20. Maps

Our world is a complex, three-dimensional sphere. Maps "translate" our three-dimensional world into a flat, two-dimensional portrait, and different types of maps have been created to help us understand different things about our complex world. To earn this badge, you should demonstrate your knowledge of maps of different types, what each type tells us, and how to use them. You might also go on to learn about making a map, where maps may be found, and how to use electronic techniques involving GPS for finding your way around the world.

Activity 20.1: Learning about the different sorts of maps and how to read them.
Most of us think of maps in terms of taking us from Point A to Point B, but that's only one sort of many maps. Different sorts of maps tell different stories. There are roadmaps, geographic maps, geologic maps, topographic maps, weather maps, and others. Buy a book or pick one up at the library to learn about different sorts of maps and what each one tells us, or explore the Internet to learn about maps and mapping. Make a chart of common sorts of maps and their characteristics.

Activity 20.2: Sources of paper maps.
Learn about the different places where maps of different sorts may be found, then go out and get the map of your choice and demonstrate how to read and use it. Also, find out what companies and agencies publish maps.

Activity 20.3: Making maps.
Make a map of your choice. This could be a simple street map of your neighborhood, a roadmap showing how to get to a mineral or fossil site from your home, a topographic map showing the hills and valleys of a nearby park, or even a map of a room in your own home. How about a treasure map showing where you buried a can of crystals or tumbled stones? In crafting your map, keep in mind such considerations as orientation, scale, symbols, legend, and labels.

Activity 20.4: Using GPS.
What do the words "GPS" stand for? Find out, and learn how to use it. See if your club leader might take your group on a "geocaching" adventure!

Activity 20.5: Maps on the Web.
The World Wide Web has become a wonderful source for maps of all sorts, including ones that allow you to change angles of view, zoom in or out, fly around the world, and otherwise have fun in two and three dimensions. Explore the Web and report on what sorts of maps you can find there.

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□ 20.1 Learning about the different sorts of maps and how to read them

□ 20.2 Sources of paper maps

□ 20.3 Making maps

□ 20.4 Using GPS

□ 20.5 Maps on the Web

To earn your Maps 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 Program 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 20.1: Learning about the different sorts of maps and how to read them.

Maps are two-dimensional representations of different aspects of our world. Kids should learn about the different sorts of maps and what kind of information each conveys. For instance, here are a few types of maps kids are likely to encounter:

- *Roadmaps* show how to get from point A to point B on streets, roads, or highways. These are what most folks think of when hearing the word "map."
- *Political maps* show borders of countries, states, and regions, locations of capital cities, etc. Kids will see these in political science and history textbooks.
- *Geographic maps* may show both natural features (rivers, mountains, lakes) and manmade features (cities, roads, railroads), as well as artificial, political features (borders between countries and states).
- *Geologic maps* show the underlying geology of a region, highlighting different types of rocks and formations. These are very colorful, for a very practical reason. The colors have been standardized to tell readers specific information about the type of rocks and their ages. Geological time periods are further delineated by letter codes, for instance, capital J for Jurassic, with lowercase letters indicating formations.
- *Topographic maps* with concentric lines allow you to "read" the landscape. Each line corresponds to a different elevation and once you become adept at reading these, you can "see" the landscape in three dimensions. Many hiking maps are topographic maps so that hikers will know just how steep the trail ahead will be.
- *Weather maps* show weather patterns across geographic areas, with symbols indicating wind patterns, storms, high pressure and low pressure systems and fronts. Kids just need to tune into the local news report to see these, and they're also often seen on the back page of the newspaper.

Help kids learn more about maps by directing them to books about mapping and bring in different sorts of maps to show how they vary. (Back-up page 20.2 has sources of maps.) Many good books are available to purchase or to borrow through the library. Some can get fairly technical, but you can also find age-appropriate books at stores that cater to school teachers and sometimes at more general bookstores. Check with the store clerk to direct you to books about geography. Following are some I've found.

More advanced, technical books:

- Barnes & Lisle's *Basic Geological Mapping*, 2004.
- Maltman, *Geological Maps: An Introduction*, 1990.
- McClay, *The Mapping of Geological Structures, Second Edition*, 2003.

Books aimed at kids:

- Richard Panchyk, *Charting the World: Geography & Maps from Cave Painting to GPS with 21 Activities,* 2011. (Ages 9-12.)
- Tish Rabe, *There's a Map on My Lap! All About Maps*, 2002. Cat in the Hat's Learning Library (Ages 4-8.)
- Scott Ritchie, *Follow That Map! A 1st Book of Mapping Skills,* 2009. (Ages 4-8.)
- Sharon Thompson, *Map Skills,* 2003. (Grade 5.)

Back-up page 20.2: Sources of paper maps.

It used to be, you got your map at your corner gas station. But different places specialize in maps of different sorts. One of the biggest places folks turn to nowadays is the Internet, but we'll cover that in Activity 20.5. In this activity, the focus is on traditional paper maps. Here are a few places you can point kids:

- *Libraries*. The library can be your one-stop shop for maps of all sorts. Just ask at the front desk!
- *Geological Surveys*. The office of your state geological survey or department of conservation will contain geological and topographic maps, as well as maps showing mines and natural resources, and more. They usually have a catalog of maps of your state and its counties and townships, and you can often purchase them online or by mail or, if you're lucky enough to live close to the survey office, you can often buy them right there. Our national United States Geological Survey (USGS) is another source. In fact, on the opening page of its website, www.usgs.gov, is a map of the U.S.; click on your state, and you'll be led to local resources.
- *American Association of Petroleum Geologists.* AAPG offers geological maps including cross sections, tectonic maps, landform maps, and more; www.aapg.org
- *University Geology Departments*. If you have a nearby college or university with a geology department, see if they'll let you look through their large, oversized geological maps that are often stored in big, flat drawers.
- *Outdoors & Camping Supply Stores*. These stores often have maps of major parks and trails, including topographic maps, hiking maps, etc.
- *Bookstores*. Here's where you're most likely to find geographic and roadmaps, including the Thomas guide series, atlases, etc.
- *Gas stations & Convenience Stores*. Yes, you still can get roadmaps at the corner gas station, as well as at convenience stores, drugstores, and elsewhere.

A number of publishers and organizations specialize in making maps. These include:

- *National Geographic*. http://maps.nationalgeographic.com/maps
- *Rand McNally*. http://store.randmcnally.com
- *Thomas Guides*. http://www.thomasmaps.com (now owned by Rand McNally)
- *DeLorme*. http://delorme.com
- *American Automobile Association*. http://www.aaa.com

Back-up page 20.3: Making maps.

Host a map-making workshop with your juniors to make maps of different sorts. You might start by asking them to sketch a simple map of the room they're in, as if they were on the ceiling of the room looking down. Sounds simple, doesn't it? But wait! Here are some questions to pose and to consider:

How do they want to orient the room on the map? Where will north be? What features of the room do they wish to highlight? For instance, do they only want to highlight permanent features, such as doors, windows, closets, etc., or also temporary, moveable features, such as tables and chairs? What sort of scale do they want to use to convey the size of the room to someone who might read their map? That is, will one foot of the actual room be translated as one inch, a half inch, or a quarter inch on the map? Or, for the true scientists among us, will one meter be translated as one centimeter? If including things like chairs in the map, will they actually draw little chairs, or will they use a symbol like this, **H**, to represent each chair in the room? If so, they'll need to craft a legend to tell readers what each symbol stands for. At the bottom of that legend, they also should indicate the scale used for the map; for instance, "Scale: 1 inch = 1 foot." Finally, they'll need to consider labels, both a large label for the map as a whole to tell readers what room this map represents and possibly small labels within the map identifying major features of the room, like a closet or a fireplace. Begin familiarizing kids with mapping terms like **orientation**, **scale**, **symbols**, **legend**, and **labels**.

From this exercise of mapping their meeting room, expand out. For instance, you might lead them in making a geographic map of their own neighborhood highlighting various features of particular interest to the kids (Timmy's yard or apartment, MacDonald's, the ice cream shop…). Or, as a group, make a roadmap showing how you'll be getting to your next field trip collecting locality. Make a miniature hilly landscape out of moist sand in a large tub and insert rows of toothpicks at different levels, with all the toothpicks of specific levels joined together by different colored yarn or string to give kids a better appreciation of what the lines on a topographic map help us visualize. Then have them sketch a 2-dimensional topographic map using the toothpicks and strings on your miniature 3-dimensional landscape to guide them.

But don't confine the kids' imaginations. Let them determine the type of map they want to make, be it a "treasure map" to a tin can filled with tumbled stones buried in the backyard, a roadmap showing how to get to a mineral or fossil site from their homes, a topographic map highlighting the hills and valleys of a nearby park, etc.

The U.S. Geological Survey has neat, helpful sections all about maps and map making that you may want to explore. Go to http://www.usgs.gov and click on the "Education" link and start exploring all the resources they have to offer for free!

Note: *Kids who make a map to a collecting locality as part of planning for a field trip can use this activity to satisfy requirements toward earning the Field Trips badge simultaneously (Activity 8.2).*

Back-up page 20.4: Using GPS.

"GPS" stands for "Global Positioning System," a satellite-based navigation system operated by the U.S. Department of Defense. It allows for determining accurate positioning on the earth's surface in latitude and longitude coordinates aided by some two dozen satellites in space. Initially reserved for military and government use, a part of the system known as the Standard Positioning System, has become readily available for civilian use and now appears in navigation systems for cars, for general aviation pilots, for recreational hikers, and more.

You can use GPS to find your way around with a handheld GPS receiver device or even a smartphone, and learning to use GPS is an important skill in today's world. In fact, most gem, mineral, and fossil guidebooks are now including GPS coordinates along with basic roadmaps, and some books are entirely geared to GPS, such as David A. Kelty's *The GPS Guide to Western Gem Trails.* Keep in mind, though, not all published coordinates are precise, and I've been warned by Christina Morrissey of the Northwest Federation that there are three formats for coordinates. That is, the numbers can be expressed in three different ways, and they do not mean the same location. For instance, see coordinates of Delorme Gazetteers versus Benchmark Maps. Every GPS unit can be set to express each of these three formats, but the fact that they exist is rarely discussed.

One fun way to learn how to use GPS is geocaching, which has become an increasingly popular pastime. It's basically a treasure hunt or a variation on hide-and-go-seek. People all across the world (even Antarctica!) have hidden waterproof containers, called geocaches, and they've posted coordinates so that others can locate the hidden caches. When players find a cache, they'll often enter the date and their own "code" into a logbook in the container. Sometimes the caches also contain little trinkets for players to trade. Players then share their experiences online.

Dennis Gertenbach, leader of the Junior Geologists of the Flatirons Mineral Club of Colorado, recommended this activity to me. He has taken kids geocaching to an area where he also demonstrates how to use a topographical map. For more information on geocaching, Dennis refers us to the following website: http://www.geocaching.com. A good article entitled "GPS and Geocaching in Education" provides a nice, clear overview and introduction to this fun activity, along with some how-to video slide shows. Created by professors and graduate students at San Diego State University, it used to be available on the web, but I wasn't able to find it on my most recent search.

In addition to exploring the geocaching website, you might encourage kids to read Donald Cooke's book, *Fun with GPS* (2005). Written specifically for kids and illustrated with hundreds of pictures, it explains what GPS is and how they can use it. It's also filled with fun activities for kids to gain hands-on experience. As one way of fulfilling this badge unit, you might encourage them to try one of those activities.

Note: *Kids can use this activity to satisfy requirements toward earning the Rocking on the Computer badge simultaneously (Activity 15.5). If they go on a geocaching trip, they can apply that toward the Field Trip badge (Activity 8.3).*

Back-up page 20.5: Maps on the Web.

The World Wide Web has become a rich trove of increasingly sophisticated maps, from **MapQuest** programs that give driving directions and roadmaps and estimated drive times between destinations, http://www.mapquest.com/, to Google Earth, and more.

In particular, take your juniors to a computer terminal to explore the possibilities afforded by **Google Earth** at http://earth.google.com. This amazing tool combines the power of Google Search with satellite imagery, maps, terrain, and 3D buildings. Among the range of possibilities suggested on the web site: "fly" to one of your junior member's homes by typing in the address and pressing "search" to zoom right in. Get driving directions to a park or natural history museum. Tilt and rotate the view on a Google Earth map to see terrain and buildings in 3D. We've truly come a long, long way from the roadmaps—which I always found impossible to refold—at the corner gas station!

Another really neat website sponsored by the U.S. Geological Survey is **EarthNow!** Visit it at http://earthnow.usgs.gov. It consists of real-time, bird's-eye images of the Earth's surface being beamed down from Landsat satellites. You actually feel like you're in a spaceship, with the surface of the Earth scrolling away beneath you. To orient you, city and town names appear in blue text.

You can pursue this activity as a group exercise, or you can encourage kids to explore for maps of their own. Whichever way you go, have them each prepare a brief oral or written report about what they found. Their report should include: 1) the web address of the site and its title, if it has one; 2) a brief description of what's to be found on the site; and 3) a conclusion about why they would recommend the site to other club members.

Note: *Kids can use this activity to satisfy requirements toward earning the Rocking on the Computer badge simultaneously (see Activities 15.1, 15.2, 15.5), as well as the Communication badge (Activities 7.1 or 7.2).*