just a few very common minerals that are easily identified, such as quartz, sulfur, malachite, galena, mica, and hematite. Older kids might be given more of a challenge, with a wider range of minerals to identify on their own or in teams after a basic overview.

You'll also find some activities overlap and can be used to help earn more than one merit badge at the same time. For instance, among the activities for the Rocks & Minerals and Fossils badges, kids are encouraged to collect rocks, minerals, and fossils, thus simultaneously fulfilling the requirements of Activity 5.1 for the Collecting badge. These aren't intended to be isolated, individual activities but part of an integrated whole that ultimately will help kids earn a "Rockhound" badge as a mark of significant achievement after earning a minimum of six of the nine merit badges.

Youth should become a central part of our efforts in order to best ensure that we are providing activities that our kids find engaging and worth their time. Thus, I welcome feedback and suggestions from both local youth leaders and kids themselves. How can the existing activities be improved? What new activities can we add? I envision this as an evolving program that grows, adapts, and improves with time and use. It's also with youth voice and commitment in mind that I developed the Leadership badge with activities that encourage our more enthusiastic and ambitious junior members to take charge of selecting and organizing activities for their peers.

Kids should have choices about which activities they participate in, and they should have a chance to help shape those activities. It's through youth voice and participation that we engender empowerment and a social commitment and sense of belonging. It's often said that our clubs and societies are declining and, therefore, that we need to attract more young people in order to keep our clubs alive. But saying it in this way puts the cart before the horse. Instead, the focus needs to be on what is best for our youth. Only then will we fire the interest of kids in ways that engender a sense of belonging, with meaningful opportunities from which a lifelong interest and commitment will emerge naturally. Let's not put our clubs first—let's put kids first! If we can find ways to make youth responsible and fully engaged participants, not just recipients, the long-term health of our clubs will follow as a natural result.

In summary, I hope this program will accomplish two things at the same time:

1) give junior leaders at local clubs a variety of proven, organized activities that offer their kids challenging educational and artistic opportunities on an on-going basis, and

2) provide motivation for pebble pups and junior members to work toward earning tangible rewards and recognition and learning satisfying skills and knowledge while—as always—having fun!

Introduction

1. How it Works

Welcome to the AFMS Future Rockhounds of America! We wish to help you as the youth leader of your local club by providing the series of guided activities that follow.

We offer a total of 9 merit badges. To earn a badge, kids must complete at least 3 of the designated activities for that badge. Talk with the kids in your club and involve them in deciding which activities to do. (In addition, we encourage you to adapt the level of each activity to best match the age groups of the kids in your club.) Sheets are provided where kids can check off the activities as they complete them. Once 3 or more are checked, both the kids and their youth leaders should sign and date the checklist and the youth leader should send it to the AFMS Juniors Activities Chair to receive the merit badge to award to youth members during club meetings.

There is also a master checklist following this introduction that kids can use to keep track of their overall progress. Once they've earned 6 merit badges, they may receive a Rockhound badge, signifying a graduation from "pebble pup" to official "rockhound." We suggest awarding these in a special ceremony at your club, perhaps at the end of the year when you hold your installation of new officers and/or at mid-year, perhaps during a club picnic.

2. The Structure of This Manual

In the pages that follow the master checklist, for each badge you'll find:

a) a brief introduction/overview followed by a list of activities and their basic requirements (we encourage you to copy and distribute this to your kids);

b) an activity checklist for signature by kids and leaders to send to the AFMS Juniors Activities Chair to receive badges (again, you ought to copy and distribute this to your kids);

c) back-up resources for youth leaders (some is background information for your own information; some is to share with your kids to help them with their projects).

Achievement Checklist

To keep track of your achievements as you complete them, put a checkmark in the boxes next to each activity. To earn a badge, you should complete at least 3 activities for each category and then have your leader send a signed notice to the AFMS Juniors Activities Chair. To earn the Rockhound badge, you need to earn at least 6 of the 9 badges.

1. Rocks & Minerals **Date badge earned:_____**

□ 1.1 Learning the characteristics of minerals.
□ 1.2 Making and using a mineral ID kit.
□ 1.3 Building a mineral collection.
□ 1.4 The three rock types.
□ 1.5 Crystal shapes.
□ 1.6 Growing crystals.
□ 1.7 State rocks, minerals, and gemstones.

2. Earth Resources **Date badge earned:_____**

□ 2.1 Everyday uses of rocks and minerals.
□ 2.2 Minerals in the home.
□ 2.3 Collecting everyday objects and the minerals that went into them.
□ 2.4 Field trip to a mine or quarry.
□ 2.5 Field trip to a hardware store.
□ 2.6 Careers in the earth sciences.

3. Fossils **Date badge earned:_____**

□ 3.1 The geological time chart.
□ 3.2 Types of fossilization and making a fossil.
□ 3.3 The forms of life.
□ 3.4 Collecting fossils.
□ 3.5 A fossil-collecting field trip.
□ 3.6 Your state fossil.

4. Lapidary Arts **Date badge earned:_____**

□ 4.1 Learning about lapidary rocks.
□ 4.2 Choosing a lapidary project.
□ 4.3 *Workshop safety and maintenance* (required to earn this badge).
□ 4.4 *Completing a lapidary project* (required to earn this badge).
□ 4.5 Sharing your lapidary project.

5. Collecting **Date badge earned:_____**

□ 5.1 Building a collection.
□ 5.2 Cataloging and labeling your collection.
□ 5.3 Storing a collection.
□ 5.4 Displaying your collection.
□ 5.5 Reporting about your collection.

6. Showmanship **Date badge earned:_____**

□ 6.1 Techniques for effective displays.
□ 6.2 Holding a workshop on display ideas.
□ 6.3 Observing and evaluating displays.
□ 6.4 *Making your own public display* (required to earn this badge).
□ 6.5 Entering competition.

7. Communication **Date badge earned:_____**

□ 7.1 Oral report.
□ 7.2 Written report or newsletter article.
□ 7.3 Bulletin board display.
□ 7.4 Corresponding with experts.
□ 7.5 Holding a symposium.
□ 7.6 Writing a field trip guide.

8. Field Trips **Date badge earned:_____**

□ 8.1 * Field trip etiquette and AFMS Code of Ethics* (required to earn this badge).
□ 8.2 Field trip planning.
□ 8.3 *Taking a field trip* (required to earn this badge).
□ 8.4 Record keeping.
□ 8.5 The indoor field trip.

9. Leadership **Date badge earned:_____**

□ 9.1 Becoming a youth officer.
□ 9.2 Organizing a group display.
□ 9.3 Leading a show-and-tell session or presentation.
□ 9.4 Planning and leading a field trip.
□ 9.5 Overseeing a newsletter column or an entire youth newsletter.
□ 9.6 Managing a youth activity booth at a local gem show.
□ 9.7 Mentoring.

To earn your Rockhound badge, you need to earn 6 or more of the 9 badges. Check off the activities you've completed. When you have earned 6 or more badges, sign below and have your FRA leader sign and forward this sheet to the AFMS Juniors Activities chair to receive your Rockhound badge.

_____
Date completed

_____ _____
My signature Youth leader's signature

_____
Name of my club

Youth Leader's preferred mailing address for receiving the badge:

_____
_____
_____

Future Rockhounds of America Membership Badge

All kids belonging to clubs affiliated with Future Rockhounds of America automatically receive the FRA membership badge. The youth leader of the local FRA-affiliated club should contact the Juniors Activities Chair of the AFMS to receive these badges. Because our budget is modest and we hope to maintain this program cost-free to local clubs and individual kids, our annual supplies are limited. Thus, we ask that local youth leaders be judicious and only request necessary minimum quantities on an as-needed basis.

1. Rocks and Minerals

To earn this badge, you should demonstrate how to identify common minerals and learn the basic rock types. Other activities involve learning about crystals and your state rock or mineral. This unit also helps you start building your own rock and mineral collection.

Activity 1.1: Learning the characteristics of minerals.
Buy a book or pick one up at the library to learn about different minerals and their characteristics. Make a chart of common minerals and their characteristics in terms of things such as color, streak, cleavage, fracture, luster, hardness, crystal shape, and weight, or specific gravity. In your chart, list various common minerals down the first column, and then have separate columns to note characteristics of each mineral.

Activity 1.2: Making and using a mineral ID kit.
Make a mineral ID kit that will allow you to demonstrate familiarity with characteristics of minerals (color, streak, hardness, relative weight, reaction to a weak acid solution such as vinegar, etc.). Using your mineral ID kit, along with a chart of mineral characteristics, successfully identify at least a half dozen minerals presented by your youth leader.

Activity 1.3: Building a mineral collection.
Build a collection of 10 to 20 minerals. Some collectors focus on a single mineral, with specimens from around the world to show different forms. A quartz collection might include amethyst from Brazil, clear crystals from Arkansas, and smoky quartz from Pikes Peak. Other collectors concentrate on a local area and collect all the minerals that might be found in one quarry, city, county, or state. Still others opt for variety and collect a little bit of everything. Whichever form you choose for your collection, be sure to follow the basics of good curation: label each specimen and keep a catalog with key information about what it is and where it came from. (See Badge 5: Collecting.)

Activity 1.4: The three rock types.
Describe the three basic rock types (igneous, sedimentary, and metamorphic) and build a collection with samples of each type.

Activity 1.5: Crystal shapes.
Draw crystal shapes and/or make crystal models with blocks of styrofoam or with styrofoam balls and dowels, with cardboard, etc. Some common crystal shapes are cubic, hexagonal, orthorhombic, monoclinic, triclinic, tetragonal, and trigonal.

Activity 1.6: Growing crystals.
Using a material like sugar, table salt, or Epsom salts, grow different forms of crystals.

Activity 1.7: State rocks, minerals, and gemstones.
Just as each state has its own flag, many have a State Mineral or State Rock. Find out what your state rock, mineral, or gemstone is and write a report about it for your club newsletter or talk about it at one of your club meeting. If your state doesn't have an official mineral or rock, write to your governor and state legislature to nominate one!

1. Rocks & Minerals

□ 1.1 Learning the characteristics of minerals

□ 1.2 Making and using a mineral ID kit

□ 1.3 Building a mineral collection

□ 1.4 The three rock types

□ 1.5 Crystal shapes

□ 1.6 Growing crystals

□ 1.7 State rocks, minerals, and gemstones

To earn your Rocks & Minerals badge, you need to complete at least 3 of the 8 activities. Check off all the activities you've completed. When you have earned your badge, sign below and have your FRA leader sign and forward this sheet to the AFMS Juniors Activities chair.

_____
Date completed

_____ _____
My signature Youth leader's signature

_____
Name of my club

Leader's preferred mailing address for receiving badge:

_____

_____

_____

Back-up page 1.1: Learning the characteristics of minerals.

Kids should learn to identify several common minerals using various simple tests of physical properties such as color, streak, luster, crystal shape, cleavage, fracture, hardness, chemical reactivity, and weight, or specific gravity. To help them, you should direct them to a rock and mineral guidebook. Many good ones are available to purchase or to borrow through the library. Some include Pellant's *The Complete Book of Rocks and Minerals*, Zim and Shaffer's *Rocks and Minerals: A Golden Guide*, Fuller's *Pockets Rocks & Minerals*, Simon & Schuster's *Guide to Rocks and Minerals*, Pough's *Rocks and Minerals: Peterson Field Guide*, Chesterman's *National Audubon Society Field Guide to North American Rocks and Minerals*, or Roots, Willis, and Brett-Surman's *The Nature Companion's Rocks, Fossil and Dinosaurs*.

Here are some basics of mineral identification:

- *Color* can be the most striking aspect of a mineral, and some can be identified by color. For instance, malachite is always green, azurite is blue, realgar is red. But color alone is usually not enough. For example, quartz occurs in many colors, caused by minute impurities, and may be clear, cloudy (milky quartz), yellow-orange (citrine), purple (amethyst), pink (rose quartz), a sparkly green (aventurine), etc.
- *Streak* is the color left when a mineral is scratched on an unglazed tile plate. This can surprise you in that it is sometimes very different from the mineral's outward color. For instance, gray hematite leaves a red streak.
- *Luster* is a reflective property of mineral surfaces. The way a mineral reflects light may make it look hard and shiny or dull or waxy. A mineral may be metallic (pyrite), vitreous or glassy (quartz), silky (gypsum), waxy (jade), resinous, pearly, earthy, etc.
- *Crystal shape* is the characteristic appearance of a crystal, usually determined by the underlying atomic structure. Crystal shape may be cubic (pyrite or galena), octahedral (fluorite), rhombohedral (calcite), hexagonal (quartz), etc. For more on crystal shapes, see Back-up page 1.5: Crystal Shapes.
- *Cleavage* is the tendency of some minerals to split or break along characteristic planes corresponding to directions of minimum cohesion. For instance, mica cleaves in thin sheets, a form known as basal cleavage. Other common forms of cleavage include rhombohedral (calcite), cubic (galena), and octahedral (fluorite).
- *Fracture* is the manner in which a rock or mineral breaks if it doesn't exhibit cleavage. For instance, a break may be conchoidal (curved like a clam shell, as in breaks on obsidian), uneven (with a rough surface – e.g., lepidolite), or fibrous (splintery – e.g., ulexite).
- *Hardness* is the resistance of a mineral to scratching. The Mohs' scale is a relative measure of this property, comparing the hardness of ten different minerals from softest to hardest: 1 – talc, 2 – gypsum, 3 – calcite, 4 – fluorite, 5 – apatite, 6 – feldspar, 7 – quartz, 8 – topaz, 9 – corundum, 10 – diamond. To arrive at approximate hardness, you can use some common tools: a fingernail is hardness 2.5, a penny is 3, a pocketknife blade or steel nail is 5, glass is 5.5, a steel file is 6.5.

- *Chemical reactivity*. Some minerals will chemically react. For instance, a good test for carbonates (calcite, limestone, dolomite, etc.) is a drop of acetic acid, or vinegar. If it fizzes, it contains calcium.
- *Weight, or Specific Gravity*. To determine the weight, or specific gravity, of a mineral requires special equipment. For most purposes, you just need to judge the relative weight of a mineral, whether heavy, light, or in-between.

See the accompanying chart that provides you with a "cheat-sheet" of a wide variety of minerals and their various characteristics. In addition, we've provided a blank chart you can copy and give to kids to fill in with different minerals they wish to test.

Back-up page 1.2: Making and using a mineral ID kit

Following is the Moh's Scale and examples of some common tools kids can use to help judge the relative hardness of different minerals by creating their own mineral ID kit:

Moh's Hardness	**Mineral**	**Common Tools**
1	Talc	
2	Gypsum	Fingernail (hardness 2.5)
3	Calcite	Copper Penny (3 to 3.5)
4	Fluorite	
5	Apatite	Knife Blade/Steel Nail
6	Feldspar	Glass (5.5); Steel File (6.5)
7	Quartz	
8	Topaz	
9	Corundum	
10	Diamond	

In addition to the tools noted in the above table, a mineral ID kit might include an unglazed tile for checking the streak of a mineral and a small bottle of acetic acid (vinegar) to test whether a mineral contains calcium carbonate.

See the chart accompanying Back-up page 1.1 for info about various characteristics for a number of common minerals. A similar blank chart is provided for you to copy and give to kids to use to complete a mineral identification exercise, or you can encourage them to create their own chart listing just the characteristics they wish to test.

A good selection of minerals to present to juniors to demonstrate ability to identify minerals might include obsidian, sulfur, pyrite, fluorite, quartz, hematite, galena, mica, and calcite. There are a number of ways of testing a kid's ability to identify minerals. The most basic is to provide kids individually with an assortment of minerals and to ask them to apply various tests. You might also create a bag of sand and gravel. "Salt" it with some of the minerals noted above and ask kids to screen out various minerals to identify. To make it challenging, include two specimens that look similar (for instance, a clear piece of quartz and a clear piece of topaz).

An even more fun activity is the "Mineral Identification Game." At a club meeting, have an assortment of a dozen to two dozen minerals spread out on a table, each with a number. Give kids sheets of papers with numbers down the side and ask them to go around the table identifying and writing down the names of each mineral matched to the appropriate number. Give them perhaps 15 minutes to do this before discussing the answers. This could be done individually, or kids could be divided into teams and this could be made into a contest to see which team gets the most correct answers.

In another version of the Mineral Identification Game, different minerals might be put on a table along with mineral identification books. The first kid to identify a particular specimen, or "mystery mineral," correctly gets to keep it. This is a definite motivator!

Back-up page 1.3: Building a mineral collection.

Back-up pages for Badge 5 on Collecting provide information on building a collection. You should refer to those back-up pages for reference in assisting kids in satisfying Activity 1.3. For instance, there you'll find information about how to organize a catalog or logbook for an entire collection, how to create labels for individual specimens within a collection, and how to store a collection.

Kids can use this activity to also satisfy requirements for the Collecting badge simultaneously.

Back-up page 1.4: The three rock types.

In this activity, kids would be expected to

a) explain the differences among the three basic rock types of igneous, sedimentary, and metamorphic and how these different rock types typically form;
b) identify specific examples of each rock type; and
c) build a small collection of representative samples.

The three basic rock types are:

- *Igneous.* Igneous rocks are formed by crystalization of magmas, either deep beneath the surface of the earth (granites) or extruded (lavas, obsidian, ash). Examples: granite, basalt, rhyolite, obsidian, pumice, scoria, diorite, gabbro, andesite, tuff.

- *Sedimentary.* Sedimentary rocks are formed by sediments (gravel, sand, mud, etc.) created by the eroding action of wind, water, or ice breaking down older rocks or by minerals precipitating out of water. Examples: mudstone, shale, sandstone, conglomerate, limestone, dolomite, coquina, gypsum, diatomaceous earth, coal.

- *Metamorphic.* Metamorphic rocks have been changed by heat and/or pressure and other earth forces. Examples: slate (formed from shale), schist (formed from shale, more intensely altered than slate), quartzite (formed from sandstone), marble (formed from limestone), serpentine, hornfels, gneiss.

For this activity, you might provide kids with the following fill-in-the-blank page to use.

Activity 1.4: The three rock types.

Igneous rocks are defined as_____

My collection includes the following igneous rocks:_____

Sedimentary rocks are defined as_____

My collection includes the following sedimentary rocks:_____

Metamorphic rocks are defined as_____

My collection includes the following metamorphic rocks:_____

Back-up page 1.5: Crystal shapes.

Crystals come in wonderful and amazing shapes that are based upon their underlying chemical structure. Some common forms are cubic, tretragonal, monoclinic, triclinic, hexagonal, trigonal, and orthorhombic. The shape of a crystal is an important trait that can help you identify a mineral, so you should familiarize kids with these basic crystal forms. Here are brief descriptions of each:

- Cubic: very symmetric and orderly, shaped like a square cube, with 6 faces, or sides (note, however, that some are shaped like octahedrons—or diamond-shaped—with 8 faces, and still others are shaped like dodecahedrons, with 10 faces)
- Tetragonal: shaped like cubic crystals that have been stretched out along one axis.
- Monoclinic: these are shaped like tetragonal crystals that have been skewed or tilted in one angle.
- Triclinic: triclinic crystals are similar to monoclinic ones but aren't usually symmetrical from one side to the other; they can look like monoclinic crystals that someone stepped on and squished!
- Hexagonal: these crystals look like six-sided prisms; viewed from the top, they look like hexagons.
- Trigonal: similar to hexagonal, but possessing a 3-fold axis of rotation instead of the 6-fold axis of hexagonal crystals.
- Orthorhombic: these crystals look like two elongated pyramids stuck together, but they're skewed at a bit of an angle.

Because it can be difficult to visualize these systems using words alone, you should get a book illustrating these different crystal forms and bring in pictures and samples of minerals that illustrate each (for instance, a cubic pyrite or fluorite crystal; a hexagonal quartz crystal).

A couple of activities provide kids with hands-on fun in learning about these shapes. In one, build crystal shapes using tinker toys or dowels and Styrofoam balls or gum drops and toothpicks. (Kids especially like the last option because they get to eat the results!)

Another way to illustrate crystal shapes in hands-on fashion is through making models by folding colorful construction paper, cardstock, or thin cardboard and pasting or taping them together. Cut-out patterns for making such models may be found on the following web site:

http://www.geocities.com/CapeCanaveral/Hall/1410/mobile.html

Back-up page 1.6: Growing crystals.

Some minerals grow into crystals in water solutions. This process can be observed using readily available materials, such as sugar, salt, alum, and Epsom salts dissolved into a "saturated solution" in boiling hot water. A saturated solution contains the maximum amount of salt that will dissolve in a given amount of hot water.

Materials.

- Crystal-building material: table salt, Epsom salts, or alum. (Other materials you might use include borax, photographic fixer, sugar, or saltpeter.)
- Water
- Measuring cups
- Spoon
- Cooking pan
- Glass jars
- Pebbles
- Stick or pencil
- String (cotton twine), cut into small lengths
- (optional) food coloring

Procedure.

1. Heat water to a boil, then turn off the heat.
2. If using table salt, mix one-half cup of salt into three-quarters cup of hot water. If using Epsom salts, mix one-half cup Epsom salts into one cup of water. If using alum, mix one-quarter cup alum into one cup of water.
3. Stir your solution. If all of your mineral dissolves, the solution is not yet saturated, and you should add a bit more mineral until no more will dissolve. (Note: you can make colorful crystals by adding a couple drops of food coloring.)
4. Place a few pebbles in the bottom of a glass jar and pour your solution over the pebbles. Or, tie a piece of string to a stick or pencil, pour your solution into a glass jar, and dip the string into the solution, and leave it hanging there from the pencil.
5. Set your jar aside in a spot where it won't be disturbed and don't bump or bounce it. Check every so often the next few days. As water evaporates, you'll see crystals forming on your pebbles or string.

Assign different salts to different kids, and at your next monthly meeting, have everyone bring their jars to compare the different forms of crystals each produced.

In addition to such home-made crystals, you can grow crystals using commercially available crystal-growing kids. Check with places like Ward's Natural Science (order their Earth Science and Geology catalogs; phone 1-800-962-2660 or check their web site at www.wardsci.com). Another source is Edmund's Scientific (phone 1-800-728-6999; web site www.scientificsonline.com). Or check in toy stores or stores such as the Nature Company.

Back-up page 1.7: State rocks, minerals, and gemstones.

The following table lists the officially designated rock, mineral, and/or gemstone for each state in the U.S. Have your kids to learn why their particular rock, mineral, or gemstone was selected. Some were selected because the rock or mineral was especially important to the economy of the state. For instance, limestone is the state rock of Indiana because of the contribution of limestone quarries to the state's economy. Indiana limestone helped to rebuild Chicago after its big fire in the nineteenth century and has been used in such historic buildings as the Washington Monument and the Empire State Building. Other state emblems were selected because they are unique to that particular state. For instance, benitoite was chosen as the state gemstone of California because it's only found in California. Kids can check with the state geological survey to learn the details behind their state rock, mineral, and/or gemstone, or they might try to unearth the original legislation that designated the official rock.

If you don't see a rock, mineral, or gemstone for your state, encourage your pebble pups and junior members to organize a letter-writing campaign to your state governor and legislature to nominate one! In organizing such a campaign, they should tell why the rock, mineral, or gemstone has special significance for the state. They might also write to rock clubs across the state to encourage others to join in their effort.

State	Rock	Mineral	Gemstone
Alabama	Marble	Hematite	Star Blue Quartz
Alaska		Gold	Jade
Arizona	Petrified Wood	Fire Agate	Turquoise
Arkansas	Bauxite	Quartz	Diamond
California	Serpentine	Gold	Benitoite
Colorado	Yule Marble	Rhodochrosite	Aquamarine
Connecticut		Garnet	
Delaware		Sillimanite	
Florida	Agatized Coral		Moonstone
Georgia		Staurolite	Quartz
Hawaii			Black Coral
Idaho			Star Garnet
Illinois		Fluorite	
Indiana	Limestone		
Iowa	Geode		
Kansas			
Kentucky	Kentucky Agate	Coal	Freshwater Pearl
Louisiana	Petrified Palm	Agate	
Maine		Tourmaline	
Maryland			
Massachusetts	Roxbury Pudding Stone (Jasper)	Babingtonite	Rhodonite
Michigan	Petoskey Stone		Chlorastrolite
Minnesota			Lake Superior

			Agate
Mississippi	Petrified Wood		
Missouri	Mozarkite (Chert)	Galena	
Montana			Yogo Sapphire & Montana Agate
Nebraska	Prairie Agate		Blue Chalcedony
Nevada	Sandstone	Silver	Black Fire Opal & Turquoise
New Hampshire	Conway Granite	Beryl	Smoky Quartz
New Jersey	Stockton Sandstone		
New Mexico			Turquoise
New York		Hematite	Garnet
North Carolina	Granite/Unakite		Emerald
North Dakota			
Ohio			Flint
Oklahoma	Barite Rose		
Oregon	Thunder Egg		Sunstone
Pennsylvania			
Rhode Island	Cumberlandite	Bowenite	
South Carolina	Blue Granite		Amethyst
South Dakota		Rose Quartz	Fairburn Agate
Tennessee		Agate	River Pearl
Texas	Petrified Palmwood		Blue Topaz
Utah	Coal	Copper	Topaz
Vermont	Marble, Slate, Granite, Talc	Talc	Grossular Garnet
Virginia			
Washington			Petrified Wood
West Virginia			Chalcedony Coral
Wisconsin	Wausau Red Granite	Galena	Ruby
Wyoming			Nephrite Jade

2. Earth Resources

This set of activities introduces the practical side of minerals, or how rocks and minerals are used in everyday life. We are surrounded by evidence of our mining heritage, from gypsum in our walls to brass knobs on doors and clay in our flowerpots and on the pages of glossy magazines. The following activities will help you appreciate the role mining and minerals play in day-to-day life.

Activity 2.1: Everyday uses of rocks and minerals.
In a group, circle around a flipchart or a chalkboard or white board. Look around the room and draw up a list of everyday things and the minerals you think went into them. (If using an old-fashioned black chalkboard, you can start with the chalk itself and the slate of the chalkboard.)

Activity 2.2: Minerals in the home.
Write a report about minerals in your home, or in a particular room in your home: your bedroom, bathroom, kitchen, living room, etc.

Activity 2.3: Collecting everyday objects and the minerals that went into them.
Build a collection of everyday objects and specimens of the minerals that went into them. You can get specimens by collecting them in the field, trading with other members in your club, or purchasing them at nature stores, museum gift shops, rock shops, or gem shows. Here are some examples to get you started: a penny and a copper nugget; a nail and a piece of iron ore or hematite; a tube of fluorinated toothpaste and a fluorite crystal; laundry detergent and a borate mineral; a fishing weight and a galena (lead) crystal. Display your collection of everyday objects and their source minerals at a local gem show, the library, during show-and-tell at school, at one of your club meetings, or wherever else a public display might be possible.

Activity 2.4: Field trip to a mine or quarry.
Take a field trip to a mine or quarry. Afterwards, write a report for your Youth Leader or make a presentation at the next club meeting describing what was being mined, how it was being mined, and how it's ultimately used. If you were able to get a sample of what was being mined, bring it to your next meeting and show and tell everyone about it.

Activity 2.5: Field trip to a hardware store.
Take a "field trip" to a local hardware store or home building supply store. List some of the things you see there and their source minerals.

Activity 2.6: Careers in the earth sciences.
Learn about careers in the earth sciences (mining, teaching, gemology, the jewelry business, seismology, etc.). Write a brief paper imagining yourself in such a career and some adventure you might undertake in that job. For instance, an oil geologist might be taking a boat ride to an off-shore oil platform. A paleontologist with a museum or university might be prospecting for fossils in the Gobi Desert. A gemologist might be cutting the world's largest blue diamond. What would be an interesting job to you?

2. Earth Resources

□ 2.1 Everyday uses of rocks and minerals

□ 2.2 Minerals in the home

□ 2.3 Collecting everyday objects and the minerals that went into them

□ 2.4 Field trip to a mine or quarry

□ 2.5 Field trip to a hardware store

□ 2.6 Careers in the earth sciences

To earn your Earth Resources badge, you need to complete at least 3 of the 6 activities. Check off all the activities you've completed. When you have earned your badge, sign below and have your FRA leader sign and forward this sheet to the AFMS Juniors Activities chair.

_____
Date completed

_____ _____
My signature Youth leader's signature

_____
Name of my club

Leader's preferred mailing address for receiving badge:

_____

_____

_____

Back-up page 2.1, 2.2, 2.3: Everyday objects and minerals that went into them.

You could conduct Activity 2.1 as a single group activity or make a competition of it, dividing the kids into two or more teams and seeing who can make the longest list in 10 minutes. To conclude the activity, you might unveil a collection of mineral specimens, revealing the actual raw materials that went into some of the things in the room.

Sitting at my computer when I first considered Activity 2.1, I quickly saw a brass lamp, windows made of silica, all sorts of things made of plastic derived from petrochemicals, bricks in the fireplace derived from clay, an old tin cup holding my graphite pencils, a gold wedding ring on my finger, walls made of plasterboard comprised of gypsum, steel nails in the furniture, and paint on the walls containing diatomite as filler. To get kids primed to think about what things are made of, you might hold up a couple common items that serve as good teaching examples:

1) an old watch you can take apart (especially one with luminescent hands) has a glass/silica top, a metal body made of brass, aluminum, etc., interior parts that might include gemstones, radioactive minerals for luminescence, etc.
2) a salt shaker with an aluminum top and glass body, filled with salt (halite) crystals.
3) a light bulb with its glass exterior (made from a combination of silica, soda ash, lime, coal, and salt), brass or aluminum screw-in base, tungsten filament, copper and nickel lead-in wires, molybdenum tie and support wires, aluminum heat deflector, etc.

There are several good web sites you can consult that provide handy lists and tables linking minerals to everyday objects. Two particularly good ones are the Mineral Information Institute (www.mii.org) and Women in Mining (www.womeninmining.org). (The MII web site provides a nice graphic illustrating all the minerals going into a light bulb; the ones I've described above are just a few on their list.) Following are samples from those web sites:

Everyday Object	Mineral
Pennies; copper wiring; electronic parts; plumbing	Copper nugget
Nails; steal	Iron ore or hematite
Toothpaste; hydrofluoric acid	Fluorite
Laundry detergent	Borate minerals
Fishing weights; batteries; TV screen	Galena (lead)
Cans; autos; airplane; building components	Bauxite (aluminum)
Tiles; kitty litter; bricks; dinnerware and other ceramics; glossy paper; fiberglass	Koalin or clay
Fertilizer; animal feed supplements	Phosphate
Swimming pool and other filters; toothpaste; metal polishes; insulators	Diatomite
Rechargeable batteries	Cobalt or lithium
Food; highway de-icing; chemicals	Halite (salt)
Cement	Limestone

Pottery	Feldspar
Concrete; asphalt; road fill; blocks; bricks	Sand & gravel
Metals & alloys; paint; rubber; skin creams	Zinc
Used in making steel	Manganese
Talcum powder; ceramics; rubber; plastics	Talc
Sandpaper & other abrasives; jewelry	Garnet
Jewelry; dentistry; electronic components	Gold
Lubricant; brake linings; molds in foundaries; pencils	Graphite
Plaster-of-Paris; wallboards	Gypsum
Sparkplugs	Kyanite
Batteries; thermometers; barometers	Mercury
Electronic insulators; paint; plastics	Mica
Concrete blocks; abrasives	Pumice
Sulfuric acid; fertilizers; chemicals; gunpowder & other explosives; rubber	Sulfur
Glass; gemstones; spectographic lenses	Quartz (silica)

Back-up page 2.3: Collecting everyday objects and the minerals that went into them.

For pointers on building a collection, see back-up pages for Badge 5 on Collecting.

To help your kids in collecting common minerals, start by approaching your fellow club members to see if they might have supplies of minerals they've collected over the years that they would be willing to donate to the cause (quartz crystals, fluorite, galena, etc.). Also, many common minerals are inexpensive and readily available from show dealers, and sometimes show dealers will offer special bulk discounts if you approach them about your project.

In the retail arena, various nature stores sell common minerals (tumble-polished pieces of quartz, hematite, pyrite crystals, etc.). For instance, try stores such as The Nature Company. Toy stores and crafts stores are other spots to try, as well as stores selling teaching supplies and the gift shops of natural history museums.

If you have active mines in your area, they may be willing to donate samples. For instance, the vast borax mine in Boron, California, is happy to lead tours and provide free samples of various borate minerals.

Still other sources (although more expensive) are the various scientific supply houses, such as Ward's, Edmund Scientific's, etc.

Back-up page 2.4: Field trip to a mine or quarry.

There's nothing like showing kids first-hand nature's bounty and where it originates. Arranging tours at quarries and mines can be a fun adventure. Many mining companies are happy to provide educational tours if contacted well in advance so that appropriate arrangements can be made.

In my home state of California, opportunities abound with inactive and active gold mines, Wild West silver towns like Calico, the borax mine in Boron, diatomite mines near Lompoc, a limestone quarry near Davenport, tourmaline mines near San Diego, gypsum mines near Ocotillo, etc. Growing up in Illinois, I was often taken on organized field trips sponsored by the Illinois Geological Survey to operating limestone quarries, coal mines, and lead mines for fossil and mineral collecting. Later in Maryland, I often searched for petrified wood as well as minerals like garnets in sand and gravel quarries, and I found an abundance of active and inactive coal mines and limestone quarries when I lived in Pennsylvania.

How do you find out about local quarries and mines? One possibility is the Yellow Pages. For instance, in my local phone book, I found Best Rock Mining Company listed under "Mining Companies." Look under "Mining," "Rock," "Quarries," etc. Try the local Chamber of Commerce. Other good bets are state geological surveys, which maintain lists of mineral resources and active mining companies. You can locate your state survey via a Google search on the computer or by looking in the phone book "Blue Pages" under State Government listings, where it might be included under the Department of Conservation or Geological Survey. On the web site of the United States Geological Survey (http://www.usgs.gov/) a handy map of the U.S. allows you to click on your state for regional geologic information.

After a field trip to a mine or quarry, have kids prepare written reports or make individual or group presentations at the next club meeting describing what was being mined, how it was being mined, and how it's ultimately used. They can also bring and share samples collected at the mine (some mines allow this; others don't) and perhaps use the experience as the basis for an educational display case at your next show or to share at their school or a science fair.

Back-up page 2.6: Careers in the earth sciences.

A couple of great resources for helping kids learn about careers in the earth sciences are web sites for the Mineral Information Institute (MII) and Women in Mining (WIM): www.mii.org and www.womeninmining.org. For additional ideas, you and your kids can explore the web site of the United States Geological Survey: www.usgs.gov.

If you live near a college or university that has a geology department, you might also contact the department because they will often have information about careers in geology for advising their students.

Here are just a few ideas:

- college or university professor of geology or paleontology
- natural history museum curator
- oil geologist
- staff geologist for a mining company
- independent consultant assessing geological hazards for the construction industry
- seismologist
- gemologist
- independent fossil or rock and mineral dealer
- professional jewelry designer and craftsperson
- jewelry store owner

3. Fossils

Fossils represent a merger between the sciences of geology and biology. They are at the core of the science of paleontology, or the study of past life. To study fossils, you need to learn about different forms of life on earth, the history of that life, and the geological processes that preserve life's record. The following activities will assist you. As a start, you should get a book. A couple of good, basic guidebooks at reasonable prices are Rhodes, Zim, and Shaffer's *Fossils: A Guide to Prehistoric Life* and Palmer's *Fossils*.

Activity 3.1: The geological time chart.
Memorize the geological eras and periods and some key facts about each one. Then make a geological time line showing all the geological periods. Illustrate it with drawings of fossils and prehistoric plants and animals characteristic of each period.

Activity 3.2: Types of fossilization and making a fossil.
Explain the different types of fossilization (e.g., carbonization, mineralization, molds and casts, etc.). Make a "fossil" by making imprints of leaves, shells, or fossils models in clay and pouring in plaster to show how casts and molds are formed.

Activity 3.3: The forms of life.
Demonstrate knowledge of the major groups of invertebrates, vertebrates, and plants.

Activity 3.4: Collecting fossils.
Build a fossil collection of 10 to 20 specimens. Collections come in a variety of forms. Some collectors concentrate on a single sort of plant or animal (for instance, trilobites) and try to collect a wide range of species. Some concentrate on a single locality or local formation and build an array of all the plants and animals that locality has to offer (such collections sometimes prove particularly useful to scientists). Still others opt for diversity, trying to collect a little bit of everything (clams, brachiopods, corals, shark teeth, trilobites, etc.). Whichever form you choose, be sure to follow the basics of good curation, labeling each specimen and keeping a log book with key information (what it is, where it came from, age of the fossil, etc.). (See Activity 5: Building a Collection.)

Activity 3.5: A fossil-collecting field trip.
Learn and demonstrate knowledge of the AFMS Code of Ethics and the rules of field trip etiquette (as well as the laws of your state or region), then head out on a fossil-collecting trip. (See Activity 8: Field Trips.)

Activity 3.6: Your state fossil.
Just as each state has its own flag and official state seal, many states have an officially designated state fossil. Find out what your state fossil is and write a report about it for your club newsletter or talk about it at one of your club meetings. If your state doesn't have an official state fossil, discuss what would be a good fossil to nominate, and then write to your governor or local state legislature to suggest it!

3. Fossils

□ 3.1 The geological time chart

□ 3.2 Types of fossilization and making a fossil

□ 3.3 The forms of life

□ 3.4 Collecting fossils

□ 3.5 A fossil-collecting field trip

□ 3.6 Your state fossil

To earn your Fossils badge, you need to complete at least 3 of the 6 activities. Check off all the activities you've completed. When you have earned your badge, sign below and have your FRA leader sign and forward this sheet to the AFMS Juniors Activities chair.

_____
Date completed

_____ _____
My signature Youth leader's signature

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Name of my club

Leader's preferred mailing address for receiving badge:

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Back-up page for Fossils badge: Reference books.

Following are some books kids might buy or seek in the library for learning about fossils:

- Paolo Arduini and Giorgio Teruzzi, *Simon & Schuster's Guide to Fossils* (A Fireside Book, Simon & Schuster, Inc.)

- Sidney Horenstein, *Familiar Fossils*, the Audubon Society Pocket Guides (Alfred A. Knopf)

- Martin Ivanov, Stanislava Hrdlickova, and Ruzena Gregorova, *The Complete Encyclopedia of Fossils* (Rebo International)

- Richard Moody, *Fossils: How to Find and Identify Over 300 Genera*, Macmillan Field Guides Series (Collier Books, Macmillan Publishing Company)

- Douglas Palmer, *Fossils*, the Pockets Series (Doris Kindersley, Ltd.)

- Giovanni Pinna, *The Illustrated Encyclopedia of Fossils* (Facts on File)

- Frank H. T. Rhodes, Herbert S. Zim, & Paul R. Shaffer, *Fossils: A Guide to Prehistoric Life*, the Golden Guides Series (Golden Press)

- Ida Thompson, *The Audubon Society Field Guide to North American Fossils* (Knopf)

- Cyril Walker and David Ward, *Fossils*, the Eyewitness Handbook Series (Doris Kindersley, Ltd.)

You can find these and other guidebooks in the Science, Nature, and Field Guide sections of your local bookstore. You can sometimes get guidebooks like these at a discount if ordering in bulk and if your club has a nonprofit, educational tax ID number and you let the publisher or distributor know you're purchasing for educational purposes. With a resource like this at hand, you're ready to lead kids into any number of activities to learn about fossils and life of the past.

Back-up page 3.1: The geological time chart.

A geologic time chart, with examples of common fossils from each period, is provided below as a reference. In addition, a similar table with blank spaces is provided for kids to fill in the era, period, and epoch names.

Alternatively, you can encourage your kids to create their own timeline in whatever way they like. For instance, some kids prefer a horizontal timeline, illustrating it to show different creatures that supplanted one another through time.

If you get a long roll of large paper, this also makes a neat group activity. Roll the paper the entire length of a room and divide it up into the geological time scale. Then pass out pencils, colorful markers and crayons, and assign kids to different periods to illustrate with fossils and reconstructions of plant and animal life of those periods.

ERA	PERIOD/EPOCH	
Cenozoic "recent life" dinosaurs dead / mammals ahead mammals diversify first humans	Quaternary	Holocene 11,000 years
		Pleistocene 1.6 million years
	Tertiary	Pliocene 5.2 million years
		Miocene 23 million years
		Oligocene 35 million years
		Eocene 56 million years
		Paleocene 65 million years
Mesozoic "middle life" dinos rule / mammals drool first dinosaurs & first mammals appear toward end of Triassic Era ends in great mass extinction (end of dinosaurs) likely caused by asteroid impact	Cretaceous 145 million years before present	
	Jurassic 208 million years before present	
	Triassic 245 million years before present	
Paleozoic "ancient life" invertebrates reign supreme Cambrian "explosion" ushers in complex multicellular life First land plants as early as Ordovician First land vertebrates and rise of seed plants toward end of Devonian Era ends in largest mass extinction in earth history; cause still unknown	Permian 290 million years before present	
	Pennsylvanian 323 million years before present	
	Mississippian 362 million years before present	
	Devonian 408 million years before present	
	Silurian 439 million years before present	
	Ordovician 510 million years before present	
	Cambrian 544 million years before present	
Pre-Cambrian Divided into Proterozoic Eon (2.5 to .54 billion years ago), Archean Eon (3.8 to 2.5 billion years ago), and Hadean Eon (starting 4.6 billion years ago, when earth formed)	 4.6 billion years before present	

ERA	PERIOD/EPOCH	

Back-up page 3.2: Types of fossilization and making a fossil.

Forms of Fossilization.

Fossils are the preserved remains or evidence of past life (plant and animal). These include actual remains of the plant or animal (such as teeth), carbonized impressions, molds and casts of shells and other body parts, etc., as well as evidence of an organism's activity, such as chemical traces, burrows, footprints, or coprolites (known as trace fossils). Following are some common forms of fossilization.

- Molds and casts. Calcareous shells may dissolve, leaving a cavity in a rock that is later filled with sediment or minerals, forming a mold and cast of the original organism. Only the general shape and form of the original organism is left.
- Mineralization or petrification. Original shell, bone, or wood may be infiltrated or totally replaced by a mineral that seeps into pores via mineral-laden groundwater. When this happens, scientists can observe even tiny details of cell structure.
- Recrystalization. Shells may recrystalize, leaving original shell material but in a different mineral form. For instance, many shells are formed from calcium or aragonite, which changes to calcite during fossilization.
- Carbonization. Between layers of finely bedded shale, original organic material may be compressed and distilled away, leaving only a thin film of carbon on a bedding plan, as often happens with leaves and insects that fossilize.
- Original remains. Sometimes, animal or plant remains may undergo little to no alteration at all. Such is often the case with fossils such as teeth that are resistant to decay. Or an animal like an insect may be captured in sap, which hardens into amber, creating a natural time capsule that preserves the original organic material. (Scientists have been able to extract bits of ancient DNA from such insects!) In Siberia, creatures such as woolly mammoths have been found locked in ice that has remained frozen since the Ice Ages.

Making a Fossil.

This activity simulates how fossils in the forms of molds and casts are created.

Materials.

- Plaster of Paris
- Jug of water
- Modeling clay
- Vegetable oil
- Paintbrush (1-inch wide)
- Paper cups
- Dowels or sticks
- Small cardboard containers
- Shells, leaves, or fossil models
- Paper towels
- Masking tape
- Pen or marker
- Roll of large paper/newspapers
- (optional) paints and paint brushes

Procedure.

1. This can be a messy procedure, so start by protecting your tabletop or other work surface by spreading out a roll of paper, newspaper, or some sort of drop cloth.

2. Place a chunk of modeling clay into the bottom of a small cardboard container (the cut-off bottoms of individual-serving milk cartons or Pringles potato chip cans work well) and press into a flat, smooth surface.
3. With your 1-inch wide paintbrush, brush a light coating of vegetable oil across the surface of the clay. This is to make it easy to remove your fossil model and, later, the plaster cast. Otherwise, the clay will stick.
4. Have kids select the fossil they wish to make. Use real leaves or seashells or plastic models of fossils. Such models often may be found in museum gift shops. Ward's Natural Science (www.wardsci.com) also sells a set of plastic fossil models. Ones that seem to be most popular with kids are trilobites, ammonites, and shark teeth.
5. Press the fossil model or seashell into the clay and then remove it to create a mold.
6. Mix and stir plaster and water in a paper cup with a dowel or stick to the consistency of a thick milkshake. Pour it into the mold created in the clay. Use the dowel to get all the plaster out, and if you're making a number of fossils and will need to re-use the dowel, wipe it clean right away with paper towels before the plaster hardens on it.
7. Gently tap the bottom of your container with the clay and plaster several times against the tabletop to ensure that the plaster completely fills the mold and to remove any air bubbles in the plaster.
8. It takes about 15 to 20 minutes for the plaster to dry enough to complete this project, and if you're working with a lot of kids, it's easy to mix up which fossil belongs to whom. Have kids write their names on small strips of masking tape with pens or markers and affix them to their fossil containers. Set all the containers aside to dry. During this drying period, you should have another activity; otherwise, you'll hear "Is my fossil ready yet?" about 200 times. This is a nice activity to do prior to a meeting; once the meeting is over, before everyone goes home, you can return to the fossils. Or, after setting everything aside to dry, you might show a video about fossils and cap it off by having everyone unveil and share their newly minted fossils.
9. Once the plaster has dried, tear the cardboard container and peal the cardboard away, leaving a layer of clay attached to a layer of plaster. This gives you a chance to talk about layers of sediment and to show kids how fossil-bearing sediments usually (but not always) form in discrete layers.
10. Peal the clay away, and your kids will find a cool fossil in their slab of plaster. Many kids then write their names on the backs of their fossil slab.
11. Optional. Have kids paint their fossils. Glossy or flat enamel paints (the kinds used with plastic model airplanes and cars) work well in shades of black, gray, brown, or beige. Craft stores often carry textured "sand" paints, so kids can paint the surface around the fossil to resemble a real matrix. I've also found a pearly coating at one craft store. I painted it over an ammonite cast that I had painted a brassy brown. The pearl coating gave a glossy, iridescent sheen just like real mother-of-pearl. Experiment with different sorts of paints and coatings like these.

Back-up page 3.3: The forms of life.

The AFMS publishes the *AFMS Fossil List*, which represents the "Approved Reference List of Classifications and Common Names of Fossils" used in judging competitive exhibits of fossil collections. This is a highly detailed list that serves as an invaluable reference tool. You can receive information about obtaining a copy by contacting the AFMS central office at the following email address: central_office@amfed.org. An abbreviated form of that list may be found on the following AFMS web page:

http://www.amfed.org/rules/fossil_update.htm

In addition to the *AFMS Fossil List*, you'll find classifications provided in the many fossil guidebooks listed above in the first back-up page for the Fossils badge.

How much detailed knowledge kids should have of the different forms of life will vary with the ages of the kids with whom you're working. For younger kids, it's enough that they learn to use common names and to distinguish among, say, clams, starfishes, sponges, etc. The older the kids, the more detail they should be expected to learn, moving from common names to scientific nomenclature, using Pelecypoda, Asteroidea, Porifera, and so on.

On the next page, you'll find a general listing of the major fossil taxa most often included in the collections of amateur fossil hunters.

Representative Phyla of the Animal Kingdom

Invertebrates:

Porifera (sponges)

Representative classes: Calcarea, Demospongia, Hexactinellida

Cnidaria (corals, jellyfish, sea pens, sea anemone)

Representative classes: Protomedusae (jellyfish), Hydrozoa, Anthozoa (corals)

Bryozoa (bryozoans, or "moss animals")

Representative classes: Stenolaemata, Gymnolaemata

Brachiopoda (brachiopods)

Representative classes: Inarticulata, Articulata

Mollusca (mollusks)

Representative classes: Gastropoda (snails), Bivalvia or Pelecypoda (clams, oysters, scallops), Cephalopoda (cephalopods: ammonites, nautiloids, squid, octopi), Scaphopoda (scaphopods)

Annelida (worms)

Representative classes: Polychaeta (marine worms), Oligochaeta (earthworms)

Arthropoda (arthropods)

Representative classes: Trilobita (trilobites), Ostracoda (ostracods), Insecta (insects), Crustacea (crabs, shrimps, lobsters), Cirripedia (barnacles)

Echinodermata (echinoderms)

Representative classes: Blastoidea, Crinoidea, Asteroidea (starfish), Ophiuroidea (brittle stars), Echinoidea (sea urchins, sand dollars), Holothuroidea (sea cucumbers)

Vertebrates:

Chordata (vertebrates)

Representative Classes:
Chondrichthyes (cartilagenous fishes: sharks, skates, rays, guitarfish)
Osteichthyes (bony fishes)
Teleosteri (ray-finned fishes)
Amphibia (amphibians)
Reptilia (reptiles: lizards, turtles, crocodiles, dinosaurs, flying reptiles, marine reptiles)
Aves (birds)
Mammalia (mammals)

Representative Classes and Orders of the Plant Kingdom

Sphenopsida (horsetails)
Filicopsida (ferns, tree ferns)
Pteridospermales (seed ferns)
Cycadales (cycads)
Glossopteridales (glossoperid)
Ginkgoales (ginkgoes)
Cordaitales (cordaites)
Coniferales (conifers: pines, spruce, etc.)
Magnoliopsida (dicotyledon angiosperms, or flowering plants)
Liliosda (monocotyledon angiosperms, or flowering plants)

Back-up page 3.4: Collecting fossils.

Back-up pages for Badge 5 on Collecting provide information on building a collection. You should refer to those back-up pages for reference in assisting kids in satisfying Activity 3.4. For instance, there you'll find information about how to organize a catalog or logbook for an entire collection, how to create labels for individual specimens within a collection, and how to store a collection.

Kids can use this activity to satisfy requirements for the Collecting badge simultaneously.

Back-up page 3.5: A fossil-collecting field trip.

Back-up pages for Badge 8 on Field Trips provide information on organizing and taking a field trip. You should refer to those back-up pages for reference in assisting kids in satisfying Activity 3.5. For instance, there you'll find the AFMS Code of Ethics, general rules of field trip etiquette, and suggestions on organizing and conducting a field trip and the tools and supplies you'll need.

Kids can use this activity to satisfy requirement for the Field Trips badge simultaneously.

Back-up page 3.6: Your state fossil.

A terrific book to share with your kids is Stephen Brusatte's *Stately Fossils: A Comprehensive Look at the State Fossils and Other Official Fossils* (published by Fossil News, 1185 Claremont Drive, Boulder, CO 80305; www.fossilnews.com). Brusatte provides background about each fossil and how it came to be the designated state fossil.

Alabama – *Basilosaurus cetoides* (Eocene whale)
Alaska – *Mammuthus primigenius* (Pleistocene woolly mammoth)
Arizona – *Araucarioxylon arizsonicum* (Triassic petrified wood)
Arkansas – none
California – *Smilodon (californicus) fatalis* (Pleistocene saber tooth cat)
Colorado – *Stegosaurus stenops* (Jurassic dinosaur)
Connecticut – *Eubrontes giganteus* (Triassic/Jurassic dinosaur footprint)
Delaware – *Belemnitella americana* (Cretaceous cephalopd)
Florida – *Eupatagus antillarum* (Eocene heart urchin)
Georgia – Tertiary Shark Teeth
Hawaii – none
Idaho – *Equus simplicidens* (Pliocene Hagerman horse)
Illinois – *Tullimonstrum gregarium* (Pennsylvanian "Tully Monster")
Indiana – none
Iowa – none
Kansas – none
Kentucky – Paleozoic Brachiopod
Louisiana – *Palmoxylon* (Oligocene petrified palm wood)
Maine – *Pertica quadrifaria* (Devonian plant)
Maryland – *Ecphora gardnerae* (Miocene marine gastropod) and *Astrodon johnstoni* (Cretaceous dinosaur)
Massachusetts – Triassic/Jurassic Dinosaur Tracks
Michigan – *Hexagonaria percarinata* (Devonian coral, "Petoskey Stone")
Minnesota – none
Mississippi – *Basilosaurus* and *Zygorhiza kochii* (Eocene whales)
Missouri – *Delocrinus missouriensis* (Pennsylvanian crinoid)
Montana – *Maiasaurus peeblesorum* (Cretaceous dinosaur)
Nebraska – Pleistocene Mammoth
Nevada – *Shonisauris ichthyosaurus* (Triassic ichthyosaur, a marine reptile)
New Hampshire – none
New Jersey – *Hadrosaurus foulkii* (Cretaceous dinosaur)
New Mexico – *Coelophysis* (Triassic dinosaur)
New York – *Eurypterus remipes* (Silurian sea scorpion)
North Carolina – none
North Dakota – Teredo Petrified Wood (Paleocene wood bored by shipworms)
Ohio – *Isotelus* (Ordovician trilobite)
Oklahoma – *Saurophaganax maximus* (Jurassic dinosaur)
Oregon – none
Pennsylvania – *Phacops rana* (Devonian trilobite)
Rhode Island – none
South Carolina – none
South Dakota – *Tricerotops prorsus* (Cretaceous dinosaur)
Tennessee – *Pterotrigonia thoracica* (Cretaceous pelecypod)
Texas – *Pleurocoelus* (Cretaceous dinosaur)
Utah – *Allosaurus fragilis* (Jurassic dinosaur)
Vermont – *Delphinapterus leucas* (Pleistocene whale)
Virginia – *Chesapecten jeffersonius* (Pliocene pecten, or scallop)
Washington – *Mammuthus columbi* (Pleistocene Columbian mammoth)
West Virginia – none
Wisconsin – *Calymene celebra* (Silurian trilobite)
Wyoming – *Knightia* (Eocene herring) & *Tricerotops* (Cretaceous dinosaur)

4. Lapidary Arts

Many rocks that look dull and uninspiring on the outside actually harbor a gem within. The lapidary arts allow you to unlock that gleaming beauty. As with any art, successfully completing a lapidary project requires training and planning, guidance by an experienced mentor, and practice, practice, and more hands-on practice! To start, you should read an illustrated guidebook, such as James Mitchell's *The Rockhound's Handbook* or Pansy Kraus's *Introduction to Lapidary* to learn about the various forms of lapidary arts and to pick a project that interests you. In addition, learn about safety in the lapidary workshop. Then jump into the workshop and practice, practice, and practice some more—it's fun, and the outcome can be a thing of beauty forever!

Activity 4.1: Learning about lapidary rocks.
Different rocks have different characteristics. Some are hard, some soft. Some are uniform in color, others are banded, while still others are mottled and mixed in color. Learn the qualities of different rocks for lapidary projects, such as soft soapstone or hard agate. List several different rocks and the sorts of lapidary projects they may be good for.

Activity 4.2: Choosing a lapidary project.
Buy or borrow a book on lapidary arts and read about one or more of the various arts that you would like to try. Among the many activities practiced by rockhounds are cabbing, faceting, inlay, wirewrapping, silver smithing, beading, carving, and rock tumbling. Work with your youth leader to determine all the materials and equipment you'll need. Then outline the steps for your project.

Activity 4.3: *Workshop safety and maintenance.*
Note: *This activity is required to earn this badge*.
Make a list of safety rules to follow in completing your lapidary project and demonstrate your knowledge of safety in a workshop.

Activity 4.4: *Completing a lapidary project.*
Note: *This activity is required to earn this badge*.
Complete your lapidary project.

Activity 4.5 Sharing your lapidary project.
A thing of beauty is a thing to be shared! You can do this in several ways. Bring your finished project to a club meeting to share with friends and explain all the steps that went into its creation. Or write a brief article for your club newsletter describing your project and outlining the steps you took in making it. Or display your lapidary work in a case at your club's annual gem show.

4. Lapidary Arts

□ 4.1 Learning about lapidary rocks.

□ 4.2 Choosing a lapidary project.

□ 4.3 *Workshop safety and maintenance* (required to earn this badge).

□ 4.4 *Completing a lapidary project* (required to earn this badge).

□ 4.5 Sharing your lapidary project.

To earn your Lapidary Arts badge, you need to complete at least 3 of the 5 activities. (Please note that successfully completing Activity 4.3 is required to earn this badge.) Check off all the activities you've completed. When you have earned your badge, sign below and have your FRA leader sign and forward this sheet to the AFMS Juniors Activities chair.

_____
Date completed

_____ _____
My signature Youth leader's signature

_____
Name of my club

Leader's preferred mailing address for receiving badge:

_____

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Back-up page 4.1: Learning about lapidary rocks.

The goal of this activity is to orient and familiarize kids with the most commonly used lapidary materials. For beginners, you should focus on the more inexpensive and commonly available forms such as agate, jasper, onyx, and soapstone.

- Agate (a hard stone that is easy to work and to polish; good for cabbing)
- Jasper (similar to agate in taking an easy polish; good for cabbing)
- Flint (good for flint knapping to make arrowheads and spear points; also good for cabbing)
- Petrified Wood (good for cabbing, book ends, specimens for display)
- Soapstone (a very soft rock especially good for beginners to rock carving)
- Onyx (a soft rock good for carving)
- Alabaster (rock carving)
- Marble (rock carving; takes a good polish)

The following stones are more expensive and require more skill to work:

- Opal
- Jade
- Stones for faceting: varieties of quartz (clear, rose, amethyst, smoky, citrine), topaz, tourmaline, corundum (ruby and sapphire)

Encourage other adult club members to bring in examples of finished cabs, carvings, faceted stones, and other projects they've done, along with examples of the rough material from which they were crafted to show your kids "before" and "after" pieces.

Back-up page 4.2: Choosing a lapidary project.

The choice of a lapidary project should be matched to the age level and abilities of your club's kids and youth. Following are some sample projects, starting from simpler ones appropriate for younger members and progressing to more difficult:

- Rock painting. (Paint designs or pictures on flat, smooth rocks, or transform round stones into bugs, turtles, bunnies, etc., with enamel, acrylic, or tempura paints.)
- "Rock Critters" (Stack and glue small stones together like snowmen to make animals and people; incorporate "google" eyes, pipe cleaner arms and legs, feathers, and other ornaments.)
- Light-catchers. (Glue tumble-polished agates or beach glass onto translucent plastic container lids and insert a wire or fishing line to hang the creation against a window pane.)
- Rock tumbling and "free-form" jewelry. (Tumble small agates and jasper and top the best pieces with bell caps to make necklaces and dangling pieces for bracelets.)
- Cabbing (to create brooches, belt buckles, necklaces, and bolo ties).
- Flat-lapping (to create bookends or to polish agates, geodes, and thunder egg halves).
- Making bead bracelets and necklaces.
- Wirewrapping.
- Gemstone trees.
- Scrimshaw.
- Flint knapping.
- Intarsia, inlays, and mosaics.
- Sphere making.
- Carving and sculpting.
- Forging glass beads.
- Metal smithing.
- Faceting.

There are a variety of projects you can do with simple tumbled stones for very young kids. I noted "free-form" jewelry and light-catchers, above. In addition, kids can glue seashells and tumbled stones against a framed background in the shapes of flowers. Or they can coat a simple clay flowerpot with plaster or self-hardening clay and press in tumbled stones for an inlay effect. If you have a club member with a drill who can drill a large number of tumbled stones for you kids, you can teach them to make bead necklaces with free-form tumbled stones.

Many books and magazines provide good ideas for lapidary projects. Some include:

Magazines:
- *Rock & Gem*
- *Lapidary Journal*
- *Gems & Gemology*

Books:

- Ann Benson's *Beadwork Basics* (Sterling Publishing Company)
- Jack R. Cox's *Cabochon Cutting* (Gem Guides Book Company)
- Henry C. Dake's *The Art of Gem Cutting* (Gem Guides Book Company)
- Pansy D. Kraus's *Introduction to Lapidary* (Krause Publications)
- Tim McCreight's *The Complete Metalsmith* (David Publishing, Inc.)
- Jinks McGrath's *Jewelry Making* (Chartwell Books, Inc.)
- James R. Mitchell's *The Rockhound's Handbook* (Gem Guides Book Company)
- Edward J. Soukup's *Facet Cutters Handbook* (Gem Guides Book Company)
- J. Wexler's *How to Tumble Polish Gemstones* (Gem Guides Book Company)

In addition to books, draw from the experience of your own adult club members. Many clubs have an expert in cabbing, another in faceting, another in metal smithing, etc. In the Ventura (California) Gem and Mineral Society, member Wayne Ehlers sponsors cab-making workshops for kids and adults alike, and he's prepared a set of handouts. In basic, step-by-step fashion, these include instructions for making a cab, useful hints, and a glossary of lapidary terms (what's a cab? a blank? a perform?).

Who are the most experienced lapidary artists in your club? Work with them to prepare a set of handouts with simplified instructions and guidelines to distribute to your junior members, with emphasis on one or two basic arts (e.g., cutting and shaping a cab, wirewrapping, soapstone carving, rock tumbling and making freeform jewelry) to get kids' feet wet.

Back-up page 4.3: *Workshop safety and maintenance*

Note: ***This activity is required for kids to earn the Lapidary Arts badge.***

Before kids are allowed to flip on a single power switch in a workshop, they should be required to read and sign a sheet outlining workshop safety rules and learn about all equipment. Machinery can be dangerous. Help kids learn how to operate rock saws, grinding wheels, and other tools safely, and make sure an experienced adult is present in helping them through their projects. Whether working with kids or adults: safety first!

There are all sorts of lapidary arts, each requiring different materials, tools, and procedures. Also, according to Murphy's Law, anything that can go wrong will go wrong. Thus, no listing of safety rules can ever be complete, and any listing that tried would end up filling several volumes. There are, however, some basic safety rules. Kids should be encouraged to create their own set to match the project they undertake. Here are a few examples:

- Keep your workspace neat and organized and your equipment clean and in good condition.
- Learn about equipment before flipping the "on" switch; know your equipment: read accompanying manuals and take note of manufacturers' safety precautions and warnings.
- Stock a first-aid kit in your workshop, along with an emergency phone number.
- Keep a fire extinguisher in your workshop and be sure it is in good working order.
- Decide what you need for your project ahead of time, and then have all necessary materials and equipment close at hand.
- Don't walk away and leave running equipment unattended; turn off machines if not being used.
- Wear safety glasses when hammering, sawing, grinding, etc.
- Keep a workplace thoroughly ventilated to avoid breathing rock dust or fumes from adhesives and, if necessary, wear a facemask to protect your lungs.
- If dry sanding, check frequently to make sure your stone does not overheat.
- Diamond saw blades should not be run dry because the heat generated will ruin them; always use a lubricating coolant with a diamond saw blade.
- Don't overload electrical circuits.
- Make sure any belts connecting grinding wheels or saws to motors are shielded.
- Don't wear loose sleeves when working with saws or grinding wheels.
- If dry sanding, wear a facemask and/or work with a suction ventilating device.
- Keep electric motors and switches dry and grounded to prevent electric shocks.
- Don't allow grinding wheels to soak up water while idle to avoid unbalanced wheels.
- When grinding small stones or grinding without a dop stick, you can protect your fingers by wrapping the tips in tape or bandages.
- Don't use too much pressure when sawing or grinding stones; let the blades and grinding stones to the work.

Back-up page 4.4: *Completing a lapidary project*

Note: ***This activity is required for kids to earn the Lapidary Arts badge.***

Your club should prepare a good supply of agate and jasper slabs, chunks of soapstone, petrified wood, onyx, and other rough materials. These should be on hand along with spools of wire, bell caps, etc., to give kids a plentiful supply of material with which to experiment and practice in crafting lapidary projects.

Then, you should schedule and sponsor several supervised sessions with as many adults assisting to give kids as much one-on-one guidance as possible, with parental attendance required as well. Don't leave kids on their own to satisfy the requirements for this badge. As with any art, successfully completing a lapidary project requires training and planning, and then practice, practice, and more practice, under the watchful eye of an experienced mentor.

5. Collecting

Kids of all ages love to collect, and most rockhounds are pack rats at heart. We like nothing better than to assemble an assortment of rocks found on our journeys, traded with fellow collectors, or purchased at gem shows and rock shops. A proper collection, however, is more than a bunch of rocks and/or fossils tossed into a box. The value of a collection lies in its "curation," or in the information included with your specimens: what it is, where it came from, who collected it, and other unique information. The collection also should be properly organized and stored so individual specimens can be cared for and retrieved easily. Curating your treasures provides an opportunity to learn about the specimens you've collected while improving both the scientific and economic value of your collection. Here are some activities toward these goals:

Activity 5.1: Building a collection.
Build a rock, mineral, fossil, and/or lapidary art collection with at least 10 to 20 specimens. A collection can focus on just one sort of thing (a collection of minerals, a collection of fossils, a collection of jewelry), or it can be a mixture of all these things. Some people get very specialized, collecting, for instance, different kind of shark teeth or different forms of quartz. Ultimately, a collection reflects the interests of the collector.

Activity 5.2: Cataloging and labeling your collection.
Take care to curate your collection. Number your specimens and, for each one, include a label and keep a logbook or catalog with key information. For rocks and minerals, this includes what it is and where it came from. For fossils, you should include both those facts as well as information about the age of the fossil. Labels for a lapidary project might include what it is, what it's made from, when it was made, and who made it.

Activity 5.3: Storing a collection.
Store your collection. Each specimen should be in its own small box or baggie. The small boxes might then be kept in trays, shoe boxes, cigar boxes, shallow shelves, soda flats, or whatever works best for you and the space you have to store your collection.

Activity 5.4: Displaying your collection.
Prepare a display to exhibit to your fellow pebble pups at a club meeting or to show to the public in a club show. In this display, you should include not just your specimens but also labels to tell your viewers what it is they're seeing. (See Activity 6: Showmanship.)

Activity 5.5: Reporting about your collection.
Give a presentation or write an article for your club newsletter or a report for your youth leader about your collection. For instance, what do you like to collect and why? Do you have any special stories to tell about 2 or 3 of the specimens in your collection? If you have a mineral collection, what's your most valuable mineral and why? If you have a fossil collection, what's your oldest fossil? Youngest? Most interesting? If you have a collection of lapidary arts, describe how a particular piece was made. (See Activity 7: Communication.)

5. Collecting

□ 5.1 Building a collection

□ 5.2 Cataloging and labeling your collection

□ 5.3 Storing a collection

□ 5.4 Displaying your collection

□ 5.5 Reporting about your collection

To earn your Collecting badge, you need to complete at least 3 of the 5 activities. Check off all the activities you've completed. When you have earned your badge, sign below and have your FRA leader sign and forward this sheet to the AFMS Juniors Activities chair.

_____
Date completed

_____ _____
My signature Youth leader's signature

_____
Name of my club

Leader's preferred mailing address for receiving badge:

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Back-up page 5.1: Building a collection.

To help illustrate the range of collectibles, have adult members of your club bring in examples from their collections. For instance, in my own club we have one member who specializes in trilobites and has a collection of literally thousands of the little bugs. Another member loves petrified wood and has assembled a collection of beautifully polished rounds from around the world. Yet another only self-collects and has an array of natural mineral specimens he's found in the deserts of California and Nevada. Yet another member loves to self-collect jasper in its many forms and to craft what he finds into cabochons; he's got a great collection of cabs in all the colors of the rainbow, along with samples of the rough from which they were made. Still others have colorful collections of polished banded agates, personally crafted facted gemstones, an assortment of fossil insects, and so on.

Adult members sharing samples from their collections will illustrate to kids the range of possibilities for creating their own collections. It's also neat for kids to hear stories from adults of their adventures as kids and what got them started in collecting the things they do.

Back-up page 5.2: Cataloging and labeling your collection.

Properly caring for, or curating, a collection greatly improves both its scientific and economic value. Kids should be taught how best to curate the rocks, minerals, and fossils they collect and the lapidary works they create. Detailed information about the collection as a whole and the specimens contained within it should be kept in a logbook or catalog. Then for each specimen, a label should be created.

The Logbook or Catalog.

A logbook or catalog provides a systematic resource for recording and retrieving information about the contents of a collection. Collectors are generally encouraged to number their specimens, placing a dab of white paint in an inconspicuous spot that won't show if the specimen is exhibited, and writing a specimen number in black India ink. Sometimes you can write directly on the specimen without the use of paint.

There's no one, universal way to number a collection, and each collector must choose a system that works best for his or her collection and preferences. The simplest method is starting with the first specimen you've collected and consecutively numbering each subsequent specimen: 1, 2, 3, 4, etc. However, it's more useful to use a number system that incorporates descriptive information. For instance, I've organized my fossil collection by geological period or epoch and then by locality. So I have trays for the Eocene Epoch that are subdivided by localities. All fossils collected from the Eocene Epoch are given a number starting with "E" for Eocene. Then they're given a locality designation: "O" for Ojai, California, "P" for Pender County, North Carolina, "K" for Kemmerer, Wyoming. Then each fossil from a specific locality is numbered starting with "1." Thus, my Eocene fossils from Kemmerer, Wyoming, are numbered EK1, EK2, EK3, etc., and my Eocene fossils from Ojai, California are numbered EO1, EO2, etc.

A mineral collection might be numbered by a specific locality, county, state, or country. Thus, all your minerals from Brazil might be labeled B1, B2, B3, etc., with "B" standing for Brazil. Or you might choose to number by type of mineral. Thus, all your quartz specimens might be numbered Q1, Q2, Q3, etc., where "Q" stands for quartz, while your fluorite specimens are numbered F1, F2, F3, etc.

A collection of lapidary arts might be numbered by the sort of artwork (grouping all cabs together under "C," all faceted stones under "F," etc. Whether the simple system of just 1, 2, 3, 4, 5, etc., or a more complex system incorporating locality and age information, the important things are to pick a system that proves most useful to you and that records essential information that it's all-too-easy to forget years down the road.

Once you've settled on a system and have begun to attach numbers to your specimens, the number for each should be recorded in the logbook or catalog along with other key information. For rocks and minerals, this includes what it is and where it came from. If the specimen is self-collected, you should record detailed information about the collecting site, including written directions and a map for how to get to it. If you

purchase a specimen, you should get as much information as you can from the dealer about where the mineral came from, including, if possible, a specific location or mine. (This is one way to separate truly excellent dealers who are interested in the scientific value of minerals from those who are in it just to make a buck and who don't take the care to record and keep such information.) You might also record when you collected or purchased the specimen.

Thus, a complete catalog entry for a mineral might include the following fields:

- Specimen number assigned to the mineral.
- Common name of the mineral.
- Locality where the mineral was found.
- An indication as to whether it was self-collected, traded, or purchased.
- Name of the person who collected it.
- Date it was collected or purchased.
- If purchased, name of the dealer and the purchase price.
- Miscellaneous notes, including directions and map to the locality if self-collected, and notes about the collecting site.

For fossils, you should include all of the above as well as information about the scientific name of the fossil and its geological age:

- Specimen number assigned to the fossil.
- Common name of the fossil.
- Taxonomic information, including the scientific name of the fossil. (You may get as detailed as you like with this, with information about Kingdom, Phylum, Class, Family, etc. but most include at least the Genus and Species.)
- Age of the fossil. (The more detail, the better. At the very least, you should record the geological Period or Epoch; at best, you should include the Formation and even the specific horizon within a Formation.)
- Locality where the fossil was found.
- Name of the person who collected it.
- Date it was collected or purchased.
- If purchased, name of the dealer and the purchase price.
- Miscellaneous notes, including directions and map to the locality if self-collected, and notes about the collecting site.

An entry for a lapidary project might include a specimen number, what it is, what it's made from (and the purchase price of the individual components, or information about where you collected or purchased the rough material to use in your project), when it was made, who made it, and estimated value. You might also include notes about any special techniques and equipment used to create your project.

It's seldom that any of us are compulsive enough or make the time to record all the information I've indicated above, but the effort is well worth it in terms of enhancing the ultimate value of a collection, and you should encourage kids to make cataloging a routine part of their collecting activity.

Labels.

A label is simply an abbreviated version of the full catalog entry, capturing only a few key points that will fit on a card small enough to store with a specimen or to show alongside a specimen in a display. For a mineral, at the least you should include the common name of the mineral and its locality. For a fossil, you should include the common name, scientific name (Genus and Species), locality, and age (period or epoch). For a lapidary project, you might include what it is, what it's composed of, and who made it (e.g., a Jade Vase, created by Jane Doe.)

While the above may be fine for most purposes, if entering competition in an AFMS or a regional federation show, you'll find very specific requirements for labeling contained within AFMS Uniform Rules book, which should be consulted for different categories of displays.

Electronic Data Keeping.

As a collection grows, it can become increasingly difficult to remember and keep track of all your specimens, even if recorded in a handwritten logbook. Also, a handwritten logbook can sometimes prove inflexible to use. One invaluable alternative is the computer. You can use the database or spreadsheet functions that come packaged with most computers to create your own electronic catalog, or you can turn to commercially available software. For instance The Fredrick Group, Inc., sells "TFGCollector" custom-made software for cataloging facts about a rock or fossil collection. (The Fredrick Group, Inc., 100 Colony Park Drive, Suite 303, Cumming, GA 30040, phone 678-947-1355, Ext. 500.)

The great advantages of a computerized database are the ability to easily edit and change information and the ability to quickly and easily pull up information about a specific desired field. For instance, if you have a quartz collection from around the world, you might want to pull up the records for just your amethyst specimens. Or perhaps you're putting together a display of quartz specimens from a single country or region. A computerized database makes it relatively easy to pull up related files like these. In this day-and-age of digital photography, some collectors even incorporate photos of collecting sites and their individual specimens into their electronic databases to make it even easier for a person to match an entry in a catalog with a specimen in a drawer.

Cataloging and Labeling Group Activity.

You can turn cataloging and labeling into a group activity. Have kids bring parts of their collections to a meeting and work with them to devise numbering systems. Then work further to identify, label, and store specimens, thus giving them hands-on experience before going home to catalog and label the rest of their collections.

Back-up page 5.3: Storing a collection.

Just as there are many individual ways to catalog a collection depending upon the nature of the collection and the preferences of the collector, so there are different sorts of storage methods and containers. The methods and containers tend to evolve with a collection, progressing from cardboard boxes to fine cabinetry with shallow trays and drawers.

As young children, many of us began with simple egg cartons, which are actually perfect for holding and sorting small specimens. Individual cups separate each mineral or fossil. And that's the main thing in choosing a storage method: keeping individual specimens separate from one another so that labels don't get mixed up. Actually, this isn't a problem if you've affixed a number to each specimen and have kept a record of that number in a catalog, but you still want to make sure minerals or fossils don't rub against one another, causing unwanted scratches or chips. So you want a system like an egg carton with its individual cups. A similar, sturdier option is the plastic box with hinged lid and square compartments sold in crafts stores or with fishing tackle.

Lapidary supply houses and dealers at some shows sell fold-up cardboard boxes in a variety of sizes. You should also collect small cardboard containers whenever you can. For instance, the cardboard boxes that hold greeting cards, match boxes, or even the cut-off bottoms of milk cartons make great specimen containers. You might also store specimens in small plastic baggies. Your boxes or baggies with individual specimens and their labels can then be organized and stored in cardboard soda flats to hold a whole collection. Get soda flats of two slightly different sizes so that one can serve as a top to protect a collection from dust and so that you can stack a collection as you fill more and more boxes. Shoeboxes and cigar boxes also work well for holding various specimens. Also, boxes that hold reams of typing paper can make great flats by trimming the bottom down to match the top to create a perfect storage box with lid.

A nice container for both storing and displaying a collection is a Riker mount. This consists of a sturdy cardboard bottom filled with cotton. Specimens are arranged in the cotton. Then a top with glass is fitted over and held in place with pins.

The most sophisticated and permanent way of storing a collection is in a unit of wooden shelves or trays kept in a cabinet. I've built several of my own and found it to be a lot easier than I initially imagined. Or, if you can afford it, you can buy shallow shelves meant for storing maps or art supplies or wooden or metal shelves built for mineral and fossil collections from scientific supply houses, like Ward's. But such professionally produced units can easily run into the thousands of dollars—not an option for the budget of most kids I've ever worked with!

As an activity, bring in a variety of shoeboxes, cigar boxes, cardboard flats with lids, plastic fishing tackle and crafts boxes, and small boxes and baggies to talk about organizing a collection with hands-on examples. Follow this up at your next meeting by having kids bring in examples of how they've decided to store their collections.

Back-up page 5.4: Displaying your collection.

Back-up pages for Badge 6 on Showmanship provide information on where and how to display. You should refer to those back-up pages for reference in assisting kids in satisfying Activity 5.4.

Kids can use this activity to satisfy requirements for the Showmanship badge simultaneously.

Back-up page 5.5: Reporting about your collection.

Back-up pages for Badge 7 on Communication (especially Activities 7.1 and 7.2) provide information on preparing an oral or written report. You should refer to those back-up pages for reference in assisting kids in satisfying Activity 5.5.

Kids can use this activity to satisfy requirements for the Communication badge simultaneously.

6. Showmanship

A fun part of collecting and the lapidary arts is sharing what we've found or made. When displaying at a local gem show, we not only get to "show off" our own collections but also to learn from others, getting advice, sharing tips, and forging bonds of friendship through mutual interests. But building an effective display involves more than getting a glass-fronted box and throwing in a bunch of rocks. Before you enter an exhibit into a show, county fair, or elsewhere, you should learn the rules of effective showmanship.

Activity 6.1: Techniques for effective displays.
Learn the techniques of assembling an effective display, such as balance, color coordination, labeling, and lighting. List them from memory.

Activity 6.2: Holding a workshop on display ideas.
Hold a workshop with fellow club members to discuss display ideas. Have a display case at hand and see what happens when you use various types of materials as background liners (light versus dark materials; plain versus patterned cloth; etc. What happens when you vary the lighting or use risers or stands to raise display specimens?

Activity 6.3: Observing and evaluating displays.
Either alone or with a group, visit a museum with rock displays or a gem show with exhibits. Carefully observe the displays, taking note of what catches your eye as being effective or not so effective. Make a checklist of techniques for effective displays and judge the displays you see against the checklist. Then hold a discussion about what works and what doesn't in a display. How could the displays you saw be improved?

Activity 6.4: *Making your own public display* (required to earn this badge).
Gather together the best of your rock, mineral, or fossil collection or your lapidary artwork and prepare a display for public exhibit. Good settings for displays include your school, county fairs, libraries, a local museum, a rock club show, or a science fair. Such a display might be done individually or collectively. If collectively, your club might approach a public library about doing a display for a month. Libraries like to do this, and they often use it as an opportunity to highlight their books on that particular topic.

Activity 6.5: Entering competition.
Enter into competitive display at your regional show, at a county fair, or elsewhere. Competitions usually have very specific sets of rules or guidelines that all entrants must follow. Work with your youth leader to make sure you understand whatever rules may be in place for the competition you enter.

6. Showmanship

□ 6.1 Techniques for effective displays

□ 6.2 Holding a workshop on display ideas

□ 6.3 Observing and evaluating displays

□ 6.4 *Making your own public display* (required to earn this badge)

□ 6.5 Entering competition

To earn your Showmanship badge, you need to complete at least 3 of the 5 activities. (Please note that successfully completing Activity 6.4 is required to earn this badge.) Check off all the activities you've completed. When you have earned your badge, sign below and have your FRA leader sign and forward this sheet to the AFMS Juniors Activities chair.

_____
Date completed

_____ _____
My signature Youth leader's signature

_____
Name of my club

Leader's preferred mailing address for receiving badge:

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Back-up page 6.1: Techniques for effective displays.

Help your kids develop a "tip list" of do's and don't's of effective displaying. For instance, kids should learn such rules as:

- *use neutral liners to highlight, not detract from, specimens*

Display cases often look best when lined with cloth wrapped tightly around sheets of cardboard or thin plywood cut to fit snuggly along the sides and bottom of a case. Two rules should govern the choice of cloth. First, you want the viewer's eye to focus on your specimens, not on the background; therefore, choose a cloth that's neutral in appearance. Avoid patterned cloth (spotted, checkered, paisley, striped) and avoid cloth that's glossy and reflects light or that's garish in color. Plain linen, canvas, or burlap in a neutral color usually works best. Second, choose a color that will highlight your specimens. Dark specimens can get lost against a dark liner; instead, use pastel shades of light blue, tan, eggshell white, etc. If displaying light-colored specimens, a dark liner (black, navy blue, dark olive green) may be more appropriate. Choose a color that enables your specimens to "pop" in the viewer's eyes.

- *use balance (in size of specimens, colors, and arrangement) to guide the viewer's eye across a display in an aesthetically pleasing way*

Choose specimens that compliment one another in size and shape and arrange them symmetrically around a center. A large specimen shoved to the side of a case can make a display look lopsided. However, a single large piece placed in the center and surrounded by smaller pieces can provide a pleasing effect. If using risers, place larger specimens toward the bottom of the case and smaller ones toward the top to lend a sense of "gravity" to the display. If displaying colorful minerals, arrange the colors in a way that provides interest to the viewer; for instance, alternate dark and light colored minerals.

- *use neat, clear labeling that's both precise and concise and large enough to read*

Handwritten labels with spelling errors on jaggedly cut pieces of paper leave a bad impression. If possible, you should use labels that are typed in large, bold print that is easily read from a distance, and labels should be uniform in size. Keep information on a label to a minimum; the centerpiece of a display should be the rocks, minerals, fossils, or lapidary pieces, and the labels should provide back-up info but shouldn't steal the show.

- *use lighting that's neither too bright nor too dim and that shines evenly across a case*

Most cases include lights, which is essential to best highlight your display. At most federation-sponsored shows, no more than 150 watts of lighting is usually recommended. Light should fall evenly throughout the case, with no round spotlights or shadows.

- *finally, consider using a theme or story to tie a display together*

This is especially effective for educational displays that illustrate a process; for instance, the steps in how to make a cab, moving from rough material at one end of the case to stones that are polished and set in a mounting at the other end. Or you might display a grouping of minerals or fossils from one locality or formation; or one sort of rock (for instance, an agate collection) or fossil (a collection of trilobites).

Back-up page 6.2: Holding a workshop on display ideas.

Once your kids are familiar with the basics of assembling an effective display, hold a seminar at one of your monthly meetings to review those basics in an interactive manner. Such a seminar should be hands-on, with a display case front-and-center to vividly illustrate display techniques.

For instance, bring in different sorts of liners to show how specimens can get lost against a "busy" background of plaid or paisley versus how they can be highlighted against a neutral background. Demonstrate how dark specimens "pop" more effectively to the eye against a background of beige, eggshell white, or light blue but get lost against a black background. Conversely, show how light-colored specimens are enhanced against that same black background.

Show the difference that lighting can make, starting with no light at all, and then illustrating problems of high-wattage light bulbs that glare or bulbs that are too small and that create "spotlighting" effects within a case.

Demonstrate appropriate use of labeling. Show labels that are too large and too crammed with dense text versus those that are small, simple, and convey "just the facts, ma'am." Illustrate the difference between hand-written labels cut out jaggedly with scissors versus typed or printed labels measured for uniformity and sliced evenly with a paper cutter. Show labels printed on thin paper that ends up curling at the edges versus labels printed on stiff card stock.

Illustrate effects that risers or glass shelves or acrylic display stands can have by adding depth to a display. For instance, show an assortment of rocks lined up in rows in an unlined case. Then show that same assortment in a case that's been lined, that has tiered risers, and that includes stands beneath the specimens.

In a display, especially one entered into a competition, all specimens should be free of dust, dirt, and fingerprints. Leave a cluster of clear quartz crystals outside for several weeks and bring it in along with a pan of water and a toothbrush to illustrate the dramatic effect a simple scrubbing can have on specimens. (But don't try this with your halite!)

After reviewing general display techniques, let the kids themselves play around with a case. You can bring in materials yourself for them to experiment with, or you can have them bring in their own collections. Don't just lecture and distribute a list of "do's" and "don't's." Let the kids see for themselves what happens when they try different arrangements and display techniques.

Finally, if you have members who have taken slides or prints of displays at various shows, a nice touch is a brief slide show or photo album of award-winning cases to show how it can all come together.

Back-up page 6.3: Observing and evaluating displays.

To satisfy the requirements for this activity, have kids write a brief written evaluation of three or four cases they've seen at a rock show or displays they've viewed at a museum or in a jewelry store window or elsewhere. In their report, they should illustrate a basic awareness of the techniques for effective displays and they should provide recommendations for ways in which the displays they viewed might be improved, whether through more effective lighting, better labels, a different arrangement of specimens, or a simple dusting of the display case. (You'd be surprised how many cobwebs you can find in some museum displays!)

Back-up page 6.4: *Making your own public display*

Note: ***This activity is required for kids to earn the Showmanship badge.***

A fun and rewarding aspect of our hobby is sharing what we've found, collected, and learned about with others. Collections aren't meant to be hoarded and hidden away. Kids should be encouraged to share their collections in a public display. The best venue for that is your own club's annual rock show or a rock show held by a neighboring club or society.

If you club doesn't hold a show and if neighboring clubs are simply too far away to conveniently attend, other options to explore include a display at a county fair, in a lobby or library window display case at elementary or secondary schools, or at a science fair. Opportunities abound. For instance, my local public library has a display case in its foyer and welcomes individuals and nonprofit organizations installing educational displays for a month at a time. Regional museums sometimes also provide a display case for a temporary rotating display. These often must be reserved months in advance, so do some early legwork to locate such public spaces.

Check for opportunities like these within your community. Then assist your kids in taking advantage of them!

Back-up page 6.5: Entering competition.

Each year, each of the seven regional federations of the AFMS holds a show and convention that includes the opportunity to enter a display into competition to earn ribbons and plaques. Junior members can even win a financial reward! The AFMS holds a joint show and convention with one of the regional federations, rotating over the years to each region. The juniors case earning the most points at an AFMS-affiliated show wins the AFMS Lillian Turner Award, which includes a certificate, a mineral specimen, and a $100 Series "E" Bond. Thus, it really can "pay" to enter!

Over the years, the AFMS has devised a detailed system of rules for all the different sorts of displays that represent the varied aspects of our hobby. Categories range from all manner of lapidary arts (sphere-making, cabbing, faceting, beading, intarsia, etc.) to mineral collecting and fossil collecting (with categories for micromounts, thumbnail specimens, and larger specimens; for self-collected fossils and purchased specimens; for materials from a single locality and those collected from around the world; and so on). Each category comes with its own requirements and rules, and—in order to ensure uniformity in judging—these rules have been collected together in a rather thick packet.

The junior program leader should obtain a copy of the AFMS Uniform Rules, read through it, and be on hand to help guide kids who wish to enter a competitive display. The rules can be complex and difficult for even an adult to follow, and entering competition can be daunting for anyone, young or old. While you shouldn't construct your kids' displays for them, you should be on hand to provide support, pointers, and advice based on a full knowledge of the AFMS rules for exhibiting.

The AFMS Uniform Rules may be purchased through your regional federation or through the AFMS central office:

AFMS Central Office
Lewis Elrod
2706 Lascassas Pike
Murfreesboro, TN 37130-1541
(615) 893-8270
central_office@amfed.org

Within the Uniform Rules are sheets that explain at a glance the things to be judged within specific categories and the number of points allocated to each thing. You should copy these sheets to share with kids entering a particular category.

These Federation-sponsored shows aren't the only opportunities for kids to enter competitions. Check around your local area. County fairs often sponsor competitions for hobbies and collections. Schools sponsor science fairs. If you come up dry, hold your own competition for your junior members and pebble pups at your club's annual show, utilizing the AFMS Uniform Rules.

7. Communication

Part of enjoying a hobby is sharing it with others. They say you don't truly "know" something until you're able to teach it to another. Learning to communicate effectively is an important skill. If you go on to become a geologist or paleontologist, you'll discover that science isn't complete until your findings are written up and shared with colleagues, either in a public address or in a journal article or a book. If you go on to become a lapidary artist, you'll find great enjoyment in sharing your skills and techniques with others as an informal mentor or in formal workshop settings. You'll find lifelong benefit to learning the basics of effective communication, both within the hobby and beyond.

Activity 7.1: Oral report.
Give a talk to your club or to your class at school about a trip you took, a project you did, a special rock or fossil you've collected, etc. In preparing your presentation, consider the key questions that all reporters ask: Who? What? Where? When? How? Why?

Activity 7.2: Written report or newsletter article.
Write a 250- to 500-word article for your club newsletter. Follow the news reporter's questions of who, what, where, when, how, and why.

Activity 7.3: Bulletin board display.
Prepare a bulletin board display for your annual show, a library, or your school on rocks, fossils, minerals, or the lapidary arts. Use pictures to convey most of your information, with writing kept to a minimum, mostly in the form of banners and headlines.

Activity 7.4: Corresponding with experts.
A great way to learn is by corresponding with experts who have made a career out of gemology, paleontology, or geology. Write or email a local jeweler, a paleontologist in a museum, a geology professor at a university, etc. These people are usually very busy, so you should briefly tell them who you are and what you're interested in. Then ask something very specific you'd like to know about their work. Share their answers with your fellow club members at your next meeting or in a report for your club newsletter.

Activity 7.5: Holding a symposium.
Geologists and paleontologists often get together in meetings to exchange ideas, give lectures, and hold symposiums. A symposium is a series of 3 or 4 brief talks organized around a specific topic. Each speaker presents, and then there's an opportunity for questions and discussions. Come up with a topic and hold your own symposium.

Activity 7.6: Writing a field trip guide.
Write a guide to your favorite collecting locality. Provide a brief overview of what's to be found; how to get to the site, with written directions and a map; and the tools you'll need and how to go about collecting. (Are the specimens on the surface? Do you need to dig for them with a shovel?) If several members of your club write guides to different sites, you can put them together into a local guidebook for your club and school.

7. Communication

□ 7.1 Oral report

□ 7.2 Written report or newsletter article

□ 7.3 Bulletin board display

□ 7.4 Corresponding with experts

□ 7.5 Holding a symposium

□ 7.6 Writing a field trip guide

To earn your Communication badge, you need to complete at least 3 of the 6 activities. Check off all the activities you've completed. When you have earned your badge, sign below and have your FRA leader sign and forward this sheet to the AFMS Juniors Activities chair.

_____
Date completed

_____ _____
My signature Youth leader's signature

_____
Name of my club

Leader's preferred mailing address for receiving badge:

_____

_____

_____

Back-up page 7.1: Oral report.

Every aspiring journalist is taught to answer six essential questions in covering a story: Who? What? Where? When? How? Why? You should teach your kids to consider these questions in delivering an oral report. This handy list helps them both to organize the report and to come up with ideas about what to say.

For instance, if they wish to tell about a field trip adventure, who went on the trip? What were they hoping to find, and what did they actually find? Where did they go? When did they go there? How did they find out about the collecting spot and/or how did they go about collecting there? And why might they recommend this site to others?

Or, a talk might be organized like a story, with a beginning, middle, and end. For instance, in describing a field trip, they might tell how they got the idea to visit a specific locality, then describe the trip itself, and end by showing what they found there. In telling how to do a particular lapidary project, they might describe the necessary tools, go through each step in the process, and end by unveiling the finished product.

In giving an oral report, it's important that the audience be engaged in ways that capture and hold attention. Good public speakers incorporate jokes to bring out smiles. In fact, they often begin their talks with a joke or an amusing anecdote to begin in an entertaining way. And, just like in a book, good illustrations can spice up the presentation, so kids should be encouraged to show or pass around specimens, to include maps, pictures or posters, or to otherwise visually reinforce what they'll telling the audience.

Finally a good way to end a talk is with questions and answers, so time should be left for the audience to ask questions or to share their own experiences.

Back-up page 7.2: Written report or newsletter article.

At both the regional and national federation levels, awards are given for the best articles published in club newsletters, with a special category for articles written by kids. Encourage your kids to contribute to your club's newsletter, or, if you don't have one, to write up a brief report to share with you and the other kids in your club. Learning to write a good report is a skill that will benefit kids in school and beyond.

In teaching your kids to write an article, you should use the same six key questions noted for Activity 7.1: Who? What? Where? When? How? Why? This handy list helps them both to organize the report and to come up with ideas for what to say in their article.

In addition, encourage kids to try different "genres" or types of articles. One genre is the anecdote, or story. Kids might write about a specific memorable event that happened while on a collecting field trip that, at the same time, packs in useful information about where they went and what could be found there. For instance, I vividly remember reading one field trip article that told the story of an encounter with a wild burro that ransacked a campsite near the Mojave mining town of Darwin. The central focus was the encounter with the burro. But in telling the story, the author provided readers with a lot of history about past mining days in the desert, minerals that collectors can find in the old mine dumps, and the wonderful wildlife and colorful characters living in the region.

Another genre is the technical article. Such an article is more scientific in tone and nature and usually involves some background reading and research. A technical article might describe how a geode or petrified wood forms. It might describe the different classifications of crystal structures. In writing a technical article, kids should end with a list of the books they consulted for their information.

Yet another genre describes a process, or provides a set of directions. An example of such an article would be one that describes in detail the steps for completing a lapidary project, such as crafting a cab. These articles usually begin with a brief overview of what is being made. Then, the necessary tools and materials are listed. Finally, each step in the process is described in numbered or outlined form. For examples of such an article, see Back-up page 1.6 on "Growing Crystals" or Back-up page 3.2 on "Making a Fossil."

Still another genre is the tall tale, or the humorous story that conveys information or expresses an opinion in a way that elicits a laugh. The perfect example is Mark Twain.

Encourage kids, especially your older ones, to write several articles, trying out different styles (funny vs. serious; technical vs. informal) until they find a style that fits them best. Publish as many as you can in your club newsletter. Seeing their names in print can be a big boost for kids' egos and self confidence, and—as noted above—it could also lead to recognition by your regional federation and the AFMS if your club newsletter editor submits articles into consideration for annual federation awards.

Back-up page 7.3: Bulletin board display.

Bulletin boards are found in many locations: in your local schools, in public libraries, in homes for senior citizens, in local and county government centers, etc. Explore options within your community and make arrangements for providing educational displays on rocks, fossils, minerals, or the lapidary arts (or on all these aspects of the rockhounding hobby). You might assign this to individual kids within your club, or you might make this a group activity involving everyone.

With a bulletin board display, your audience is usually passing by and isn't likely to stand still and read a great deal of text. You need to grab attention quickly and to get your message cross efficiently. As with billboards along a highway, vivid and memorable pictures should do most of the talking and supporting text should be kept to a minimum, mostly in the form of headlines and brief captions.

For instance, a bulletin board about rockhounding in general might ask the question, in large, colorful print: "WANT A NEAT HOBBY?" At the bottom, in equally large print, you might write "TRY ROCKHOUNDING!" These two large banner headlines very quickly broadcast the main message of the bulletin board. Then the middle of the bulletin board can be filled with large photographs, drawings, and other visual images about various aspects of the hobby. Each might be provided with a small caption where you can go into a bit more information. But remember, unlike an article in a newspaper or newsletter, folks will be reading this while standing up and usually while on their way elsewhere, so each caption should be as brief and to-the-point as possible and in print that's large and easily read at a distance.

Back-up page 7.4: Corresponding with experts.

In encouraging kids to correspond with experts, you may want to do some advance legwork to make sure that they'll get a timely response. It would be a shame to build up a child's expectations and enthusiasm only to see a letter, email, or phone message go unanswered.

Start by asking kids what it is they'd like to learn about. Then decide who might be a good expert to address their questions. For instance, a child might want to know where all those diamonds come from in the jewelry store windows downtown or in the mall. Or they may want to know how a particular dinosaur got its name. The first question would be appropriate to address to a local jeweler and the second to a museum paleontologist or a university professor. You should help decide who would be the best person to address the question and to track that person down and see in advance if they would be willing to help in your project.

Here are examples of different experts you might contact and how to track them down:

- Local jewelers: Check your yellow pages under "Jewelers" or "Jewelry." They usually have a number of different categories: Jewelers-Manufacturers, Jewelers-Retail, Jewelers-Wholesale, Jewelry Buyers, Jewelry Designers, Jewelry Engravers, Jewelry Repairing, etc. Other categories to try include "Gemstones," "Appraisers," or "Lapidaries."
- Geologists and paleontologists: check the geology department web site of the nearest college or university. (A listing of all colleges in the U.S. is available through a web site maintained at the University of Texas: http://www.utexas.edu/world/univ) Such department web sites usually have a listing of all faculty on staff, with brief descriptions of their areas of expertise. Someone there may be able to help you or to give you the name and contact information of a colleague at another college or university.
- Geologists and paleontologists: call up the closest natural history museum to see if they have a staff geologist or paleontologist.
- Geologists and other earth scientists: The U.S. Geological Survey web site has a link to the "Earth Science Information Center" to address earth science questions via the U.S.G.S. education web site: http://www.usgs.gov/education/.
- Mining experts: two groups have web sites that provide much educational information on mining and mineral resources, along with links to ask questions. One is the Mineral Information Institute (http://www.mii.org) and another is Women in Mining (http://www.womeninmining.org).

Back-up page 7.5: Holding a symposium.

Because it's a group event involving several presenters, not just one, organizing a symposium takes special advance planning. First, you need to select a topic that will be of interest to a number of people in your group and about which people may have differing but equally useful opinions and experiences to relate. The goal of a symposium isn't to come to a single correct answer to a question. Instead, it's to share information and tips that a variety of people have formulated in tackling the question at hand, thus giving everyone involved new insights and ideas to consider.

For instance, one good topic for a symposium is how to catalog a collection. Everyone seems to have a different system (see Back-up page 5.2: Cataloging and labeling your collection). It can be useful to hear how different people have organized their collections in different ways and can give kids a number of useful ideas for deciding how they may wish to catalog their own collections.

Another helpful symposium topic might be on cabbing and how to bring out the best shine in a cab. Different minerals have different characteristics, and some—such as jade—can prove difficult to polish. What sorts of techniques have different club members developed over the years? What sorts of polishing compounds would they recommend? What sorts of techniques have they used with different minerals? Etc.

Usually, a symposium has three or four presenters, along with a host or moderator. The moderator introduces the topic and then introduces each speaker in turn and makes sure they stick to their allotted time. Each person might talk for 10 or 15 minutes. At the end, the moderator summarizes, followed by opportunities for the audience to pose questions or to share their own thoughts, experiences, and insights in a follow-up discussion.

Kids themselves might organize, run, and participate in their own symposium. Or, they might come up with the topic, make the plans, and then invite adult members to serve as speakers, followed by questions from the kids.

Back-up page 7.6: Writing a field trip guide.

The best model to provide to kids for writing a field trip guide to their favorite local collecting site is one of the many published field guides. The geological surveys of some states publish rockhounding guidebooks you can use as models, and two publishing companies publish guides covering many states.

Gem Guides Book Company publishes the "Gem Trails" series. In these guidebooks, the first paragraph for a particular locality usually tells what can be collected there. This is followed by directions for how to get to the site and instructions for how to collect (for instance, by searching the surface of the ground, by digging in specific layers, by splitting shale, etc.). Then there's usually a photograph of the locality and people collecting there, followed by a map. They also often give special words of advice or warning. For instance, there may be special issues regarding status of ownership of the land and needs for making advance arrangements or getting special passes or paying fees. There may be warnings about hazards such as rattlesnakes, open mine pits, extreme heat in the summer, etc.

Falcon Press Publishing Company publishes "The Rockhound's Guide" series. In the one for California, the author starts with a listing of the Land Type (desert versus coastal, etc.), Best Season to visit, Tools, Material to be collected, Special Attractions, Vehicle Type needed to reach the site, etc. This list is followed by directions, or "Finding the Site," and then "Rockhounding," or paragraphs describing what you'll find and how best to collect it. A map and a photo of the site then usually follow.

Any of these can provide helpful and useful models for your kids to follow.

8. Field Trips

The ultimate hands-on activity is a field trip! Little can replace the thrill of discovering a precious gemstone or a fossil first-hand. Also, a lapidary project has a lot more personal value and meaning if you collected the rough material yourself. But before you start down the road, you need to know the laws of your state and rules governing proper behavior for collectors and respecting private property. You also need to consider what you'll be collecting and how you'll collect it and then make plans and gather together the proper equipment. The follow activities will help you get the most out of your field trip adventure.

Activity 8.1: *Field trip etiquette & AFMS Code of Ethics* (required to earn this badge)
Learn and demonstrate knowledge of the AFMS Code of Ethics. Make a permission release form. Demonstrate field trip etiquette on your next trip. If the trip was on private land, did you first gain permission? Did you provide the owner with a release form? Did you fill in any holes you made? If at a road cut, did you keep rocks off the roadway?

Activity 8.2: Field trip planning.
Choose a locality for a field trip from a guidebook or from suggestions by adult members in your club. Draw a map and directions to your site. List what you expect to find, then list the tools and supplies you'll need to collect and transport your finds home.

Activity 8.3: *Taking a field trip* (required to earn this badge)
Take a field trip to a collecting locality. Be sure to follow proper field trip etiquette during the trip—and have fun!

Activity 8.4: Record keeping.
Start and maintain a "field journal" of what you did and what you found during your field trips in a composition or spiral-bound notebook, three-ring binder, or other record book or on the computer. Take notes while in the field and later write up a formal report including observations about the locality and specimens. Pinpoint where you found your rocks, minerals, or fossils, so that others could locate the spot. Was there a specific layer containing the fossil or mineral deposit? If so, how could others locate and identify that layer? If you have a camera, illustrate your field journal with photos, or provide drawings that may prove useful to others wishing to visit the site.

Activity 8.5: The indoor field trip.
Organize a field trip to a college geology department or to a museum, calling in advance to arrange a tour not just of the exhibitions on public display, but the treasures behind the scenes.

8. Field Trips

□ 8.1 * Field trip etiquette and AFMS Code of Ethics* (required to earn this badge)

□ 8.2 Field trip planning

□ 8.3 *Taking a field trip* (required to earn this badge)

□ 8.4 Record keeping

□ 8.5 The indoor field trip

To earn your Field Trips badge, you need to complete at least 3 of the 5 activities. (Please note that successfully completing Activity 8.1 is required to earn this badge.) Check off all the activities you've completed. When you have earned your badge, sign below and have your FRA leader sign and forward this sheet to the AFMS Juniors Activities chair.

_____
Date completed

_____ _____
My signature Youth leader's signature

_____
Name of my club

Leader's preferred mailing address for receiving badge:

_____

_____

_____

Back-up page 8.1 * Field trip etiquette & AFMS Code of Ethics*

Note: ***this activity is required to earn this badge*.**

Before ever setting foot in the field, kids should be taught proper field trip etiquette and the do's and don'ts governing proper—and legal—behavior when collecting natural resources. If organizing a group field trip, as the group leader, it's your responsibility to teach by example.

First and foremost, be aware of the laws of both the U.S. and your state government regarding fossils. Some areas, and some types of fossils, are regulated and, if anything, such regulations will increase in coming years. Here are just a couple examples. While common invertebrate and plant fossils are usually okay to collect, no vertebrate fossils may be collected on federal lands without special permits, which are usually only granted to scientists conducting a formal research study. Also, while plant fossils are usually okay to collect, no more than 25 pounds of petrified wood, plus one piece, may be collected in a single day, up to a limit of 250 pounds per year. No collecting of any sort is allowed within National Parks.

Whether searching for fossils, rocks, or minerals, always secure necessary permits and be aware of special regulations. For instance, if collecting in a National Forest (as distinct from a National Park), you're not allowed to do more than surface collect (no digging or otherwise disturbing the natural features of the land) and you need to purchase an "Adventure Pass" to park on national forest land. To collect on private property, obtain permission and make arrangements with landowners well in advance of your trip. With a large group, you'll likely be required to sign a waiver or liability release form promising not to damage property and absolving property owners of any responsibility for accidents. In fact, you're likely to get a better reception if you approach a property owner with such a waiver already in hand and with evidence of insurance coverage through your regional Federation. (See Back-up pages for Activity 8.3 for sample liability release forms.)

In selecting your field trip site, avoid areas with obvious hazards (high-traffic road cuts, steep bluffs, thick clumps of poison oaks, etc.). Remind kids to dress in appropriate outdoor clothing, sturdy shoes, and a hat, and before you go, explain any ground rules. Then, remind kids of those rules once you arrive. Kids have boundless enthusiasm and energy, especially if they've been cooped up in a bus or car. If parking near a roadway, be sure your car is fully off the pavement when you arrive, then watch out for kids rushing up steep slopes of loose talus. Don't let rocks get tossed into a roadway—or toward other kids! Don't undermine overhangs, and don't leave unfilled holes. Do make sure an adult in the group knows first-aid and has a fully stocked first-aid kit close at hand, with a cell phone and directions to the nearest hospital in the event of an emergency.

Before leading kids on a field trip, inform them of rules like these and also distribute and ask them to learn the A.F.M.S. Code of Ethics.

American Federation of Mineralogical Societies
Code of Ethics

- I will respect both private and public property and will do no collecting on privately owned land without permission from the owner.
- I will keep informed on all laws, regulations or rules governing collecting on public lands and will observe them.
- I will, to the best of my ability, ascertain the boundary lines of property on which I plan to collect.
- I will use no firearms or blasting material in collecting areas.
- I will cause no willful damage to property of any kind such as fences, signs, buildings, etc.
- I will leave all gates as found.
- I will build fires only in designated or safe places and will be certain they are completely extinguished before leaving the area.
- I will discard no burning material - matches, cigarettes, etc.
- I will fill all excavation holes which may be dangerous to livestock.
- I will not contaminate wells, creeks, or other water supplies.
- I will cause no willful damage to collecting material and will take home only what I can reasonably use.
- I will practice conservation and undertake to utilize fully and well the materials I have collected and will recycle my surplus for the pleasure and benefit of others.
- I will support the rockhound project H.E.L.P. (Help Eliminate Litter Please) and will leave all collecting areas devoid of litter, regardless of how found.
- I will cooperate with field-trip leaders and those in designated authority in all collecting areas.
- I will report to my club or federation officers, Bureau of Land Management or other authorities, any deposit of petrified wood or other materials on public lands which should be protected for the enjoyment of future generations for public educational and scientific purposes.
- I will appreciate and protect our heritage of natural resources.
- I will observe the “Golden Rule,” will use Good Outdoor Manners, and will at all times conduct myself in a manner which will add to the stature and Public Image of Rockhounds everywhere.

Revised July 7, 1999 at the AFMS Annual Meeting

Back-up page 8.2: Field trip planning.

Choosing a Field Trip Locality

In choosing a locality, select sites relatively rich in minerals or fossils. By nature, kids are impatient and will want to start finding "stuff" right away. Your goal, after all, should be to foster enthusiasm, not to tax their patience. If you don't know of suitable exposures in your immediate area, ask around at a local college. Many college geology departments have road logs for earth science field trips. Three publishers have extensive series of guidebooks covering many states in the US: Mountain Press of Missoula, Montana, publishes the Roadside Geology Series; Gem Guides of Baldwin Park, California, publishes the Gem Trails series; and Falcon Press of Helena, Montana, publishes The Rockhound's Guide series. In addition, state geological surveys often have guidebooks to their states or individual educational reports and road logs on specific mineral or fossil localities. The U.S. Geological Survey web site (http://www.usgs.gov/) has a handy map that allows you to click on your state for regional geologic information.

Field Trip Supplies

Different localities have different materials and, therefore, different requirements in terms of the tools and supplies necessary for collecting. Select the materials appropriate to the site you'll visit. The following list is meant to be representative, not exhaustive:

Protective clothing and sturdy hiking boots
Detailed area maps and compass
Backpack or rucksack
Rock hammer, rock pick, sledge hammer
Chisels, gads, pry bar
Shovel, trowel, hand rake
Sifting screens
Pocket knife
Paint brushes and toothbrushes
Hard hat if in a quarry or elsewhere with a danger of falling rocks
Wide brimmed hat to protect against sun exposure
Heavy work gloves
Shatterproof goggles if hammering rocks
Toilet paper, paper towels, newspapers, bubble wrap for wrapping delicate specimens (the toilet paper comes in handy for other reasons while in a remote field location…)
Masking tape
Small storage boxes and ziplock baggies
Cardboard flats or other boxes or containers for transporting specimens
Cards for writing locality info to wrap in the field with your specimens
Magnifying glass or hand lens
Spray bottle of water to check for potential lapidary material
Field notebook and pencils/pens to record info about a site
Camera and film to keep a visual record of a site and specific collecting horizons
First aid kid
Plenty of water and food and, if going overnight, camping gear

Back-up page 8.3: *Taking a field trip*

Note: ***this activity is required to earn this badge*.**

The first step in taking a field trip is planning. You should follow the recommendations in Back-up page 8.2 for selecting a field trip site and choosing the appropriate supplies. You should make a map and write out clear directions to the site, along with a list of recommended tools and materials to bring, and distribute this to field trip participants.

And you should know how many people you'll be leading on the trip. A trip with just a few participants is a lot less intrusive—especially on a rancher's private land—than a trip with 30 or 40 participants. The larger the group, the more management concerns to consider, and the more adults you'll need to help chaperone. So get a clear idea as to the size of your group by circulating a field trip sign-up sheet. (See example within the following pages.)

It's usually a good requirement to have one or both parents accompany their kids on a field trip. If they can't, any absent parents should sign a permission slip and liability release, providing phone numbers where they may be reached during the time you'll be on the trip, and you should let them know when you'll return and where to call in case of questions. Everyone (kids and adults) participating in a field trip should also sign a personal injury and liability release form. Finally, during the trip itself, it's best to use the buddy system with two kids always together in case one is injured.

Following is a series of forms to assist you in planning and conducting a group field trip.

FIELD TRIP SIGN-UP SHEET

Trip location:_____ Trip date:_____

NO.	NAME (PLEASE PRINT)	HOME PHONE
1		
2		
3		
4		
5		
6		
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8		
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34		
35		

(This form courtesy of Richmond Gem & Mineral Society)

PERSONAL INJURY & LIABILITY RELEASE FORM

TO:_____

Name of Company, Quarry, Mine, or Property Owner

SUBJECT: Release of the above named from any responsibility should personal injury or property damage occur while visiting, collecting, or otherwise being on the property owned or operated by the above.

INSURANCE: The_____

Name of Club or Society

is covered by a blanket policy issued to the California Federation of Mineralogical Societies that covers Bodily Injury and/or Property Damage. A copy of said policy can be made available upon request.

We the undersigned hereby waive any right to make claim against the host for any injury or property damage that may occur while a guest on property owned or operated by the host company or landowner.

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

(This form courtesy of Richmond Gem & Mineral Society)

LIABILITY RELEASE
(Place the name of your club here)

To whom it may concern:

I, the undersigned parent or guardian, do hereby give permission for _____ to participate in the events as scheduled by the youth advisors of the (insert the name of your club here).

It is understood that any personal loss or injury, should such occur to _____ while a participant in the scheduled activity remains our responsibility and that no claim may be made against either the advisors or the (insert the name of your club here).

It is further understood that the blanket insurance policy for the society covers the third party (i.e., host or property owner) should damage occur while a guest on said premises during a scheduled field trip by (insert the name of your club here).

Should emergency first aide or medical attention be needed while _____ is participating in the scheduled activity, permission is granted to attend to the need. Our own health and accident insurance is carried with_____.
(Name of Insurer
and the policy number is_____.

I/we can be reached by telephone at _____home or_____office.
If unable to reach anyone, a third party may be called_____.
(name and phone number)

Signing this release signifies validation for as long as the above named child remains a member in good standing of the (insert name of your club here).

_____

_____
Signature of Parent(s) or Guardian

_____
Date

(This form courtesy of Richmond Gem & Mineral Society)

Back-up page 8.4: Record keeping.

Much of the value of a mineral or fossil lies in its context: where did it originate, and what might that tell us about its formation and about its place within the overall geology of a region and its geologic history? While a gemstone may hold intrinsic value and economic worth even if its ultimate source is unknown, a fossil, especially, that lacks context lacks scientific value and becomes a mere curiosity or a purely commercial object. Even a gemstone is further enhanced if it has a story behind it—if it's the "Moguk Ruby" or a "Virgin Valley Opal." Whether it's minerals, gemstones, or fossils, kids should be encouraged to look beyond economic value and the "gee whiz" factor of a neat object and to consider the scientific and educational value of what they collect.

Thus, kids should be taught and encouraged to maintain a field journal of what they did and what they found during their trips in a composition or spiral-bound notebook, three-ring binder, or other record book or on the computer. I do both. I've bought a small, sturdy, bound diary in which I can jot notes, make sketches, and rough out maps while in the field. Once home, I then transfer the information in a more organized fashion on the computer to print and maintain on three-hole punched sheets that can be inserted into a binder or manila folders for easy storage and easy reorganization as additional sheets accumulate. These records are used to pinpoint where rocks, minerals, or fossils were found so others could locate the spot—or so I can find it again years later in spite of an imperfect memory. They also augment sheets containing catalog information about each specimen (see Back-up pages for Activity 5.2 on cataloging and labeling a collection), additional information I find and photocopy about the geology or paleontology of a particular site, and sheets of slides or prints that I've photographed of a locality.

Kids should be encouraged to be as specific as possible in their record keeping. What are the directions to the site? What distinguishing (preferably permanent) landmarks might mark the site? (For instance, "a 30-foot red granite boulder" is much more likely to still be around 40 years from now as opposed to "a small, rotting log.") In this day-and-age, they can even provide precise GPS data. Was there a specific layer containing the fossil or mineral deposit? If so, how could others locate and identify that layer? What exactly did they find, and was it relatively abundant or scarce? Did they notice anything unique, such as certain minerals or fossils occurring together with other sorts of specimens, or on their own? The more detail captured, the better. Once in the field, the impulse is to collect, collect, and collect some more. But while collecting the rocks, kids should take the time to carefully collect information to accompany those rocks. These written records of their adventures can often be even more interesting than the rocks themselves!

Encourage kids to augment written entries with drawings, maps, and photos. I always make a camera and plenty of film an essential part of my collecting tools. In recording information about a locality, a picture really can be worth a thousand words. Plus, they come in useful in other ways, as in preparing a slide show for fellow club members, illustrating a bulletin board display, or providing visual relief and support in an article. (Most professional magazines require contributing authors to provide visually interesting photos if submitting an article for consideration.)

Back-up page 8.5: The indoor field trip.

Not all field trips need to be out into the field. In some places, all the hard work of searching, collecting, and cleaning rocks, minerals, and fossils has already been done, and the results are just waiting for you to see! Take your kids on a trip to one such locality, i.e., a college geology department or a science or natural history museum.

Many college geology departments have teaching collections, and—given that they are educational institutions—most are happy to oblige in guiding your kids through their collections if given sufficient advance notice. You should also try to arrange a question-and-answer session with one or more of the faculty on staff. Some departments have active public outreach efforts, so while visiting, you should strive to forge a long-term relationship with receptive faculty members who may be able to help you in an on-going manner with additional activities for your kids.

Museums—both the large, world-class varieties like the American Museum of Natural History and smaller, regional ones like the Santa Cruz City Museum—are terrific places to take kids. It's probably childhood trips to the Field Museum in Chicago, along with field trips sponsored by the Illinois State Geological Survey, that fanned my interest in the earth sciences. The most memorable visit, however, was one in which I was invited to tour not just the exhibitions on public display, but the treasures behind the scenes in none other than the Smithsonian. I vividly remember seeing tray after tray of shark teeth of all manner and variety being pulled and stacked in front of me until the stack was taller than I was. A mile-high row of such trays stretched down an aisle as far as the eye could see, or so it seemed. However large it really was, an impression was indelibly made!

Call in advance to arrange a group tour of a museum and most will assign a specific guide or docent to escort you and your kids. When calling, be sure to check into the possibility of a "behind the scene" tour in addition to the public displays.

The web is a great place to locate the nearest natural history museum. For instance, just a few seconds after typing "Natural History Museums" into the Google search engine, I found a long list of sites, with four that I explored in more detail. Each offered excellent and thorough listings of museums around the U.S. and the world, complete with links that take you to the museums' own web site:

http://www.lib.washington.edu/sla/natmus.html
http://www.ucmp.berkeley.edu/subway/nathistmus.html
http://members.aol.com/fostrak/museums.htm
http://dir.yahoo.com/Society_and_Culture/Environment_and_Nature/Natural_History_Museums/

9. Leadership

Learning to lead is an important skill that will benefit you far beyond this hobby of rockhounding. As you learn from your youth leader, we hope you will be inspired to take the initiative to become a leader yourself. As you develop and deepen your knowledge and skills gained through FRA activities, assist in teaching your fellow youth members and in helping your youth leader to decide which activities to pursue with the group. The following are intended to help you assume and develop a leadership role within your club.

Activity 9.1: Becoming a youth officer.
Become an officer within your youth group and help decide what topics and activities your group will do this year.

Activity 9.2: Organizing a group display.
Take charge of organizing a group pebble pup display at your club show or at another venue, such as a library display window.

Activity 9.3: Leading a show-and-tell session or presentation.
Lead a group show-and-tell session, presentation, or symposium to adult members of your club.

Activity 9.4: Planning and leading a field trip.
Plan and lead a field trip.

Activity 9.5: Overseeing a newsletter column or an entire youth newsletter.
Oversee a monthly column for a year in your club's newsletter or start and edit your own junior members' newsletter.

Activity 9.6: Managing a youth activity booth at a local gem show.
Either on your own or working with adult members of your club, help to decide on activities to include in a Kids' Activity booth at your local gem show, and then help to run the booth during the show.

Activity 9.7: Mentoring.
Become a mentor to younger or less experienced members of your club, sharing your knowledge and experience with them in a specific project, such as how to craft a cab, how to build and curate a collection, etc.

9. Leadership

□ 9.1 Becoming a youth officer

□ 9.2 Organizing a group display

□ 9.3 Leading a show-and-tell session or presentation

□ 9.4 Planning and leading a field trip

□ 9.5 Overseeing a newsletter column or an entire youth newsletter

□ 9.6 Managing a youth activity booth at a local gem show

□ 9.7 Mentoring

To earn your Leadership badge, you need to complete at least 3 of the 6 activities. Check off all the activities you've completed. When you have earned your badge, sign below and have your FRA leader sign and forward this sheet to the AFMS Juniors Activities chair.

_____
Date completed

_____ _____
My signature Youth leader's signature

_____
Name of my club

Leader's preferred mailing address for receiving badge:

_____

_____

_____

Back-up page 9.1: Becoming a youth officer.

Building leaders is essential to the future of our clubs, providing the guidance, ideas, and inspiration that keep us all going. It's never too early to start cultivating the leaders of tomorrow! You should think about assigning or electing youth officers, especially if you have older kids within your group. The overall structure might mirror the offices of your adult club, but with fewer positions and fewer demands. Adjust the type and number of offices to the ages and abilities of the kids in your group and the size of your group.

If you have a large number of older kids who prove enthusiastic and ambitious, some basic offices to consider might be a youth group President to oversee meetings and to help decide what topics and activities to pursue for the coming year. A Recording Secretary would keep notes from meetings to outline, distribute, and archive and to include in the regular club newsletter. A Treasurer could help lead efforts to raise funds to be used for special youth events and might help run the youth activity booth at your local gem show (see Activity 9.6). A Newsletter Editor might oversee constructing a youth newsletter or a youth section of your club's regular newsletter (see Back-up page for Activity 9.5). A Field Trip coordinator could help decide on two or three special trips for the kids in your club to organize and to take over the course of a year (for instance, an outdoor collecting trip during warmer weather and an indoor visit to a museum for the colder or rainier seasons).

If you have a small group with mostly young kids, you may end up appointing a single Youth Assistant from among the older, more mature kids within the group. Such an assistant might help give advice about activities to try in a group setting that he or she believes would be the most interesting to his/her friends and could help you come in early to do any advance preparations and set-up.

With all the demands kids have on their time today, however, don't overload them. This should be an enjoyable, rewarding experience, not a burden or a drudge.

Back-up page 9.2: Organizing a group display.

One thing I always look for at a local gem show—and more and more often am disappointed not to find—is a Pebble Pups group display. Frequently, members of neighboring clubs band together and enter a club display at shows of neighboring clubs, and the combined efforts and materials make for truly outstanding exhibits.

Similarly, while a single young child just starting out in the hobby may not have many pieces in his or her collection, the combined efforts of all the kids in a club can result in a great display that illustrates the range of individual interests and the overall scope of the hobby. The kids in any club should always be encouraged to put together such a group display—and it's even better if the kids themselves take charge of organizing and arranging it.

For any kids who volunteer to oversee such an effort, you should lend advice and assistance as requested and should the need become apparent. Hold a meeting with the kid/s organizing the effort to discuss how to go about it and share the Back-up pages for Badge 6 – Showmanship, especially Activity 6.1 on techniques for effective displays. Among the procedures they'll need to consider are:

- Should we have a theme (for instance, fossils, or the many varieties of quartz, or local rocks and minerals)?
- How and when will we gather together material from our fellow club members?
- Where and when will we all meet to talk about how best to arrange our display?
- Where will we get our case and when will we set it up?
- What will we need for set-up (e.g., liners, risers, display stands, etc.)?
- Will we make uniform labels or ask that everyone bring their own labels?
- How will we keep track of everyone's individual specimens?
- How and when we will return everyone's specimens?

The easiest place to assemble such a group display is at the club's annual show. However, search out other public spots within the community, as well, such as the local library, public schools, local museums, or perhaps a friendly jewelry or crafts store owner.

Back-up page 9.3: Leading a show-and-tell session or presentation.

Kids expressing an interest in leading a group show-and-tell session, presentation, or symposium should be provided with the Back-up pages for Badge 7 – Communication, especially for Activity 7.1 – Oral report and Activity 7.5 – Holding a symposium.

Show-and-tell sessions are the easiest to arrange and ought to be organized around a theme. Here are just a few ideas:

- Things I collected on our most recent club field trip.
- Things I purchased at our annual club show.
- What I've made at our club workshop.
- My most valuable specimen and why I like it.

While a free-flowing show-and-tell session can more-or-less run itself once it gets going, a full-scale symposium can take a great deal more planning. If your junior member chooses to go this route, be sure to take the time to review Back-up page 7.5, and then—have fun!

Back-up page 9.4: Planning and leading a field trip.

A youth member expressing a desire to plan and lead a field trip should first exhibit complete familiarity with Badge 8 on Field Trips and should have earned that badge before undertaking this activity. Share all Back-up pages from Badge 8.

Back-up page 9.5: Overseeing a newsletter column or an entire youth newsletter.

When I belonged to the Carmel Valley Gem and Mineral Society in California, we had one youth member who was dinosaur crazy. It was the same time that *Jurassic Park* hit the scene, and you couldn't round a corner, walk into a grocery store, or turn on the television without seeing a dinosaur. Bob, or "Dinosaur Bob" as he came to be known, took the initiative to start his own "Fact of the Month" column in the regular club newsletter, a column devoted solely to the topic of fossils (usually dinosaurs) and graced with his own dino drawings. You should encourage a similar child or youth with a passionate interest in the hobby to do the same.

You could either have a single youth correspondent who pens a monthly column or you could establish a Youth Column and encourage kids to take turns contributing to it. To make the column stand out, you should place it at the same spot in each issue of the newsletter, where it's easy to flip to—such as the last page or a middle fold.

Dinosaur Bob had a theme going for him, making it easy to come up with topics each month. His columns usually started with a simple question that grew into a short essay: What color were dinosaurs? Were dinosaurs warm-blooded or cold? How did the dinosaurs die? A year-long series of mineral columns can evolve from focusing on the birthstone of the month. A lapidary column might take the form of a Dear Abby column, addressing such vexing questions as, "One writer asks, 'Why won't my jade take a decent polish?'" "How do you avoid flat spots on a cab?" You might establish themes like these, or simply allow kids to write what tickles their fancy at the time.

Warning: *don't undertake the following unless you're willing to commit a great deal of time!* If you have a truly enthusiastic bunch of kids, including some real wordsmiths, a great project is pulling together a full-scale juniors newsletter—a newsletter by and for fellow junior members. A terrific model is the "Mineral Mites Bulletin" inaugurated by Ismael Sanchez, Advisor to the "Mineral Mites" of the Kern County Mineral Society in Bakersfield, California. Their newsletter consists of the Advisor's Report (written by the adult youth leader), the Assistant Advisor's Report, juniors officers contributions, an events calendar, a "Mineral of the Month" column, old clippings from articles in the KCMS club and other rock club newsletters, jokes, poems, games, juniors activities (for instance, learning about mining with a chocolate chip cookie!), notice of awards for Mineral Mites accomplishments, and Federation reports. In addition to contributions from the Mineral Mites officers, all junior members are encouraged to become involved in the publication. It's printed in four color and includes wonderful clip art and photos. A truly outstanding effort.

However, if you have just a small group and limited resources, even a much smaller effort can prove to be a lot of fun and a great learning experience for your kids. You could put together a single-page monthly flyer or fold a sheet of paper and create a four-page mini-newsletter. But for even a modest newsletter, heed the warning posted above! A monthly newsletter just simply takes time and effort, no matter how long or short, and no two ways about it.

Back-up page 9.6: Managing a youth activity booth at a local gem show.

Every show should have a youth activity booth, and it's even better if youth are actually running it! One thing my own kids often eagerly volunteered for—even after they grew older and began to tire of the old man's fascination with rocks and fossils—was helping to run the youth activities booth at our annual show. They especially liked the part where you take money and spin the spinning wheel or sell a grab bag.

You should hold a meeting with kids to decide on what sorts of activities they'll want to sponsor and how much space they'll need. Here are examples of fun activities often seen at gem shows:

- A "Wheel of Fortune" spinning wheel, where every spin wins a rockhound prize of a mineral specimen, crystal, polished slab, fossil, etc., donated by club members. If you don't have a spinning wheel, a variation is to have kids draw a numbered ticket from a hat and match it to numbered specimens on a prize table.
- Grab bags filled with tumbled stones.
- Making fossils (see Activity 3.2).
- Sand-sifting with a screen or colander for small fossils and gemstones in a box of sand.
- A "Pirate's Treasure Chest" filled with tumbled stones from which kids get to pick an assortment.
- Black Sand Fun, where a container is filled with magnetic sand and a series of magnets.
- Making rock critters by gluing together flat or round stones and attaching eyes, pipe stem arms or antennae, etc., to make snowmen, caterpillars, bugs, etc.
- Rock painting, creating lady bugs, fat cats, and other creatures by painting on large, smooth flat or round stones with tempura.
- Coloring and drawing with coloring book pages of earth science scenes (available at children's bookstores, teaching stores, etc.) or on large sheets of paper rolled out on a table. (This activity should be free. In addition to having activities that kids pay for at a show, you should always have a few that any child can do free-of-charge, such as coloring and drawing or the Black Sand Fun.)

In addition to deciding on what activities to sponsor, kids should determine a budget, help get the supplies they'll need (relying as much as possible on donations from adult members and sympathetic local store owners within the community), and work on the layout and set-up of the Kids Activities Booth. They'll also need to draw up a work schedule so that all kids get a chance to rotate through overseeing various activities while still allowing time to enjoy the show themselves.

Back-up page 9.7: Mentoring.

Actually, if any of your kids have been taking the lead on the various activities outlined above, they've already most likely been mentoring!

Becoming a mentor means helping younger or less experienced club members, sharing one's knowledge and experience with them in a specific project, such as how to craft a cab, how to build and curate a collection, how to identify a mineral or fossil, etc. A mentor is someone who is always on hand, ready and willing to lend help and advice as a friendly and sympathetic colleague, someone who has already been through the ropes and who can share from experience.

As new kids join the club, you might consider formally assigning a "buddy" to them from among your more experienced club members—a mentor who shares whatever interest the new club member arrives with and who can help channel and cultivate that interest.

Rockhound Badge

Once you've completed six or more of the nine FRA badges, you will be eligible to receive an official "Rockhound Badge." This signifies your graduation from a Pebble Pup or Junior Member to a true, blue Rockhound.

Send a copy of your Achievement Checklist, signed by you and your youth leader, to the AFMS Juniors Chair, indicating the activities you've completed and the badges you've earned. Your Rockhound Badge will then be processed and approved and forwarded to your youth leader to award in a special ceremony.

If you wish to earn all nine badges, by all means, please proceed! The more you learn, the better. It will make you more fully versed in the hobby, and the more knowledge you gain in life, in general, the better.

In earning at least six of the nine badges, you will have demonstrated a well-rounded knowledge of the many facets of our hobby. We hope that, along the way, you will have picked up knowledge and skills you will enjoy for the rest of your life—all while having fun!

On behalf of the American Federation of Mineralogical Societies, congratulations!

Ideas for future badges if the program proves successful:

Organizing a Club Library

In many of our activities, I've recommended that you guide your junior members to a good book on a particular topic or activity. That in itself can become an activity for your junior members: building a library of reference books that can serve as a legacy for future junior member (and adult members!).

A well-rounded library would include books on rock collecting in general, on minerals, on fossils and paleontology, on guides to mineral and fossil collecting in your particular state, on lapidary arts, etc. Things involved with this might include:

1) Building a "library fund." Kids should know that things cost money, and if something is important enough, it's money well spent. Thus, kids should build a library fund via fundraisers among local members at club picnics or via a silent auction at a club meeting, at the juniors' activities booth at the club show, etc.
2) A "field trip" to a local bookstore (or to an on-line bookseller like Amazon or Barnes & Noble) to see what books they have available and to discuss them as a group before deciding which to buy. For instance, there are several general guides to minerals. Let the kids decide which seems most useful to them.
3) Deciding where the library is to be stored and how. One club has a nifty 3-shelf bookcase on wheels with doors that may be shut and locked to keep books from falling out if it's transported. Each year, a new club librarian is elected to house and oversee the collection.
4) Devising a checkout system for cataloging and monitoring the collection and deciding who is to oversee it (the adult youth leader, a junior librarian elected from among the kids, a librarian from adult members of the club, etc.).
5) Working with the local public library. Rather than trying to run a club library yourself, another option is working with the local library system. Talk with the librarian to see what books on geology, paleontology, and mineralogy might be of value for the community as a whole and arrange to purchase those books from your fund-raising activities to donate to the public library.

Do-Your-Own-Thing

An open-ended category to allow a junior member to take on a project we may have overlooked. They should develop a rationale statement and a description and then outline what will be involved in the activity for approval before undertaking it.