12. Gold Panning & Prospecting

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To earn your Gold Panning & Prospecting badge, you need to complete at least 3 of the 7 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:

_____

_____

_____

Back-up page 12.1: Gold as a mineral.

Gold is popular! You'll be able to find any number of books about it in a bookstore or at your local library to recommend to your juniors for learning about gold as a mineral. One example from my own home library is Joseph Petralia's *Gold! Gold! A Beginner's Handbook & Recreational Guide*. Also the U.S. Geological Survey distributes a free pamphlet written by Harold Kirkemo, William L. Newman, and Roger P. Ashley and entitled simply *Gold.*

Or direct kids to a general rock and mineral identification book, such as:

- Pellant, *The Complete Book of Rocks & Minerals*
- Zim & Shaffer, *Rocks & Minerals: A Golden Guide*
- Fuller, *Pockets Rocks & Minerals*
- Simon & Schuster's *Guide to Rocks & Minerals*
- Pough, *Rocks & Minerals: Peterson Field Guide*
- Chesterman, *National Audubon Society Field Guide to North American Rocks & Minerals*

A neat little book especially suitable for younger kids is Darryl Powell's *Gold! A Coloring and Activity Book for Young Prospectors.* In it, "Nugget the Gold Prospector" tells kids where gold is found, what it looks like, and why it's so valuable, all with large-format illustrations for kids to color and a quiz, crossword puzzle, and other activities at the end. You can get copies and current pricing by contacting Diamond Dan Publications, c/o Darryl Powell, (585) 278-3047, email diamonddan@rochester.rr.com, web site: www.diamonddanpublications.net.

Another golden mineral is iron pyrite, or "fool's gold." Here's how gold compares to iron pyrite by a variety of common mineral properties:

Property	Gold	Pyrite, "Fool's Gold"
Color	golden-yellow	brassy-yellow
Streak	gold-yellow	greenish-black
Cleavage	none	cubic & octahedral
Fracture	hackly	uneven
Luster	metallic	metallic
Hardness	2.5 – 3.0	6.0 – 6.5
crystal shape	isometric/cubic	isometric/cubic
specific gravity	15.6 – 19.3	4.9 – 5.2

Gold is one of the basic elements in chemistry: atomic number 79. In the periodic table, it's listed as Au, from the Latin word for gold, *aurum*. It's a "noble" metal, meaning it doesn't oxidize under normal conditions. By contrast, iron pyrite is a compound (iron disulfide, or FeS_2) made from the elements iron and sulfur. In the air, pyrite tends to decompose over time, reacting with oxygen and water to form sulfuric acid. While gold has many uses (see Back-up page 2.2), pyrite has just a few, such as the manufacture of sulfuric acid and sulfur dioxide, as an aid in the recovery of other metals (iron, gold, copper, cobalt, nickel, etc.), or to make inexpensive costume jewelry.

Back-up page 12.2: Uses of gold.

Gold has a pleasing heft to it and a brilliant shiny color that doesn't tarnish, corrode, or rust. It's a rare mineral (known as a "precious mineral"), and that rarity along with its shiny beauty gives it value. It's also a soft mineral. The most malleable and ductile of our metals, it can be beaten into sheets as thin as a few microns thick. Because it's so easy to work with, it has many uses, which further adds to its value. It also conducts heat and electricity very well. Have kids learn why gold is considered valuable and explore its many uses. Then encourage them to publish their findings in the club newsletter or give a presentation at a club meeting.

A good resource for this assignment is the web site of the Minerals Education Coalition, or MEC (http://mineralseducationcoalition.org). MEC is a nonprofit organization that provides educational programs to teach kids about the importance of natural resources, how we use them in everyday life, and where they come from.

To give you a start, here's a partial listing of some of gold's many uses:

- economics (gold is melted and formed into bricks or ingots and held in gold reserves by many nations, like the supply the U.S. keeps at the Fort Knox Bullion Depository)
- jewelry (this is where most gold ends up)
- medallions and coins (some medallions used as awards—such as Olympic Gold Medals or the Nobel Prize—are crafted from gold, and although we no longer do so, for thousands of years many countries used precious metals such as gold and silver in making their coins; the U.S. stopped using gold in common coinage in 1933)
- architecture (you'll see "gold leaf" on the domes of many state capitol buildings)
- dentistry (nearly 50 pounds of gold are used in dental work *every day* for procedures such as crowning teeth or for permanent bridges)
- medicine (a radioactive isotope of gold is used in some cancer treatments, and another variety has been used to treat rheumatoid arthritis)
- scientific and electronic instruments (gold has a pure, stable nature and seldom oxidizes or combines with other elements; due to this, as well as a good capacity for conducting electricity, gold is a key part of semiconductor circuits)
- the space program (for electronic components and to reflect heat off satellites and space capsules)
- the electro-plating industry (as an electrolyte)
- photography (gold toners shift black-and-white tones to brown or blue, and on sepia-tone prints, gold toners produce red tones)
- glass and acrylic coating (gold-coated acrylic windows are used in the cockpit of some airplanes to keep windows clear of frost and fogging and to help maintain temperatures in the cabin; it also coats visors in astronaut helmets; and the world's largest telescopes have mirrors coated with pure gold)

Note: *Kids who give a presentation or write an article can use this activity toward earning their Communication badge simultaneously (Activities 7.1 and 7.2).*

Back-up page 12.3: Gold throughout history.

Gold has been valued, sought, and fought over throughout history. Help your kids pick a specific event to research. Then have them share what they've learned with one another, give a presentation to the club, and/or write a brief report about it for the club newsletter. The Minerals Education Coalition (MEC) has a terrific little packet all about gold on their web site (http://mineralseducationcoalition.org) that you can download for free. It includes a timeline about gold through recorded history, as well as all sorts of other facts about gold, and even a coloring page of a prospector panning for gold in a stream alongside his trusty burro. Here are a few historic events you may wish to pick from to assign a topic, or you can let kids explore and find an event on their own:

- In the 14th century B.C., Tutankhamun ("King Tut") was pharaoh of Egypt, and when Howard Carter and Lord Carnarvon discovered his tomb in 1922, they found spectacular gold items that have come to be known as the "Treasures of Tutankhamun." Have kids find out what's included among those treasures.
- Have you heard the story of the Golden Fleece of Jason and the Argonauts in Greek mythology? The story is believed to have its roots in the practice of using sheepskin to recover gold dust from river sands feeding into the Black Sea in 1200 BC.
- In 300 BC, the Greeks and Jews of ancient Alexandria started the practice of alchemy, or the effort to turn common metals like lead into precious gold. The quest continued and intensified—to no avail—with Medieval alchemists.
- The lure of gold is said to have been one cause of the Second Punic Wars between the Roman Empire, which had few gold resources, and Carthage, which was expanding its colonial empire in Hispania, or gold-rich Spain, around 200 BC.
- In 1511, King Ferdinand of Spain launched massive expeditions of Conquistadores to bring back all the gold to be found in the New World; most was obtained by plundering Aztec and Inca treasuries of Mexico and Peru. It also led to quests for the mythical country of El Dorado, where the streets were said to be lined in gold.
- A gold rush started in North Carolina in 1803, sparked in part by the 1799 discovery of a 17-pound nugget by a 12-year-old boy in Cabarrus County. Before the discovery of gold in California, North Carolina had become known as the "Golden State," and prior to 1829, all the gold coined at the Philadelphia mint was from North Carolina.
- The Forty-Niner Gold Rush that brought so many adventurers to California and eventually led to California statehood started when flakes of gold were found in 1848 during construction of a sawmill for John Sutter along a river near Sacramento.
- The impact of gold discoveries in the Black Hills of South Dakota in the 1860s and 1870s led, among other things, to Custer's Last Stand.
- Another gold rush was sparked with discoveries in Cripple Creek, Colorado, in 1892.
- The discovery of gold by two prospectors in the Klondike of Canada's Yukon Territory sparked a rush into the cold regions of Western Canada and Alaska in 1898.

A couple of neat books geared to kids are Kalman's *Life in the Old West: The Gold Rush* and Diamond Dan Publications' *Gold! – An Activity Book for Young Prospectors.*

Note: *Kids who give a presentation or write an article can use this activity toward earning their Communication badge simultaneously (Activities 7.1 and 7.2).*

Back-up page 12.4: Gold resources in your own state or region.

Help kids learn about gold resources that may be found in them-thar hills of their own home state or region. Use the U.S. Geological Survey web site (www.usgs.gov) to guide you to information about mineral resources in your state.

Check bookstores and outdoor or camping supply stores for guides and maps to gold regions in your state. In bookstores, these are often found in sections selling field guides or regional books. In camping supply stores, these are often found in the maps and publications section. While most guides focus on gold-rich states like Alaska, Nevada, or California, you can find guides to many other states and regions. Wherever there's gold, there seems to be a book about it. For instance, here's a partial selection:

- Koschmann, *Principal Gold Producing Districts of Alabama, Georgia, Virginia, Pennsylvania, and Tennessee*
- Wendt, *Where to Prospect for Gold in Alaska Without Getting Shot!*
- Preston, *Arizona Gold and Gem Maps*
- Toole, *Where to Find Gold in California*
- Voynick, *Colorado Gold: From Pike's Peak Rush to the Present*
- Dwyer, *Lake Superior Gold: An Amateur's Guide to Prospecting*
- Stevens, *Memoirs of a Maine Gold Hunter* and other books by Stevens
- Klein, *Where to Find Gold and Gems in Nevada*
- Preston, *Nevada Gold and Gems Maps: Then & Now*
- Wilson, *Gold Panning in New Mexico: From Map Reading to Staking the Claim*
- Koschmann, *Principal Gold Producing District of New Mexico*
- Knapp & Glass, *Gold Mining in North Carolina: A Bicentennial History*
- Gerrick, *Gold Prospecting in Ohio*
- Beydler, *Virginia Gold Mines: The Golden Piedmont*
- Battien, *Gold Seekers: A 200 Year History of Mining in Washington, Idaho, Montana and Lower British Columbia*

Joseph Petralia's *Gold! Gold! A Beginner's Handbook & Recreational Guide: How & Where to Prospect for Gold* talks about the history of gold and prospecting methods, and then includes a chapter that gives a general idea as to where gold has been found in the Southeast, Rocky Mountain states, and the West.

In addition, look in back issues of *Rock & Gem* magazine. They publish an annual issue devoted to gold, and for a long time, they've been including as a regular feature maps to specific gold-panning locations at various accessible spots across the country. Check around for publications like these, whether in your local library, bookstores, camping supply stores, or your state geological survey or division of mines.

Note: *Kids who give a presentation on where gold can be found can use this activity toward earning their Communication badge simultaneously (Activities 7.1).*

Back-up page 12.5: Field trip to a gold mine.

We have approximately 30 major gold mines operating in a big-scale sort of way in our country, with most of today's U.S. gold coming from the states of Alaska and Nevada. But gold deposits have been found coast-to-coast, and there are a lot of smaller operations scattered across the country. Because it's so valuable, great efforts are made to recover even small amounts. Every time the price of gold spikes, new mines seem to sprout.

Check with your state geological survey or division of mines for any operating gold mines in your state and try to arrange a field trip to one if the mine owners will allow such a visit. You might need to go outside your own state and venture further into your general region, thus making for a longer two- or three-day field trip.

There are two major types of gold deposits, each requiring different mining techniques to retrieve the gold within: 1) **lode or vein deposits** in which gold is found where it precipitated along cracks and veins in the bedrock, and 2) **placer deposits** where gold has weathered out of its original lode or vein deposit and is often found mixed with sand and gravel laid down by stream channels and rivers.

In a lode deposit, mining involves blasting ore and crushing huge amounts of it to recover small amounts of gold. The crushed ore is heated or "smelted" to melt and release the gold, which is usually poured into bar shapes. In placer deposits, huge quantities of sand and gravel must be sorted and screened with the help of running water to retrieve gold nuggets. Gold is very heavy, with a density of 16 to 18 as compared to a density of about 2.5 of "waste rock" (the sand and gravel). This difference in density means that miners can use gravity to help separate gold from gravel by devices that agitate the rocks and collect the gold. Such devices include hand-held gold pans, rockers, and sluice boxes.

Gold is also recovered using various chemical procedures, such as amalgamation (where mercury, or quicksilver, bonds with gold from ore) or the cyanide process (where potassium cyanide is used to dissolve and recover gold from low-grade ore).

Note: *Kids can use this activity toward satisfying requirements toward earning their Field Trip badge simultaneously (Activity 8.3).*

Back-up page 12.6: Panning for gold.

See suggestions provided in Back-up page 12.4 on how to locate gold fields nearest you to arrange a panning trip with your club's juniors. You might need to go outside your own state and venture further into your general region, thus making for a longer, more ambitious two-, three-, or even four-day field trip adventure. ***A reminder:*** **always obtain permission from landowners before undertaking any field trip, especially when prospecting for a valuable resource like gold, and check to make sure the spot you're panning or prospecting is not under a claim.**

However, no matter how hard you look for a good local gold-panning locality, the unfortunate reality is that not every state is rich in gold resources. If the search for a gold-panning site within reasonable proximity for your kids comes up dry, a good alternative is to set up tubs of water on a backyard patio and pour in bags of gold concentrate. You can order these from many places through the web. In a search engine, just enter "gold panning concentrate" and a host of commercial sites pop up, many from California and Alaska. Prices ranges from "practice" bags at 2 pounds for around $15.00 to super-deluxe 20-pound bags at over $400. (I recommend the practice bags…) Here are just a few examples of the many sources you can find on the web to purchase gold panning concentrate, along with gold pans and other equipment:

- Minerals Education Coalition (http://mineralseducationcoalition.org). Click on the tab for the "MEC Store." They sell a "Gold Panning Kit" with gold concentrate, pan, instructions, etc., that was going for $15 when I last checked, as well as individual pans and individual bags of concentrate at reasonable prices.

- Gold Fever Prospecting (http://store.goldfeverprospecting.com/goldpanning.html). Get a variety of equipment, books, and concentrates from the California Motherlode.

A warning, though: these companies and offers seem to come and go. When I prepared the last edition of this AFMS/FRA Badge Manual, I listed four such sources. Half of those are no longer to be found on the web, so be prepared to do some web surfing for new companies and new sources of supplies.

At a recent gem show, I picked up a "Gold Panning Kit" in a little box being sold by a dealer specializing in educational specimens and kits, DVDs, books, and the like. This particular product is put out by GeoCentral of Mason, Ohio, www.geocentral.com. It's geared to ages 8 and above and includes everything you need: a seven-inch gold pan, bag of pay dirt, magnifying glass, pipet, tweezers, storage flask, and a panning guidebook with instructions. Best of all, when I checked it out, the whole kit was selling for just $10.00!

Some companies selling concentrate also sell equipment or provide a beginner's package like the one described above with concentrate, a pan, and instructions. Panning equipment usually includes a gold pan, hand lens, magnet, eyedropper (for picking up tiny gold flecks), vial, and a long screwdriver or other rod to dig out sediment in crevices.

Basically, gold panning involves combining sand and gravel with water in a gold pan and swirling and shaking so that the heavier grains of gold settle to the bottom while lighter sand and gravel is removed from the pan.

Here are just a few of the many good resource books about gold panning and prospecting:

- Butler, *Recreational Gold Prospecting for Fun and Profit* (1998)
- Koch, *Gold Prospecting and Placer Deposits: Finding Gold Made Simpler* (2013)
- Lagal, *The New Gold Panning is Easy: Prospecting and Treasure Hunting* (2003)
- Petralia, *Gold! Gold! A Beginner's Handbook and Recreational Guide* (1992)
- Walsh, *Treasure Hunter's Handbook* (2014)

Note: *Kids who go into the field to pan can use this activity toward satisfying requirements for their Field Trip badge simultaneously (Activity 8.3), as well as the Collecting badge (5.1).*

Back-up page 12.7: Metal detecting for gold, coins, and other artifacts.

People lose things all the time. Whether at a beach, park, playground, school yard, fairgrounds, sports grounds, or anywhere else where many people congregate, coins fall out of pockets, rings or earrings fall off, and other metal objects mysteriously disappear and fall to the ground to be buried in the sand or soil. Also, around especially old houses and fence lines people sometimes had trash heaps in the days before garbage trucks rolled up on a weekly basis. These are all great areas for kids to go out equipped with metal detectors to find man-made treasures. And they may want to go out to known gold fields for natural treasures. Using a metal detector, Australian Kevin Hillier found a 61-pound gold nugget that sold for over a million dollars!

Before kids pick up a metal detector, they should learn the "Code of Ethics" for detecting and respect all laws and property rights. A code has been developed by The Task Force for Metal Detecting Rights Foundation. Among other things, it states: "I will follow all laws relating to metal detecting on federal and state lands as well as any laws pertaining to the local areas I may be searching; I will respect private property and attain the owner's permission before metal detecting; I will recover targets in a way that will not damage or kill vegetation and I will fill in holes completely, leaving the area looking as it was; I will use common courtesy and common sense at all times." In just a few short months after I learned of this organization and code, however, their web site seemed to have disappeared. I did find it again by searching "metal detecting code of ethics." The code popped up on several sites, including http://www.whiteselectronics.com/the-hobby/knowledge-base/code-of-ethics.

A number of great websites introduce folks to metal detecting. Here are just a couple:

- http://gometaldetecting.com
- http://metaldetectingworld.com/how_to_metal_detect_p1.shtml

Just how expensive are metal detectors? I've found many models in the range of $400-$750. Those with more power and features tend to be in the $1,000 range, and professional grade models can be $2,000 or more. But don't despair! I did find one model that seems perfect for kids. The "Bounty Hunter® Junior Metal Detector" was listed (in January 2016) at just $69.99 and was on sale at Cabela's for nearly half that. So reasonably priced models do exist—you just need to shop around! A good website to help you is Metal Detector Reviews, a site devoted to listing, comparing, and reviewing metal detectors of all grades and brands: http://metaldetectorreviews.net.

A nice reference book for kids to read is Liza Gardner Walsh's *Treasure Hunter's Handbook* (2014). A good reference for adults is Garret Romaine's *The Modern Rockhounding and Prospecting Guide* (2014), which has a solid chapter on detecting supplemented with many good website recommendations. This book covers the whole rockhounding hobby, not just detecting, so it's great for your overall reference shelf.

13. Gemstone Lore & Legend

Because they're so rare and beautiful, gemstones and precious metals have always fascinated people. We give them as gifts to mark special occasions, like a diamond ring for an engagement or a gold watch for retirement. And many cultures have invested gems with mystical, magical powers and legends. These units let you explore gemstone lore and legend, and to compare legend against what contemporary science says.

Activity 13.1: Anniversary stones.
A 25^{th} anniversary is considered a silver anniversary and a 50^{th} anniversary is golden. Construct a list of all the gemstones and precious metals used to mark anniversaries from 1 to 100.

Activity 13.2: Birthstones and the Zodiac.
Each month is marked by its own "modern" or "traditional" birthstone or a "zodiac" stone. List birthstones for all the months of the year and find out as much as you can about your own birthstone.

Activity 13.3: Fabled gemstones.
Some especially large and valuable gemstones have been lost, stolen, and/or vested with supernatural powers or curses. Pick a famous gemstone and explore its history and any legends associated with it.

Activity 13.4 Gems in religion.
Whether the religion is Christianity, Judaism, Islam, Hinduism, Buddhism, or others, you're sure to find gemstones and precious metals mentioned in its holy books, including the Bible, Koran, Torah, etc. Pick a religious text and see what gemstones are mentioned and their significance.

Activity 13.5: Mysticism and minerals.
Many gemstone minerals have important scientific, economic, medical, nutritional, and artistic uses and value. In addition to valuing them for such practical uses, some people and cultures have assigned mystical or magical properties to certain minerals and gemstones. Pick a mineral or gemstone and explore what legend and lore says about its mystical uses and properties. Then compare that to what contemporary science says about the mineral.