

[View this email in your browser](#)



Message from the President

At last, fall is in the air. I have nothing against the other seasons in the mountains, but fall is my favorite with warm days and cool nights. It is a great time to get out into nature. I recently did a hike on the Full Moon-Richmond trail west of Ironton Flats. I did not find many minerals but did observe my first ever badger at timberline. And, great views of the Red Mountain area. This is a great hike even with the initial climb.





FUN

OPEN HOUSE!

DISPLAYS

Celebrating our 75th year

Sunday, September 25th

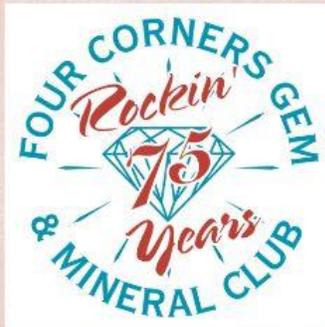
3:00 p.m. to 6:00 p.m.

At the Club House

2351 N Main Ave - Brookside Park

FOOD

SHOP TOURS



We would LOVE to have your presence at our September Celebration of our Gem Club! We are reaching out to the public and many potential community partners to show them what we are all about. Come be part of the fun!

RSVPs are very appreciated!

Please [email Melanie Gonzales](#) by September 20th with your name and approximate guest total.

Four Corners Focus

It has been a while since we advertised a Four Corners Focus, but we have shined the spotlight on Chayse Romero about mid-August and she will continue to shine for September as well! Chayse is one of our instructors and her classes fill up FAST due to popularity. That says something about her art, her talent and her as a person! [Please read about her story and the role our Four Corners Gem and Mineral Club got to play in it here.](#)

Upcoming September Board Meeting

As per our newly approved Articles of Incorporation and Bylaws, we will hold a Board Meeting once every two months starting with September 12th. These meetings are open to all members. You are encouraged to come and bring your ideas, suggestions and input, but only Board Members will cast votes. Please see our [Club calendar](#) to see when these meetings are scheduled.

Nominations and Elections

September is our month of seeking nominations to our Board of Directors for the upcoming elections in October. If you are interested in serving on the Board, [please let us know!](#) Our October meeting will be a member meeting where all FCGMC members will be voting on Board of Directors positions and any other Club business that needs to be put to a member vote. This is a crucial meeting to offer your input as a membership and attendance is highly encouraged!

Upcoming Classes and Events in September

Saturday, **September 10th**, 5:30 pm at Maria's Bookshop: Author Amy Ellwein will be signing her new book "Geology of the Colorado Western Slope." This tenth book in the Geology Underfoot Series offers an inside view of the uniquely enigmatic landscape west of the Continental Divide in Colorado. [More information here](#)

September 24th and 25th: Introduction and Practicing the Lost Wax Casting via Metalsmithing, **Saturday, September 24th from 9 am to 4 pm and Sunday, the 25th from 8:30 am to 2:30 pm**. A \$225 class fee covers all materials; \$100 down to reserve a seat. Contact Jaymus Perry at 970-422-2490 or www.artbonnet.com for more information or to get registered.

September 25th 3 pm to 6 pm: Open House celebration! [RSVP here by September 20th](#).

No field trips are planned for September yet, but there might be a unique and fun trip opening up in October and there are a lot of upcoming classes in October and November!

If you want to know more, visit the Club's calendar at www.durangorocks.org/events.html.



Open Shop Hours

Tuesday 1-4 pm

Tuesday 6:30-9 pm

Wednesday 9am-noon

Wednesday 1-4 pm

Thursday 1-4 pm

Thursday 6:30-9 pm

First & Third Saturdays 10am-2pm

Open Shop Punch Card

If you like using open shop, remember we have a punch card for multiple use. [Prepurchase](#) 10 visits for \$45 - a \$5 savings - and don't worry about having your "shop fee" when you come in!

Equipment Issues

It has come to my attention that the Genie has been damaged and needs maintenance. I will find some time to do that in the next few weeks, but the equipment will not be usable until then. The repair may require the purchase of new parts.

Please take extra precautions when using all of the equipment as it is expensive and time-consuming to maintain. If you are not trained on the

use of the Genie, please find someone who is experienced to help you learn.

Rock On: A “Dirty” Half Dozen: Six Minerals or Groups of Minerals with a Bad Reputation

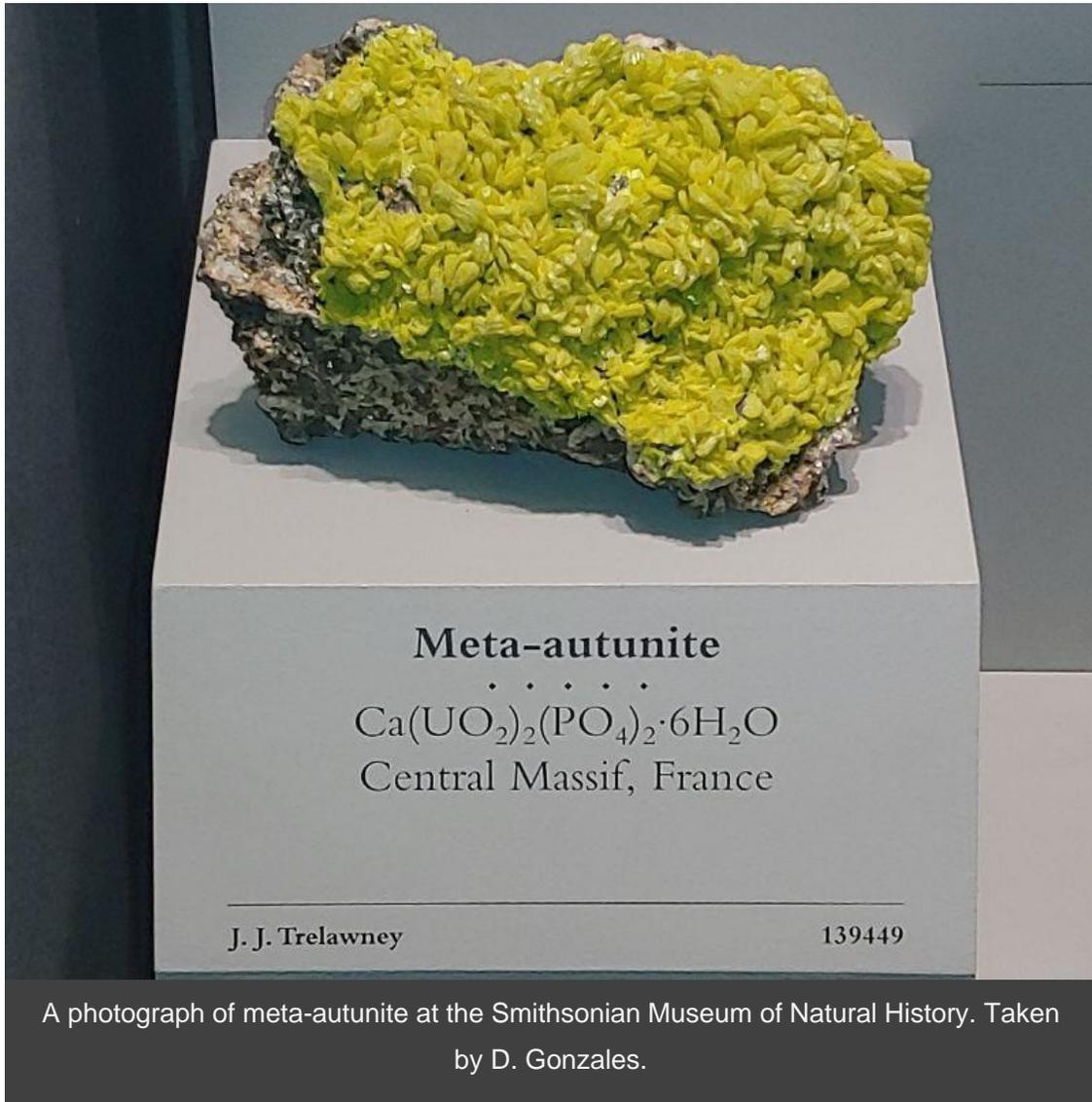
“Away! Thou’rt poison to my blood.” William Shakespeare

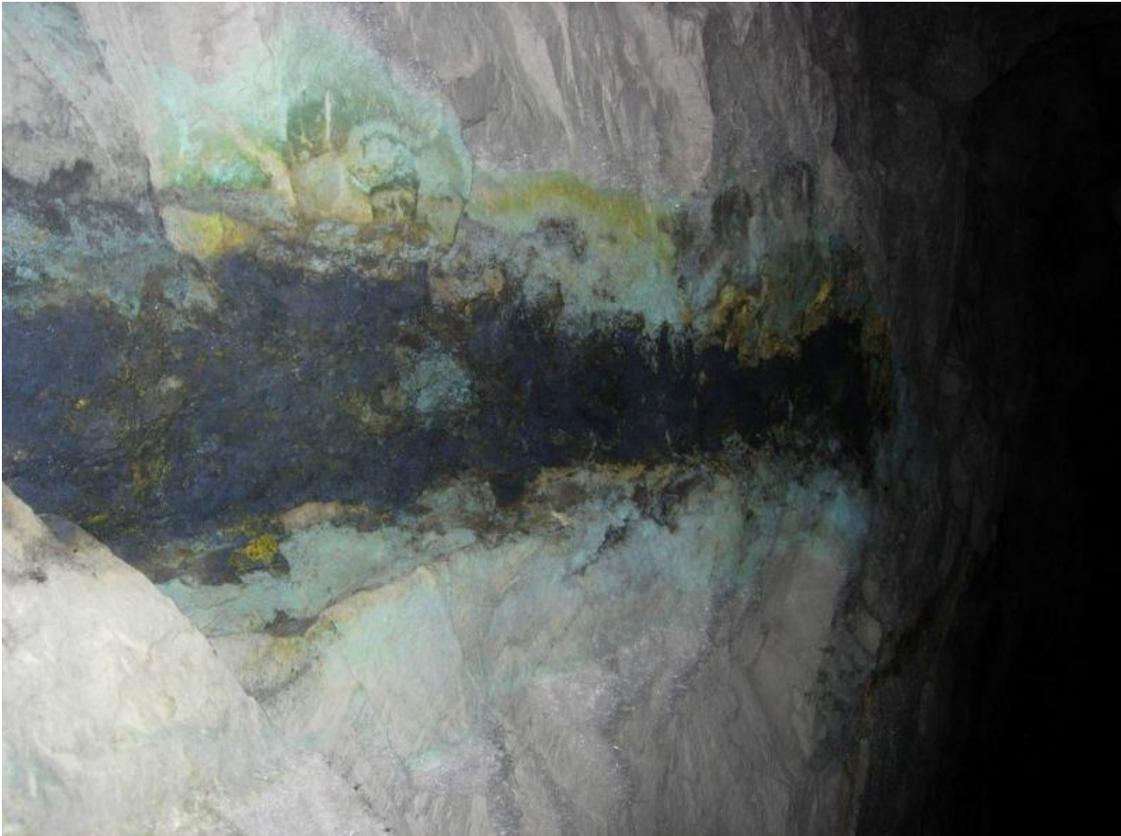
Several years ago, I compiled information on the twelve minerals or mineral groups with a “bad” reputation because of the potential harm they pose to humans and the environment. Specimens of the full dozen are on display in Sitter Hall at Fort Lewis College. Go check it out!! In most cases, the greatest potential harm happens when humans process minerals with certain elements or properties, but natural weathering and degradation of minerals can also lead to problems in the environment. Most of the minerals in the “dirty half dozen” have provided humans with incredible products, and the threats to humans and environment were often not realized because of a lack of knowledge or understanding about the potential consequences. Today, the industrial and technological uses of these minerals (and the elements they contain) are diminished or abandoned, but we still make and use materials that are created from some of them.

#1 URANIUM-BEARING MINERALS

Uranium (U), radium, and radon are naturally occurring radionuclides found in minerals and rocks. In nature, uranium occurs in many minerals (e.g., zircon = $ZrSiO_4$) in small concentrations. Some minerals such as uraninite (UO_2), carnotite ($K_2(UO_2)_2(VO_4)_2 \cdot 3H_2O$), autunite $Ca(UO_2)_2(PO_4)_2 \cdot 10-12H_2O$, and coffinite ($U^{4+}, Th(SiO_4)_{1-x}(OH)_{4x}$) contain much higher concentrations of uranium. Uranium decays over time to more stable elements (lead) by releasing alpha and beta particles, and gamma rays. In most rocks the concentrations of uranium are rather low, but when the rocks are milled, processed, and concentrated (example “yellow cake”), the uranium concentrations are considerably higher. The mining boom in the Four Corners region that started in the 1940’s to deliver uranium for the production of nuclear weapons left impacts on the environment and human health. Inhalation of uranium-laden dust can cause inflammatory reactions in the nasal passages and kidney damage, respiratory effects, lung disease, and cancer. Exposure to uranium may cause lung cancer and tumors of the lymphatic and hematopoietic tissues. Yes,

uranium-bearing minerals can be harmful, but it is the radioactive clocks that are created in mineral such as zircon is one natural system that allows geologists to give rocks "birthdates."





A deposit of uraninite with secondary carnotite (yellow) and unidentified green mineral hosted in sandstone at the Centennial Mine near Lisbon Valley, Colorado. Photograph by D. Gonzales.

#2 PYRITE & OTHER MINERALS CONTAINING SULFUR

Pyrite is a major contributor to acid drainage associated with exposed sulfide-bearing rocks, mine workings, and mine-rock waste piles. The creation of acidic water is a natural process that is accelerated and enhanced when ore-bearing rocks are extracted during mining. The “red” of Red Mountain is an example of the natural weathering process on a larger scale. When you hear the term “acid-mine drainage” then you know pyrite is the principal culprit. The production of acidic waters is a challenging environmental problem in nature and the minerals-extraction industry. The oxidation of pyrite from contact with water and air along with the action of bacteria, converts the pyrite (FeS_2) into ferric sulfate (FeSO_4). Continued chemical reactions produce sulfuric acid

(H_2SO_4). In fact, pyrite was once mined in Rico, Colorado for the production of sulfuric acid. The creation of sulfuric acid from weathering of pyrite can further pollute water systems when other minerals are altered and release harmful elements into the environment (e.g., arsenic, cadmium, and lead). Acidic waters also destroy the creations of humans, such as buildings and machines made with iron and steel.



Large specimen (about 3 feet long) of pyrite from the Rico mining district housed at the Western Mining Museum in Colorado Springs, Colorado. Photograph by D. Gonzales.

#3 GALENA AND OTHER LEAD-BEARING MINERALS

Galena (PbS), anglesite (PbSO_4), and cerrusite (PbCO_3) are principal sources of lead (Pb, Plumbum) in nature. In most natural settings galena is relatively insoluble, but under certain conditions it weathers and degrades to more soluble

anglesite and cerrusite which can undergo rapid dissolution and release of Pb into the environment.

Humans and lead have a long history, in part because lead minerals are encountered when mining silver-rich deposits. Over the course of human history, the many industrial and domestic applications of lead resulted in its widespread dispersal. Lead was or is used in plumbing, food preparation, ammunition, fishing sinkers, winemaking, ceramics, paint, car batteries, and printing. Dangerous levels of lead found in drinking water in Flint, Michigan, is an example of the mass exposure of Pb introduced into municipal water systems. Exposure to lead in humans happens by: 1) inhaling lead-contaminated dust, especially from painted surfaces; 2) eating paint chips or soil containing lead; or 3) drinking lead-contaminated water or food; 4) consuming food and beverages from dishware that contains leaded glaze or glass; and 5) use of "leaded" gasoline in the past. Lead poisoning can cause developmental and nervous-system disorders, especially in fetuses and children. Lead accumulates in our bodies where it attacks the peripheral and central nervous systems causing neuropathy, abdominal pain, insomnia, lethargy or hyperactivity, damage to the brain and nervous system, muscle and joint pain, reproductive problems, and in extreme cases it can cause seizures and death.



A mass of galena from the Brushy Creek mine in Missouri weighing 2155 pounds. This specimen is housed at the National Mining Hall of Fame and Museum in Leadville, Colorado. Photograph taken by D. Gonzales.



A vein of galena + tetrahedrite + siderite + calcite in a mine drift of the U.S. Galena and Silver mine near Wallace, Idaho. Photograph taken by D. Gonzales.

4 CINNABAR AND OTHER MERCURY-BEARING MINERALS

There is long and interesting history of humans and mercury (Hg, Hydrargyrum). Mercury is found in small concentrations worldwide in soil, rocks, and water. In nature it is a main ingredient in cinnabar (sulfide), native mercury (silver-gray liquid), and coloradoite (telluride). These natural products are common in volcanic hot springs, and hydrothermal systems and related mineral deposits. The city of Almaden in Spain has historically been one of the largest producers of mercury from cinnabar and native mercury. Mercury is one of the most lethal industrial pollutants. In the past, the many products and applications (e.g., thermometers, barometers, switches and relays) of liquid mercury or “flowing metal” caused it to be widely used and

distributed. Cinnabar was used in the past to produce brilliant red paints and bright orange pigment on ceramics, murals and tattoos. Native mercury is very insoluble in most natural scenarios, but when oxidized it can be methylated by sulfate-reducing bacteria, producing methyl mercury and dimethyl mercury, two of the most toxic compounds known to humans. Native (metallic) mercury primarily causes health effects when it is breathed as a vapor and absorbed through the lungs, but it can also be absorbed through the intestines or skin. Mercury (often in the form of methylmercury) can accumulate in fish and shellfish which are then eaten. Almost all people have at least trace amounts of methylmercury in their tissues, reflecting methylmercury's widespread presence in the environment and people's exposure through the consumption of fish and shellfish. Symptoms of mercury poisoning include muscle weakness, tremors, emotional changes, weakness and muscle atrophy, "pins and needles" feeling in hands and feet, headaches, loss of cognitive functions, neuropathy (loss of feeling and paralysis), impairment of speech and hearing, problems with vision, loss of coordination of movements, insanity, paralysis, kidney effects, respiratory failure, and even death. Erethism (erethism mercurialis), "Mad Hatter disease", or "Mad Hatter syndrome", is a neurological disorder which affects the whole central nervous system, derived from mercury poisoning. Historically, it was common for England felt-hatmakers in the 19th century to use mercuric nitrate in the production of felt for hats which exposed them to the effects of mercury poisoning.



Photograph of cinnabar from the Tongren mine, Bijang district, Guizhou, China (mindat.org).

#5 ARSENIC-BEARING MINERALS

The mention of the word “arsenic” conjures visions of the Victorian period, when arsenic was the poison of choice. Despite its fearsome reputation, the element arsenic (As, Arsenicum) is relatively common (but very minor) in nature. Native arsenic and arsenic-bearing minerals are relatively uncommon but are concentrated in some ore deposits, hydrothermal vents, fumaroles, and hot springs. Minerals containing arsenic include orpiment (As_2S_3), realgar (AsS), arsenopyrite (FeAsS), enargite (Cu_3AsS_4), and tennantite ($\text{Cu}_{12}\text{As}_4\text{S}_{13}$). Arsenic is released into the environment through natural activities such as volcanic action, erosion of rocks, or forest fires. Industry practices such as copper smelting,

mining and coal burning, and application of fertilizers have also contributed to the distribution arsenic in the environment. Weathering of arsenic-bearing minerals releases soluble arsenic into aquatic systems, and heating of arsenic-rich minerals produces toxic fumes. Arsenic was used in many different products through human history including medicinal potions, arsenical bronze, pigments and colorants such as “Scheele’s Green”. Approximately 90 percent of industrial arsenic in the United States was used in wood preservatives, but arsenic is (or was) also applied in paints, pesticides dyes, metals, drugs, soaps and semi-conductors, food coloring for sweets and beverages, and a stimulant for human metabolism. Arsenic is a powerful toxin used in poisons such as “Aqua Tofana” and “La Cantarella” and supposed health potions such as “Fowler’s Solution”. Long-term exposure to arsenic is linked to cancer of the bladder, lungs, skin, kidneys, nasal passages, liver and prostate. Non-cancerous effects can include thickening and discoloration of the skin, stomach pain, nausea, vomiting; diarrhea; numbness in hands and feet; partial paralysis; and blindness.



Drill core containing calcite + realgar (red) from the Turquoise Ridge mine, Nevada. Photograph taken by D. Gonzales.

#6 ASBESTOS MINERALS

Asbestos minerals commonly form in metamorphic rocks and are either phyllosilicates (micas) or inosilicates (amphiboles). The amphibole group of asbestos minerals are the most notorious for causing health issues in humans, but in many instances the term “asbestos” is used without any distinction in the variety. Several common minerals that were used in “asbestos” include chrysotile (white asbestos), crocidolite (blue asbestos), and amosite (brown asbestos). Crocidolite is considered by many to be the world’s most dangerous asbestos mineral.

Asbestos is known for its insulating properties and heat resistance and is used in products such as vehicle brake pads and shoes, roofing materials, and heat-resistant clothing and blankets, thermal and chemical insulation, fire-proof materials

for fire fighters, and manufactured tiles. The processing by humans, and the concentrations of fibers in raw processed “asbestos” and products, has a high potential for causing health issues. Asbestos is a well-known health hazard, and its use in building materials is banned in many countries. Exposure to airborne friable asbestos may have potential health risks because a person may breathe in asbestos fibers which get trapped in the lungs. Continued exposure can increase the amount of fibers in the lungs. Fibers embedded in lung tissue over time may cause serious diseases including asbestosis, lung cancer or mesothelioma. Even minor exposure to certain asbestos-mineral fibers (e.g., crocidolite) increases the risk of developing lung disease.



Chrysotile
Phillips Mine,
Arizona

Chrysotile asbestos from the Phillips mine in Arizona. Sample donated to Fort Lewis College by Chuck Baltzer. Photograph by D. Gonzales.

Some Sources of Information

1. Chaline, E., 2012, Fifty minerals that changed the course of history: Ontario, Canada, Firefly Books Ltd., 224 p.
2. Cooper, R. G., and Harrison, A. P., 2009, The exposure to and health effects of antimony: Indian journal of occupational and environmental medicine, v. 13, no. 1, p. 3–10. doi:10.4103/0019-5278.50716
3. Lenntech online, Periodic table, [Periodic table - chart of all chemical elements \(lenntech.com\)](http://www.lenntech.com/periodic-table/), accessed in 2019.
4. U.S. Environmental Protection Agency, Environmental topics, <https://www.epa.gov/environmental-topics>, accessed in 2019, Last updated on January 15, 2022.

September Birthstone (Virgo, August 23-September 22; Libra, September 23-October 22).

For the month of September, the traditional birthstone has the blues, sapphire blues. Sapphire is the blue variety of corundum (Al₂O₃) in contrast to the red variety known as ruby. Corundum, however, can come in a variety of colors, many of which are called sapphire. As noted by the Gemological Institute of America (GIA), sapphires have “been long associated with royalty and romance and are also said to symbolize fidelity and the soul.” The Greek work sappheiros is the source of the gems name.



“The famed Rockefeller Sapphire weighs 62.02 ct. Here it is flanked by two cut-cornered triangular cut diamonds, mounted in a platinum ring signed Tiffany & Co. Courtesy: Christie’s Images Ltd., 2015.” Photograph from [September Birthstone | Sapphire Birthstone History & Location | GIA](#)

Kashmir, Myanmar and Sri Lanka are important sources for the September birthstone along with Australia, Thailand, Cambodia, Madagascar and the Montana. Sapphire, like all corundum, is a common constituent of aluminum-rich metamorphic rocks and silica-poor syenite plutons. It can also form in the margins of ultramafic intrusive rocks, silica-poor and potassium or sodium rich mafic intrusive rocks, and some pegmatites.



Sapphire crystals from gravels in Ratnapura district, Sri Lanka. Photograph from <https://www.mindat.org/photo-77431.html>



Blue to colorless corundum viewed with a microscope under uncrossed polarization. Sample from the S. Andrea Granite, Elba Island, Italy. Photograph from [corindone\(elba\)\(9\).jpg \(800x533\) \(alexstrekeisen.it\)](#)

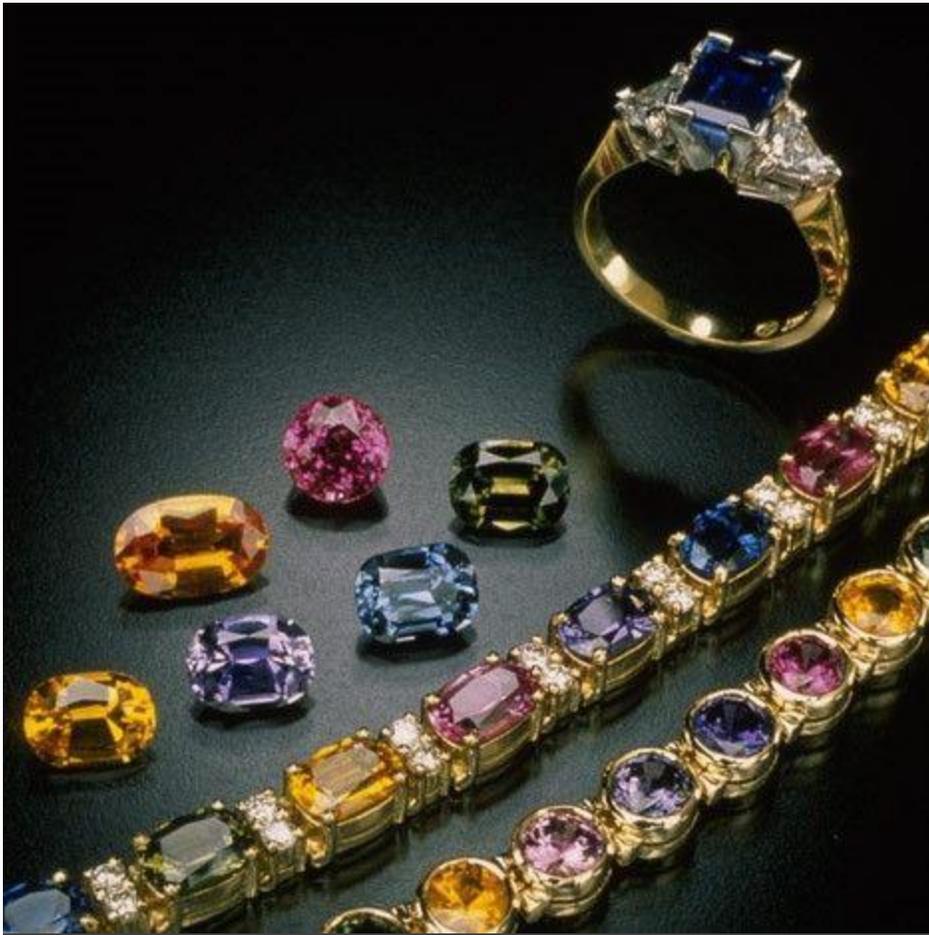
The deep blue color, vitreous luster, high hardness (H =9) and lack of cleavage make sapphire a desired gemstone. Most corundum contains color-causing trace elements. When minor amounts of iron and titanium present in the mineral, the corundum is blue sapphire. Corundum can show a phenomenon called asterism, or the star effect. This phenomenon usually appears as a six-ray star pattern across a cabochon-cut stone's curved surface. The star effect can be seen in ruby or any color of sapphire, and it arises from white light reflecting from numerous tiny, oriented needle-like inclusions.



Intensely blue sapphire from the Kashmir region on the India/Pakistan border. Photograph from [Sapphire Description \(gia.edu\)](#).



Violet sapphire from the Aliabad marbles, Pakistan. Photograph from <https://www.mindat.org/photo-1216199.html>.



This photograph illustrates the wide array of colors in corundum. Photograph from [Sapphire Description \(gia.edu\)](http://www.gia.edu)