The New Mexico Facetor

Volume 18, No.4, July/August, 1999

In This Issue

Don't forget: next meeting is September 9, 1999 at 7:00 pm. Dues are $20.

The Prez Sez: Emeralds

What is your favorite colored gemstone? I think I would have to answer emerald if asked. It is my birthstone, for the month of May, and the deep saturated tones of green bring bliss to my senses. Emeralds are mined in South Africa, Pakistan, and Colombia, and a heated debate can be started as to which locale produces the creme de la creme. In May, 1999, Discover magazine had a wonderful two-page article on why Colombian emeralds are considered the topmost in quality (clarity, color, size). I would like to give you the jest of what the article said from a geologic standpoint, for I felt the author did a good job.

Emeralds are part of the beryl family, composed of beryllium, aluminum, silicon, and oxygen, with the trace elements chromium and vanadium displacing a few of the aluminum atoms in the crystal structure. Beryl is a rather common occurrence in the continental crust, but as we all know, emeralds are not. Why not? Well, to make emerald, the common mineral beryl must come into contact with those trace elements (chromium and/or vanadium) in a hot liquid. This is harder to accomplish than at first glance. The Earth's crust contains all the lighter weight elements: silicon, oxygen, beryllium, and aluminum. These are called felsic by geologists. The heavier elements, vanadium and chromium, are found in the Earth's mantle and are known as mafic. How did the mafic components meet the felsic components and form emerald?

In the case of Pakistan and South Africa, the mafic meets the felsic via granitic intrusions. Let's review the mechanisms for this process. Mountain ranges are where two continental plates have collided, and the plates are thrust upward. The continental rocks with the lighter weight elements from the surface have the opportunity to be folded back under and deep into the Earth, where they melt again in the magma (allowing the felsic rocks to come into contact with the mafic rocks).

The magma begins to rise back through the Earth's crust. At a depth of six miles, the magma attains neutral buoyancy, ceases to rise, and begins to cool into granite. Hot, mineral-laden water is forced out of the granite as the granite solidifies, and the water follows a path of least resistance as it flows through fissures in the rocks above it. If the surrounding rock happens to be mafic, which means it has lots of iron, magnesium, calcium, and the trace elements chromium and vanadium, then something special can occur. The hot, mineral-laden water percolates through the mafic-felsic rock. In time, the rocks cool down, and the fissures are filled with black, flaky biotite. Interspersed in the biotite flakes may be green emeralds.

Interestingly enough, when researchers traveled to Colombia to study the emerald deposits there, they did not find granites. Instead, they saw black shales and sedimentary rocks from the ocean floors, containing continental rock that had, with time, washed down from the surrounding terrain. So, the shale contained felsic rock. The shale layer had been deposited during the Cretaceous period when a shallow inland sea covered what is now Colombia.

The shale layer is sandwiched between layers of salt, laid down via evaporation. The shallow sea fluctuated in depth over time. Now, for the dynamic action! The continental plates were in motion, with the South American plate being pushed against the Pacific plate, causing the Andes mountains to rise. The shallow sea buckled, and faults were formed miles down into the Earth. Hot water was released from below and immediately migrated up through the new fault zones. The water absorbed minerals along the way, as well as dissolving salt, as it headed though the salt layers. This corrosive mineral-laden, hot water became trapped below an impenetrable layer of shale for a while, until the pressure became so great that the shale layer shattered explosively.

The hot, mineral-laden water continued to move into the cooler rock above, and emeralds crystallized immediately. The emeralds crystallized so fast that there was no time for the crystals to incorporate the surrounding shale into its structure. The crystals grew without the strain or impurities that would have occurred with slower cooling. The Colombian emeralds contain pockets of fluid that we call “gardens”. If one views these gardens under a microscope, then one finds crystals of sodium chloride, a souvenir of the emeralds’ origin. Such salt inclusions have not been duplicated by the crystal growers of synthetic emerald. It seems Mother Nature has a unique way of fingerprinting her own work.

The two geologic mechanisms discussed above have both yielded emeralds. However, due to the quick cooling and, therefore, crystallization, which occurred in the Colombian region, these emeralds are purer and of better clarity. If you do not agree, then buy one from each region and judge them for yourself!

Special Events

The **Guild Picnic** will be held **September 11**, 11:30a.m. at the home of Paul and Marge Hlava, 4000 Smith S.E in Albuquerque. Tables will be set, plates and eating utensils will be provided, and a charcoal grill will be ready. Bring lawn chairs, meat to grill, and a side dish and/or dessert to share. Waylon Tracy is bringing a ham, and Nancy Attaway will bake her cherry chocolate Bundt cake. Paul will provide iced tea and flavored waters, but B.Y.O.B. A tailgate is scheduled after lunch, so bring items to sell. Steve Attaway will furnish a door prize.

The **tour of Tripps’, Inc.** in Socorro was slated for October. However, Tripps’, Inc. is now closed on Saturdays. We will discuss at the September meeting what day may be possible, as we only have weekdays available. The tour shows lost wax casting operations/jewelry finishing.

Betty Annis scheduled another **Ladies of the Guild Luncheon** for **October 15** at 11:30a.m. at Paisano’s on 1935 Eubank Blvd. (on the west side of Eubank, north of Indian School and south of Menaul Blvd.) Be there!

Susan Earns Perfect Score

President of the New Mexico Faceters Guild, Susan Wilson, Ph.D. again aced GIA’s annual Gems and Gemology Challenge. Susan received notice of her perfect score in July and was given a GIA Continuing Education certificate. In recognition of her achievement, her name will appear in the Summer 1999 issue of Gems and Gemology.

Wanted: New Millennium Cut

President Susan Wilson proposes a design challenge, a new dazzling faceting diagram to commemorate the new millennium. The Guild will vote during the Christmas party, and the winner will receive a gift from the Guild.

Minutes of the NMFG Meeting

July 8, 1999

By Nancy L. Attaway

President Susan Wilson called the meeting to order at 7:20 p.m. and welcomed all members and guests. She asked everyone to introduce themselves to the group.

Treasurer's Report

Treasurer **Bill Andrzejewski** reported:

Heading	*Total*
Previous Balance	$1,211.48
Expenses	$82.44
Deposits	$60.00
Balance Forwarded	$1,189.04

Old Business

President Susan Wilson thanked **Betty Annis** for organizing the ladies' luncheon. Betty scheduled another ladies luncheon for October 15, 11:30a.m. at Paisano's (on the west side of Eubank just north of Indian School).

Susan Wilson reminded everyone of the **Guild picnic** scheduled for **September 11** at the home of **Paul and Marge Hlava** at 11:30 a.m. Everyone planning to attend should bring their lawn chairs, meat to grill, and a dish to pass. The picnic is also BYOB. We will do another tailgate of items for sale. **Waylon Tracy** plans to bring a ham, **Nancy Attaway** will bake her newly famous chocolate cake, and **Steve Attaway** will furnish a door prize.

New Business

Editor Nancy Attaway related that publisher, Jim Summers said that he would not be able to publish the newsletter for another month. Nancy hired Alpha Graphics on Juan Tabo to print the newsletter and send it out.

President Susan Wilson announced that the Guild will meet at Sandia High School for the meeting September 9, as the meeting rooms in the New Mexico Museum of Natural History will not be completed by that time.

Susan Wilson and Nancy Attaway will organize a tour of **Tripps', Inc.** in Socorro for **October**. The Guild will also visit the new room that houses the Mineral Museum at the New Mexico Institute of Mining and Technology.

Guild Librarian Russell Spiering suggested that Guild members call or e-mail him with any requests for books from the Guild library. Guild members may ask Russ about books pertaining to specific topics or certain authors whose books the Guild library may contain.

Russell Spiering announced the "All That Glitters" gem and jewelry competition, sponsored by the New Mexico Jewelers Association, is to be held the end of July. He said that he had extra copies of the entry forms. Any entries may be taken to either Harris Jewelers and Gemologists/ Casa de Oro in Rio Rancho or Beauchamp and Co. Jewelers in Albuquerque. The entry deadline is July 16.

Ernie Hawes announced that he had natural and synthetic rough for sale. He was helping the heirs from Idaho liquidate the estate of their father, who had been a facetor. Ernie will display the items after the meeting. Those interested in the rough should contact him. A Graves faceting machine from the estate may still be for sale.

Nancy Attaway announced that **Mamadou Drameh** is back in Albuquerque with more red and green **Nigerian tourmaline.** For those who missed the January buying frenzy or who want more, contact Nancy for details.

Show and Tell

The show and tell case displayed glittering gems and wonderful new jewelry from our members.

Louie Natonek faceted a lovely large natural amethyst in the supernova oval cut and a round rhodolite garnet. He developed a new diagram for the rhodolite garnet that he calls *Corona 2*, which features nine mains with two breaks. Louie also brought two matching Russian synthetic small round emeralds set in gold earrings that he cut in the *Corona 1* design, which has one break. These designs will be published in a future issue of *The New Mexico Facetor*. Louie polished both the amethyst and the rhodolite garnet on a cerium lap, and he polished the synthetic emeralds on a ceramic lap with diamond.

Louie decided to eliminate beginning and regular faceting classes and wants to introduce classes that feature specialty designs. He would like to begin these classes with teaching difficult diagrams, such as the ultima cuts.

Russ Spiering displayed a pendant and a pin/pendant that featured tube-set champagne-colored diamonds accenting carved crystalline Mintabie opals interlocked with black jade. Russ set a 10.5-carat tanzanite crystal with distinct crystal faces in a 24Kt. pendant. His wife, Kathryn wove a round spool knit chain from gold wire.

Susan Wilson faceted a 14mm. round deep red Nigerian tourmaline in the flasher cut twelve-sided round. She shallowed the angles for the tourmaline, shallower than what is used for topaz, but she still had areas of the stone that showed some extinction. She remembered that Will Moats used a critical angle of 38.5 degrees on the Nigerian tourmalines he cut. Susan will use her large round liddicoatite tourmaline and measure the refractive index. She will report her findings at the September meeting.

Nancy Attaway faceted four deep blue aquamarines from Madagascar in emerald cuts that varied in sizes from small to large. Nancy developed an original design for the pavilion that she plans to publish. Nancy also cut a small hot pink Brazilian tourmaline free-form triangle.

Nancy faceted a 13mm. triangular pinkish-red Nigerian tourmaline that incorporated a new pavilion design. Steve and she had derived the angles with the aid of Gem Cad. Steve calls the new design "The Third Tri", as it took several attempts to get it right. Nancy plans to have it published in the next issue of *The New Mexico Facetor*.

Steve Attaway cast a 14Kt. gold ring that held a 0.54 point round tanzanite. He arranged the stone in the ring when the ring was a wax pattern to have it fit with only one prong and a lip of gold after the ring was cast. He also cast a 14Kt. gold pendant and set a large pearshape aquamarine (that Nancy cut) much the same way, but without any prongs. Steve set the carved oval cabochon black opal he cut for Jim Eker in a hand wrought 14Kt. gold pendant.

Refreshments

Troy and **Eileen Smith** brought home-baked refreshments to the meeting, as did **Elaine Weisman**, and **Scott** and **Susan Wilson** prepared homemade ice cream with apricots. Thank you very much. **Troy and Eileen** Smith volunteered to bring refreshments to the meeting in September, as did **Merrill O. Murphy** and **Betty Annis.**

Future Programs

Vice-President/Programs Bill Swantner scheduled master facetor Scott Sucher to speak at the Guild meeting in September. Scott Sucher has traveled in Southeast Asia and will discuss his buying trips for gems and gem rough. Scott Sucher faceted replicas of the famous diamonds in history, and he may discuss how he completed this collection either at the September meeting or during the November meeting. Bill Swantner will make a short presentation during the September meeting to cover the optical data and the measurements he made for the emerald involved in the Fred Ward legal case, which has since been settled.

Bill Swantner will arrange for geologist **William Mansker** to speak at a Guild meeting. Bill Mansker will then discuss diamonds in kimberlite and will also show examples of pyrope garnets in kimberlite pipes that he collected years ago from Buell Park, New Mexico. Buell Park lies northwest of Gallup and is an eroded volcano.

Bill Swantner will take the speaker to dinner before the meetings. Guild members wanting to be included in dinner arrangements with the speaker should notify Bill.

Science Fair Presentation

By Will Moats

At our July 1999 meeting, Catherine E. Dowe presented her award-winning Science Fair experiment, "Jello Volcano and the Wrath of Pele". Catherine attends Manzano High School. Her teacher/advisor is Ellen Wylie.

Catherine conducted a series of gelatin experiments intended to simulate the shapes of various types of igneous intrusions. Her experiments consisted of solidifying colorless gelatin in large plastic mixing bowls to simulate a homogeneous, isotropic host rock. She injected colored liquid gelatin to simulate magma at various rates into a hole located in the bottom of each bowl. At moderate to high injection rates, the liquid gelatin propagated through the solidified gelatin and formed intrusive bodies of various shapes. Catherine observed that the shapes of the gelatin intrusions mimicked the geometry of several types of igneous intrusions actually seen in the field, including dikes, sills, pipes, and cone sheets.

One unexpected observation was that the predominant propagation direction of some of the dike-like features changed from initially vertical to subhorizontal as the gelatin magma advanced. The observation of such horizontal flow can be used to explain lava flows that emanate from fissures along the lower flanks of modern volcanos. Catherine plans to continue her experiments, with an emphasis on studying the conditions that promote the formation of cone sheets.

Program Speaker

by Stephen and Nancy Attaway

Dr. Jill Glass, a ceramic scientist at Sandia National Laboratories, presented research on fracture and crack growth titled “Brittle Material Fracture and Fractography”. She covered information relating to her work on ceramic and glass failure analysis, and she correlated the data to correspond to the faceting of natural gemstones. Dr. Glass related her brittle fracture theory and showed how fractography, the study of fracture surface features, can help determine the different ways cracks can grow.

Dr. Glass began by explaining what constituted good, bad, and ugly fractures. Good fractures were mining and road construction, the cleaving of gem material, like diamonds, and removable valves. Good fractures also include the Echo Ampitheatre in northern New Mexico, as the rock there exhibits the same twist tackle features found in glass fracture. The bad fractures were the Fred Murrah Building in Oklahoma that was made of glass and was bombed, the fallen rock slabs in Yosemite National Park, and osteoporosis of human bones. Bad fractures also include the Liberty type of ships, which broke in half from the brittle metal used in their construction. Ugly fractures were car windshield cracks and the Fred Ward emerald.

Dr. Glass defined brittle fracture as happening with little or no warning. Brittle fracture shows little or no plastic deformation, as the atoms are unable to slide past one another. The pieces resemble a puzzle and match perfectly, if you can find them all. Brittle materials are everywhere, appearing in many types of glasses, intermetallics, foods, ice, metals, polymers, and semi-conductors. They can form as single crystals or as poly crystals.

Brittle materials fail under tensile stress from tension and compression. The presence of flaws produces local tensile stresses that appear from macroscopic compression. Most brittle materials exhibit linear elastic behavior.

Flaws are present on many scales. Vacancies, interstitials, and substitutions can appear in the atomic structure and lead to fractures. Rows of atoms may be dislocated and cause fractures. Crystallites or grains and anistrophy can produce fractures. Multi-grain levels, pores, chemical in homogeneities, and other such processing defects may also enable fractures to occur. Impacts and scratches when materials are carelessly handled may even cause fractures.

The worst flaws that stem from size and orientation in the worst location possible produce failure of the material. Stress, whether applied or residual, is necessary for fracture. The residual stresses are often hidden and are ready to help initiate material failure. The processing of materials, whether it was manufactured too fast or had too little time to cool, along with the damage from the subsequent handling, can produce residual stresses.

Dr. Glass pointed out that flaw size can be correlated with tensile strength to estimate the theoretical strength of a material. She showed equations that were developed to describe the concentrations of stress at a crack tip. The larger the flaw, the more stress is concentrated at the crack tip. The stress at the crack tip will be proportional to the square root of the crack size. Large flaws lead to low strength. Small flaws lead to high strength.

Material failure may be due to its fabrication and the presence of any flaws on the atomic level, such as voids, large grains, and inclusions in the material. Material fracture can be caused by machining and accidental damage from handling. Fractures may appear as radial and lateral cracks. Dr. Glass showed some very interesting mirographs that illustrated how chatter marks from machining can form along fracture surfaces.

As a model for how atoms are pulled apart, Dr. Glass gave an example of two boards nailed together with uniform spacing. The nails represent the bonds between atoms. For short cracks, there will not be much leverage applied to the most critical nail. For long cracks, the leverage will be greater, and the most critical nail will be under a great deal of tension.

Dr. Glass also pointed out how quantitative information can be obtained from indentation tests. She reviewed the Vicker’s Hardness test that uses a small diamond pyramid to indent and fracture a ceramic. By measuring the forces and indentation size, an estimate for hardness and fracture toughness can be made.

Dr. Glass introduced the concept of sub-critical crack growth. In normal conditions, a crack will need to have a critical stress applied before a crack will grow. Under some conditions, however, the crack will grow even when the stresses are well below the critical stress. Sub-critical crack growth is promiscuous, because a flaw grows slowly at stresses far below the expected failure load until the flaw is large enough to cause catastrophic failure.

Dr. Glass and her co-workers at Sandia National Laboratories have identified one of the causes of sub-critical crack growth in glass. By reacting with silica, water allows fracture to occur more easily. Water and other reagents allow brittle fracture to occur at lower stresses than normal (under fast loading). This is known as sub-critical crack growth and static crack growth. Water decreases strength and changes the crack velocity. In the absence of stressed bonds, the rate of reaction between silica and water is very low. Straining the silica bonds increases the activity of the bond and allows water to break the bonds much more easily. At a crack tip, the atomic bonds will be highly stressed. Dr. Glass showed graphs where the crack velocity was greatly affected by this phenomena.

Dr. Glass is considered an expert at identifying the cause of fractures. For this forensic science, she uses what is known as fractography, and she explained that fractography is the study of fracture features. Fractography is the examination of a surface created by fracture, and it involves the interpretation of fracture markings seen on these surfaces. Fractography can be used both qualitatively (the direction of fracture propagation) and quantitatively (the stress at the time of failure). Fractography can provide factual information for comparison with eyewitness accounts. Well-established fractographic techniques are available for determining crack propagation direction, failure origin location, estimating the failure stress, identifying what types of flaws are present, and for identifying local events that initiated failure, e.g., impact, thermal shock, or sub-critical crack growth.

One of the primary tools used in fractography is the texture on the surface of the crack. Dr. Glass gave examples of mirror, mist, and hackle fracture features. It appears that fracture begins as a smooth mirrored surface. As it propagates away from the point of origin, however, a mist-like surface will develop. After further propagation, the surfaces become uneven and form what is know as a hackle. The helical mark will always point back to the origin of the crack. Eventually, the crack may branch out and form multiple cracks.

Since the dimensions of fracture features are related to the stress, Dr. Glass can estimate the magnitude of the stress that caused the fracture. A small mirror feature indicates a very high stress at failure. A large mirror feature is generated by a small failure stress. If the ceramic body is small and the failure stress is extremely low, then the mirror may extend over the entire fracture surface and the mist and hackle regions will be absent.

The Relevance to Faceters:

Dr. Glass recommends that we try to minimize stress and look for it (birefringence). She said that we can use birefringence to study gemstones stress. Some stones, like tourmaline, can have tremendous residual stresses. Stress can sometimes be seen using a polariscope.

When Nancy Attaway asked whether sub-critical crack growth could be the cause of a Mexican opal cracking, Dr. Glass stated that there was a good chance that it could explain the demise of more than one gemstone.

In single crystals, crack propagation is strongly influenced by cleavage tendencies. Even so, the mirror, mist and hackle regions will still be present. Dr. Glass advised that we minimize damage and look for it. Since the failure strength depends on the size of a crack, we should try to minimize the damage caused by the sawing and grinding processes.

Dr. Glass advised us to fingerprint our gemstones. The small flaws visible under the microscope are often the flaws that will grow to become cracks. If your gem rough is filled with these small inclusions, then you should expect it to be weaker than gem rough that is clean and contains no inclusions. She also said to keep our gem rough dry. Gem rough that has been preformed may have cracks that can grow by sub-critical crack growth. Keeping gemstones dry will help reduce the sub-critical crack growth rate.

Any stones that have been polished but show sub-surface damage could also be susceptible to sub-critical crack growth. Making sure that all the sub-surface damage has been removed by proper working of the grinding grits will help to insure that your stones pass the test of time.

Bill Swanter pointed out that while hardness and fracture toughness are fundamental to gem behavior, he knew of no one who had made such measurements. A good catalog of the fracture toughness of different gemstones would help us communicate to the public which gemstones would be best for ring stones and which would be better set in earrings and pendants.

More detail of Dr. Glass's research can be found in her chapter, **Ceramics (Mechanical Properties)**, in the *Kirk-Othmer Encyclopedia of Chemical Technology, Forth Ed.* Volume No. 5, 1993 John Wile & Sons.

In the News

New Fancy Diamond Grades

Source: National Jeweler June 16, 1999

The American Gem Society is preparing a new grading system for fancy-shaped diamonds. Gemologists run fancy shapes through a Brilliance Scope, made by GemEx, to evaluate the light return from the diamond's crown. It distinguishes brilliance and dispersion and measures overall light performance. Grading fancy-shaped diamonds will prove difficult, because of the variety of proportions that fit into the category of a certain shape.

Mauritanian Diamonds

Source: National Jeweler June 16, 1999

Ashton Mining and Dia Met Minerals formed a joint venture to explore and develop diamond deposits in west Africa's Mauritania. The region contains the extensive Archaen Reguibat Shield, considered to be an excellent potential for the discovery of kimberlite diamond deposits. Ashton discovered the first diamonds in Mauritania last year. The Archaen Reguibat Shield is associated with significant economic diamond deposits in southern Africa, Canada, and Russia.

Major Gemstone Auction

Source: JCK July 1999

Last May, Shreve's Auction Galleries of New York sold more than 200 lots of some of the finest quality natural colored gemstones ever offered. The "Connoisseur's Gem Collection" took over 15 years to assemble and included the 78.59-carat "Empress of Alma" round-cut Sweet Home mine rhodochrosite, the third largest faceted rhodochrosite in the world, which sold for $12,000. Also included were a 29.93-carat cushion-cut tanzanite that sold for $11,000; an 8.91-carat imperial pink topaz that sold for $10,500; and a 15.88-carat indicolite tourmaline that sold for $9,000. The final sale was the gem sculpture carved by master carver, Thomas McFee, titled "The Aztec Princess" that sold for $7,500. The sculpture stands eleven inches tall and features a princess of 22Kt. gilded bronze. She wears a headdress of rhodonite, lapis, malachite, British Columbian jade, chrysoprase, and mauve agate and holds a carved Mexican opal mask of Montezuma.

Benitoite Mining Venture

Source: JCK July 1999

AZCO Mining, Inc. signed an extension until January 1, 2000 on its option to purchase the benitoite gem mine in San Benito County, California. The price of the rare blue gem compares to that of fine sapphires and tanzanites. The average wholesale price now runs about $1,000 per carat.

Montana Sapphire

Source: JCK July 1999

Montana sapphires occur in areas west of Helena. The areas include Yogo Gulch, Missouri River, Rock Creek, Gem Mountain, Dry Cottonwood Creek, and Deer Lodge County.

The untreated fine quality blue sapphires of Yogo Gulch rival the finest sapphires anywhere. Two separate claims mark Yogo Gulch, one by Cascade Mining Company and the other by individual mining by Roncor, owned and operated by Jeff Kunisaki.

Several small claims lie along the Missouri River, including the Eldorado Bar claim. Sapphires from the Missouri River gravels are mostly party-colored and respond well to heat treatment. Currently, the commercial river deposits are inactive.

Sapphires from Rock Creek and Gem Mountain mining areas exhibit a full spectrum of colors, including bicolors. They are also heat treated.

Dry Cottonwood Creek has produced larger yellow, gold and green, pink and blue sapphires. American Gem Corp., the owner of the claim, has had to sell the property to pay its debts. American Gem Corp. is no longer a sapphire mining company but a company that markets Montana sapphire through internet sales and television (AmericanSapphire.com). The company maintains a fee dig business at the Rock Creek site west of Philipsburg and also sells gravel concentrate.

Tom Lee's Gem River Mining Corp. has operations in Deer Lodge County. Sapphire colors include blue and party colors, with the occasional ruby. The material is also heat treated.

Japanese Akoya Pearls

Source: JCK July 1999

Japanese Akoya pearls still rank high in the pearl market, despite the alarming mortality rate of the Japanese pearl-producing oysters. The Japanese Akoya has a better luster, due to the thin and tightly-packed nacreous layer deposited from its mollusk variety in cold water temperatures. This gives the Japanese Akoya pearl a mirror-like surface, a light dispersion, and an iridescence that no other pearl can duplicate. Supplies are running short, due to changes in the ecosystem from world-wide weather conditions, pollution, and red tides.

A Trip to Four Peaks

Source: JCK July 1999

Richard B. Drucker, G.G. trekked to Arizona's Four Peaks amethyst mine, driving a four-wheel drive road to an elevation of 4,000 feet and hiking the rest of the way to 7,200 feet. Amethyst crystals covered the ground. Richard limited sample collecting to about 25 pounds, as he had to carry it back down to the road. The mine area is primitive, and only two miners work the site for five days at a time. Mining is mostly done by hand with hammers and chisels. The mine currently extends about 45 feet into the mountain. A shop in Scottsdale cleans, cobbs, sorts, and tumbles the amethyst, which is sent to Thailand, Sri Lanka, and China to be faceted.

Another Emerald Nightmare

Source: Modern Jeweler July 1999

Following Fred Ward's horrible legal emerald case, another legal case involving an emerald has appeared. Manuel Marcial, the facetor of the North Carolina emeralds, was arrested in Florida after a customer charged him with grand theft and misleading advertisement. The precedents created by the Ward case have led to customers expecting a guarantee of emeralds against any defects and anything else that happens, even if the customer breaks them. As with the Ward case, the Marcial case involves conflicting appraisals, denials by insurance companies, and questionable assumptions made by "expert witnesses".

Faked Chinese Peridot

Source: Colored Stone July/August 1999

Famed gem cutter and carver Arthur Anderson purchased what he thought was fine quality faceted ovals of Chinese peridot in large sizes. The color was exceptional and looked like Pakistani material, but the price was suspiciously low. During re-cutting the material did not behave like peridot, and Arthur sent the stones to GIA's lab. Test results confirmed that the stones were glass. This is not the first time that GIA has seen this glass.

New Canadian Iolite

Source: JCK August 1999

Anglo Swiss Resources found a substantial deposit of gem iolite last December in the Slocan Valley, a glacier-carved valley in southeastern British Columbia. They mine "North Rainbow iolite" at the Blu Starr Gemstone Property in the Selkirk Mountains, a mountain dome cut by a glacier. The deposit is estimated to have hundreds of millions of carats of rough. The geology of the area is comparable to that of Sri Lanka's gem areas. The first Canadian iolites were cut by master gemcutters Bruce MacLellan and Ken Dale, who say that the material is the finest iolite they have ever cut. Iolite is from the Greek word "ios" for "violet".

Two New Diamond Cuts

Source: JCK August 1999

Two new and innovative round cuts for diamonds made their debuts at a recent JCK Show. One, called the "Spirit of Flanders", divides a standard diamond's pavilion mains with two additional facet junctions. Its crown has been redesigned into a modern rose style but utilizes a flat table facet. Also, The Royal Brilliant Company of New York displayed its new "Royal Brilliant 82". This 82-facet design uses double rows of 10 bezel facets on the crown opposed by a single row of 10 pavilion mains.

Tiffany Diamond Deal

Source: JCK September 1999

Tiffany negotiated with Canadian diamond miner Aber Resources for first dibs on a mine run of uncut diamonds from the Diavick mine in the Northwest Territories. Diavick will become Canada's second diamond mine in 2002, estimating 6 to 8 million carats a year. Tiffany plans to buy 14.9% of Aber's stock.

New Tanzanite Simulant

Source: JCK September 1999

Synthetic forsterite, produced for laser applications and made by Morion of Brighton, Massachusetts, is now marketed as a tanzanite imitation. Cobalt gives synthetic forsterite a blue/purple color. The refractive index for synthetic forsterite is lower than that of tanzanite. Synthetic forsterite exhibits an obvious doubling. Hardness is similar. Forsterite is a member of the olivine mineral series.

Synthetic Blue Diamonds

Source: JCK September 1999

Ultimate Created Diamonds of Golden, Colorado now markets a fancy intense blue-colored synthetic diamond that equals the best natural blue diamonds ever found. Prices range from $2,000 to $5,000 per carat, but sizes and quantities remain limited. Both synthetic and natural blue diamonds are type IIb, where boron gives the blue color and electrical conductivity. Unlike natural diamonds, synthetic blue diamonds phosphoresce for hours after exposure to short wave ultraviolet. Synthetic blue diamonds exhibit sizable inclusions of the metallic nickel-iron residual flux. A neodymium magnet will attract synthetic blue diamonds that contain visible flux.

The "Nature of Diamonds" Exhibit

by Nancy L. Attaway

While in San Diego visiting family in August, I visited the San Diego Natural History Museum in Balboa Park. The San Diego Natural History Museum is currently hosting the famous "Nature of Diamonds" exhibit, which will run from March 27 until September 7. The diamond exhibit was a collaborated effort between the San Diego Natural History Museum and the Gemological Institute of America. The exhibit also ran in conjunction with GIA's Third International Gemological Symposium held June 21 to 24.

Vince Manson, Ph.D., GIA's director of strategic planning and curator of "The Nature of Diamonds" exhibit in San Diego, was also the former curator of gems and minerals at the American Museum of Natural History in New York. Dr. Manson was instrumental in bringing the famous exhibit that enthralled New York audiences last year to San Diego this year. George E. Harlow, curator of the Department of Earth and Planetary Sciences at the American Museum of Natural History in New York, organized the exhibit, which was displayed in New York from November 1, 1997 until April 26, 1998. The Diamond Information Center in New York co-sponsored the exhibit. {Dr. Vince Manson died on July 3, 1999 at his home in Carlsbad, California after his year-long battle with cancer. He was 63. The diamond exhibit has been dedicated to his memory.}

The exhibit contains $50 million in diamond jewelry, with some pieces dating from the 14th and 15th centuries. It features the 407.48-carat "Incomparable Diamond", the third largest cut (yellow) diamond in the world. It also features an 18th century necklace from the court of Catherine the Great; a 19th century Indian gold necklace in Mogul style with lasque-cut diamonds, emeralds, and pearls; and many wonderful pieces from the Cartier Collection.

The "Nature of Diamonds" exhibit is advertised as the first comprehensive attempt to show the natural, cultural, and geographic history of diamonds. It describes diamonds from their geologic origins and explains their place in history, art, adornment, and literature. The exhibit also demonstrates the many uses of diamonds in modern technology. The exhibit, which took the Museum of Natural History in New York eighteen month to complete, includes diamonds and diamond jewelry on loan from private collections. The exhibit logo features a large, pinkish-orange lion's paw clam shell jewelry item accented with several rows of pave diamonds set in gold.

The exhibit begins with the history of diamond discoveries from 400 B.C. and takes the visitor from India to present times. Various models, diagrams, interactive displays, and videos explain what a diamond really is, where it has been found, and how it is mined. A three-dimensional model shows the atomic structure of diamond, and another display explains its hardness and its high refractive index. A large-screen computer animation explains how diamonds were formed deep within the earth more than three million years ago under intense heat and pressure. It illustrates how volcanic eruptions transported diamonds to the surface and how surface movement and erosion of the earth's surface through time carried diamonds away from the craters. The visitor walks through a re-created mine tunnel that shows how diamonds were formed in the earth. One display in the simulated mine tunnel reveals a large tetrahedral diamond crystal in its kimberlite host rock.

Displays showcased many magnificent items jewelry, some worn by royalty. Display cases held heavy silver and gold diamond brooches designed in flower motifs that had once decorated the splendid evening gowns of rich and famous women. Some of these brooches were made "en tremblant", meaning the piece of jewelry had incorporated springs that allowed sections of the item to move with the person wearing it. The marvelous Tudor Rose corsage was one of these pieces made "en tremblant". Displays also featured wonderful artifacts, including several of the first diamond rings ever made. The oldest item on display was a Roman ring from 300 A.D. that held two tetrahedral diamond crystals set points up from the ring's top.

Oil paintings and photographs accompanied the displays and depicted famous persons, like Catherine the Great from Russia, Queen Victoria of England, and legendary Hollywood actresses. Visitors marveled at the displays inside a walk-in vault that featured exquisite diamond and platinum jewelry while listening to glamorous Marilyn Monroe sing "Diamonds Are a Girl's Best Friend". One of the displays showcased a 21-carat pearshape, velvet blue Kashmire sapphire set in a large diamond pendant. Another one held a large tetrahedral, slightly yellow diamond crystal from Arkansas. Another displayed an incredible bracelet of many large pearshape diamonds with an enormous pearshape diamond at the center. Spectacular diamond and platinum jewelry in the forms of bracelets, necklaces, brooches, earrings, rings, and tiaras that once adorned the bodies of rich and famous women were now on display.

Black and white film clips showed several famous Hollywood actresses wearing diamond jewelry, including a luminous Elizabeth Taylor. One film clip depicted a lovely

Lauren Bacall, who dreamed she was a wealthy woman, pointing to every item in the jewelry case with her long cigarette holder and saying, "I want that, that, that, that, that, and that, and charge it." My favorite film clip showed the incomparable Mae West, dripping in diamonds, replying to handsome Cary Grant, "Well, I'm sorry that you think more of my soul than you do of my diamonds."

One display featured 260 naturally colored diamonds. Other displays showcased famous diamonds, including the Pumpkin diamond, the largest fancy orange ever recorded; the Cullinan Blue necklace, created for Lady Anne Harding Cullinan, wife of Premier Diamond mine owner Sir Thomas Cullinan of South Africa, that featured eight blue diamonds (one weighs 2.60 carats); and the Armstrong diamond ring set with a 14.11-carat emerald cut diamond.

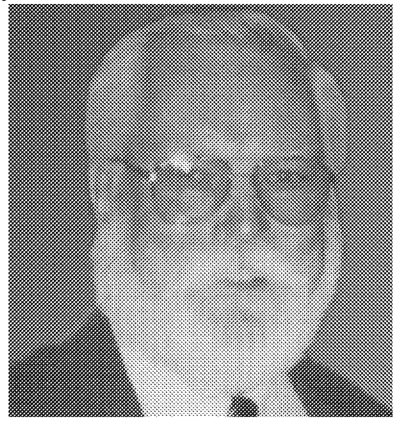
Models and videos demonstrated the three types of mining: kimberlite pipes or underground mining; alluvial or gravel mining; and marine or beach and undersea mining. My favorite video, "Diamonds in the Tundra", featured now famous Charles Fipke, who located the diamonds in Canada's Northwest Territories and in the Arctic region of Canada. This fascinating documentary explained how Charles Fipke believed that an economic potential in diamonds existed in Canada. Over many summers, Charles painstakingly sifted gravel and collected samples from miles and miles of northwest Canada. He looked for the chromites and garnets that would indicate the presence of diamonds, and he recorded their levels of concentration on topographic maps. After ten years of exploration, Charles Fipke finally realized his dream. He is credited with finding a multi-billion dollar diamond industry in Canada. He is now searching for the next one.

Displays demonstrated the identification and grading of gem diamonds. Videos explained the process of preparing the rough diamond for cutting and showed the steps and equipment used in cutting. Displays also illustrated the difference between natural diamonds and its synthetics and simulants, including synthetic moissanite. One display showed a diamond paper filled with diamond crystals that a certified buyer of rough diamonds would purchase.

The last section of the diamond exhibit demonstrated the use of diamonds for industrial applications. The physical properties of diamonds make it an ideal tool in industry, and its intense strength makes it a valuable cutting tool. Diamonds are used extensively as saws, grinders, and wire dies. The future will hold new and exciting applications for diamonds. Diamonds of all colors will continue to be worn in gold and platinum jewelry for years to come.

Facet Designer's Workshop

By Ernie Hawes



In past columns, I have commented on various occasions that a lot of designs just have too many facets. I have said "less is more," meaning that oftentimes, designs with fewer facets are more effective than patterns with lots of facets. On paper, the many-faceted designs look nice, but when cut, they are "busy" and do not have sufficient individual character to justify the large number of facets. This is particularly true in stones 12 to 16 millimeters in diameter and under. There are exceptions to this but not many.

A cursory review of the designs in DataVue2 make it apparent that a significant number of designs contain small facets that appear to have been added as an afterthought, perhaps as a result of an error in cutting a more basic design. I cannot prove this, and some designers will want to jump on me for these comments. However, I think that I am entitled to my opinion, and I can back it up with both evidence and the support of some other well respected designers.

Quite simply, a design does not have to be complicated to result in a beautiful gem, and a complicated design does not always yield a glittering gem. I will not name any designs that I think are too complicated, but I have seen several stones cut with so many facets that the finished gems appear as a blurred jumble of reflections generally lacking in individual character. These overly complicated designs would look fine cut in really large gems 25 millimeters or larger, but how many of us ever cut stones this size? The most commonly cut design, the standard round brilliant, should serve as a basic reference for a reasonable number of facets. In fact, there are several designs with fewer facets than the standard round brilliant that result in very beautiful gems. I have selected two examples for the designs in this issue of our newsletter. The first is a modified version of an old pattern whose creator is unknown. The second example is a new pavilion with a step-cut crown designed by our Editor, Nancy Attaway.

There is a second basis on which I can justify my “less is more” statement. Designs, such as the one given here, can be cut in less time than patterns with more facets and still result in very attractive gems. A garnet cut in the *Modified Swiss Cut* will be worth just as much as one cut in the standard round brilliant pattern. If you sell stones, this quickly proves my point.

I am not sure where I found the *Modified Swiss Cut (for garnet)*, but my GemCad file is a little over three years old. The original design with different angles is, of course, much older. It is an excellent pattern for small dark garnets like the Arizona pyrope garnets that many Southwestern faceters have. Change the angles for quartz, and you will have a good design for small dark amethysts.

The second example is called *Third Tri*, by Nancy Attaway. This is an excellent design for the somewhat dark Nigerian tourmalines that several of us purchased this year. Here are Nancy’s comments on the creation of this design.

“I am partial to hard-cornered geometric shapes, and the triangle is one of my favorites. Several remarkable triangular designs have been created for faceting, and those include Merrill O. Murphy's *Tri Polar*, Paul Smith's *Apollo Cut*, and Bob Klein's *Tribrite*. I have used all three of these excellent diagrams for many types of gems and have been pleased with the results. These triangular designs utilize a blunted corner instead of a corner that comes to a point. A few jewelers have told me that a blunted corner is easier to set, as a corner with a point has a tendency to chip.

I acquired a nice parcel of the lovely tourmaline from Nigeria last January. The pink to red to purple colors appeared very saturated. I cut the first stone at quartz angles and the next two at topaz angles. It still seemed that I could have shallowed my angles a bit more to maximize brightness. Guild Mineralogist Paul Hlava performed a microprobe analysis on the tourmaline and determined it to be liddicoatite. Guild member and geologist Will Moats employed Snell's Law to calculate the critical angle, which he found to be 38.5 degrees. Armed with that information, I wanted to develop a triangular design for a large piece of pinkish-red liddicoatite that would yield a lot of brightness.

There were many features I liked in the *Tri Polar,* the *Apollo Cut*, and the *Tribrite* designs, and I wanted to incorporate several of those in my design. I also looked at Long and Steele's *Triangular Double Barion* and thought it could be a place to start. However, as I cut this diagram, I did not realize that it had facet 96 where facet 16 normally is. I expected to see facet 96 on a wide side and facet 16 on a corner. Steve pointed this out to me with GemCad while we were trying to figure out what I was doing wrong.

The gem rough selected for the triangle was saturated in color and needed a very shallow pavilion. I thought that a limited number of strategically-placed facets would work best. Less would be more. I widened the blunt-cut corners at 16, 48, and 80 and split the pavilion facets and simply fanned out a series of facets on each of the three sides on 96, 32, and 64, including a culet facet for each of those sides. The resulting faceted stone and the stone projected on GemCad yielded sparkle with minimum extinction.

The name, *Third Tri*, came from the three attempts at design. Steve and I used GemCad to get an idea of the angles needed, and our first two attempts were less than impressive. The third try resulted in a stone design that was bright, yet simple. We used GemCad to create a rough design, but the final placement of the facets was done at the faceting machine, being creative with the design.”

In conclusion, I will be the first to admit that there are exceptions to the remarks made here. However, if you see a design that has 90 or more facets, think twice before attempting to cut it in anything under 18 to 25 millimeters in diameter. You may be proving that you have extraordinary skill in putting good meets on small stones, but the finished gem will probably be no more beautiful and may be even less attractive than a gem with fewer facets.

Bill Andrzejewski Recovers

New Mexico Faceters Guild Secretary/Treasurer Bill Andrzejewski suffered a heart attack in August and spent several days in Presbyterian Hospital after emergency surgery. He is recovering at home and will undergo another operation. Bill resigns as Guild Secretary/Treasurer, a service he has performed for three years. The New Mexico Faceters Guild wishes Bill Andrzejewski a speedy recovery and thanks him for a job well done. Ina Swantner has volunteered to serve as Secretary/Treasurer for one year.

Once Atop A Mountain

By Smoky MacLaren

(For Scott and Susan Wilson, who have visited Scotland and like its mountains, its lochs, and its people.)

It has been quite a long time now since I have written anything for the *New Mexico Facetor*. So, mayhap, I should introduce myself to the newer members of the New Mexico Faceters Guild.

I am an American Scotsman. I was born and reared in Edinburgh, where my father was a physician and my mother was a nurse. We were a close family. Father had an interesting hobby. He faceted cairngorm (smoky quartz, the national stone of Scotland, found in the Cairngorm Mountains, a range of the Grampians in northeast central Scotland) and other stones from Scotland using a jam-peg machine he had put together from bits and pieces. At first, the mechanism was driven by foot pedals salvaged from an ailing sewing machine. Later, he converted it to an electric motor drive. I hardly remember the foot-driven machine, though my Uncle Cord later insisted that Father started me down the same road using the old pedal machine. So, I, too became a facetor.

Then, World War Two came down on us, and the missiles began to fall upon London. That marks the time when Father and Mother went to care for the injured Londoners, and I was sent to the U.S.A. with Uncle Cord. I never saw my parents again, and I have never returned to “yon bonny banks and yon bonny braes” of the land that remains ever vivid in my dreams.

Uncle Cord and I lived in several towns in the U.S. before finally settling in Colorado Springs, Colorado. Although the Colorado Rockies were much more timbered than were the mountains of Scotland, they made us more at home than other parts of this strange new world. In Colorado Springs, Uncle Cord and I built us a jam-peg machine. I went to high-school and, in my spare time, faceted a few stones for the local jewellers. Uncle Cord was something of a machinist and found employment at the local military base. Four years later, I lost Uncle Cord when the airplane in which he was riding crashed into a mountain during a snow storm. I was alone, but not totally without income. Uncle Cord had sold our family properties in Scotland, and I invested the proceeds in a wee commercial gem supply house and shop. Special gem cutting added to the commercial sales income.

Somewhere, bye the bye, I learned about the topaz stones from just west of Colorado Springs. I became the local expert on those, then, with much reading, became knowledgeable about other gemstones in Colorado. Sometime, thereabouts, I met a native Coloradoan named Merrill O. Murphy. Murf, everyone called him. I never did learn what that “O” stood for. We became good friends. Down the years, we have shared special gem locations and have gone looking for gems in some of the most unlikely places. One of those is not far from Murf’s home town, Rifle, Colorado. Of course, we had to go there. That is the location we (Murf and I) are sharing with you today.

Murf’s dad prospected, always for gold, in the local mountains all his life. It was a hopeless thing, since there is little or no gold in that part of Colorado. From friends (read: other prospectors), he had long known of the “sapphires” found southeast of Rifle, but he had never mentioned them to his sons. Why? Because only gold had any real value. Gemstones were hobby things. But, somehow, Murf became aware of a sapphire location or locations. Murf extracted every wee bit of information he could get from his dad. The location seemed highly unlikely for sapphire, but gemstones do seem to find a home in the most unlikely places.

The geology seemed all wrong. Rifle is located at the junction of Rifle Creek and the Colorado River. The Colorado flows west. A few miles to the north are the Hogbacks, a sharp range of sandstone mountains made of near-vertical slabs. There’s nothing valuable there except coal. The Hogback trends to the east-southeast, diving under the river about seventeen miles upstream, before joining with other mountains. A few miles to the west, the Roan Plateau rises over 3,000 feet nearly up vertically from the river bottom. Geologically, the Roan Plateau is an ancient inland sea-bottom exposed by erosion. The layered rocks are mud compressed into a calcium-rich stuff locally called oil shale. The local terminology is apt, since the friable rock contains vast amounts of oil and natural gas. The Colorado River has cut a vee-shaped channel through the “oil shale” in its irresistible trend toward the Gulf of Mexico.

On the south of the river, still higher mountains tower above the valley floor. Again, the rocks closer to the river are “oil shale,” but higher up, the predominant rocks become basalt. Mamm Peak pierces the “shale”, rising to 11,123 feet above sea level. The basalt extends west for fifty miles and east for twenty miles. The basalt is surface-visible for most of the total seventy miles. Strangely, we thought, the “sapphire” appeared to be in the contact zone between the basalt and the “oil shale”.

Murf’s dad took us to a point in Rifle where Mamm Peak and a goodly bit of the range to the east was easily visible. “Look over there toward the Peak,” he told us. “Now, let your eyes roam to the east where you see that long, white slide. The sapphire I saw is high up alongside that big old slide where the lava pokes through. There’s several ways to get there, none of ‘em easy. Could be the easiest is from Talkembaugh Mesa due south of here. Drive your pickup as far as you can south on the mesa ‘til you can’t go no farther. Then walk east by a good bit south, to the top of the divide, swingin’ well clear of slides. Walk east of that big slide and come down the ridge heading north. Come down a quarter mile or so to where you see the dark lava a-pokin’ through the shale. The sapphire is right there. Stay clear of that slide. One slip sends you down that slide face a thousand feet or more. It’s a heck of a walk just a-gittin’ there but not hard to find.”

So, a few years later, we went up there, and it wasn’t easy. We drove up to Talkembaugh Mesa and south to a locked gate. It turned out that Murf had gone through high school with a Mary Jane Von Dette. Her brother now lived a few hundred feet from the gate. He had a key to the lock and opened the gate for us. We drove south until the road/ trail became impossible. We locked up the pickup, put on back-packs, and headed off to the southeast through trees and brush, always steeply uphill. En route, we circled carefully past minor slides but finally reached the ridge top. Continuing east, we came upon the trail leading downhill to the north. As Murf’s dad had said, the trail abruptly reached the “dark lava a-pokin’ up through the shale.” On either side of us and just beyond the intrusion, the slide dropped off at an estimated 50-degree angle. On the face of the slide, dark, horizontal bands of basalt cut through the “shale.” Each band was a foot or two wide but unreachable because of the sharp drop-off of the slide. At the north-facing base of the intrusion were fragments of basalt, some with pieces of crystalline material stuck to nests of small yellow crystals. Complete larger crystals of dark material seemed to be roughly rectangular. Smaller dark fragments, when held to the light, were sort of grey or intensely blue-violet, depending on orientation. Identification wasn’t difficult. Our “sapphire” was obviously cordierite, sometimes called iolite. The smaller yellow crystals in the nest were identified by a mineralogist as sodium-harmotome. (I think identification was made by Dr. Sinkankas.) Harmotome is common in Europe but rare in America. It is a barium-aluminum silicate, white, colorless, or slightly gray. Sodium harmotome, on which we have no information, must substitute some sodium for barium in the chemical equation. Sodium in the crystals may also account for the light yellow color. So far as we know, harmotome in association with cordierite is otherwise unknown.

Although some of these cordierite crystals and pieces were as much as an inch on a side, the crystals tended to be rude-shaped, fractured, cleaved or broken. In larger cut stones, the color was often too dark to display the bright color well. Few of the yellow harmotomes were transparent enough to facet. They were quite soft, 4.5 on the Mohs scale, They were brittle, and the refractive index was a wee bit less than that of quartz.

Over the years, I have faceted (and sold) all the cordierite I had. Murf tells me the same has happened to him, and we have not gone back to that site. Our legs are not as strong as they once were, and the way into there grows ever more difficult. I believe that new houses are being built all over Talkembaugh Mesa, making entry through there more difficult. However, we are equally sure that there are other deposits in that general area. Topographic maps show some old Jeep roads that lead to prospects in that region. Murf has tried to find a way into those that are south of the Paul Pitman ranch and probably on BLM land. Unfortunately, people on the ranch have refused to discuss access.

Special Dates for Guild Members

June, July, August, and September:

Steve and Nancy Attaway celebrated their 15th wedding anniversary June 23. Tony and Edna Anthony celebrated their 50th wedding anniversary July 20. Herb and Maria Traulsen celebrated their 26th wedding anniversary July 27. Merrill O. Murphy celebrated his birthday August 16. Heidi Ruffner celebrated her birthday August 22. Ernie and Becky Hawes celebrated their 39th wedding anniversary August 20. Louie and Harriet Natonek celebrated their 36th wedding anniversary August 24. Scott Wilson will celebrate his birthday September 24. Troy and Eileen Smith will celebrate their second wedding anniversary September 28. {My apologies to the ones I missed.}

Gem Myth of the Month

By John Rhoads, D & J Rare Gems, Ltd.
raregems@amigo.net

Gem Myth: "Multi-colored tourmalines are called "watermelon tourmalines".

We often hear at shows or even here at our shop in Salida, Colorado about someone's watermelon tourmaline. We will usually be shown a multi-colored tourmaline that exhibits anything but the colors of a watermelon.

Watermelon tourmalines are tourmalines that, when cut in cross section, resemble a slice of watermelon. The outside skin is green like a watermelon, and the center is pink like a watermelon. Between the skin and the center is a white zone like a watermelon. Tourmalines without this color scheme should be referred to as "bi-colored" if they contain two distinct colors. If they are multi-colored or if they show three or more colors, then these tourmalines should be also termed bi-colored.

Good, clean, true watermelon tourmalines are rare as faceted gems. The stresses that occur when a crystal grows with the distinct layers of color that appear like a watermelon often cause fracturing of the material. Even if the crystal is clean, the sawing and cutting action involved in preparing and faceting watermelon tourmaline can cause fracturing to occur at the color boundaries.

More often than not, the slices of a watermelon tourmaline are usually polished and left to remain in their original shape. They make excellent earrings and pendants just as they are as small polished slabs. Their colors and color arrangements are often something wonderful to behold.

Gem Myth: "Diamonds are overpriced and are actually very common in nature."

A few recent television broadcasts that featured diamonds unfortunately misled viewers into believing the myth that diamonds are overpriced and quite common in nature. In a few locations around the world, diamonds are still recovered by hand, which can give the appearance that they are inexpensive to recover. However, for the vast majority of diamonds, the mining cost remains extremely high. That cost is reflected somewhat in their price. Due to the high cost of recovering diamonds, the price for individual diamonds is also high. Ultimately, the price of a diamond is reflected in the basic rules of supply and demand.

Diamonds purchased for jewelry is pure vanity. No one really needs diamonds, and no one is really forced to buy them. If everyone stopped buying diamonds, then the price would quickly drop. However, due to careful and clever marketing schemes by the DeBeers diamond cartel, the demand is kept high for diamonds. This keeps diamond prices stable. The market is then assured that there will always be a reliable supply of diamonds available and marked at prices the public is willing to pay.

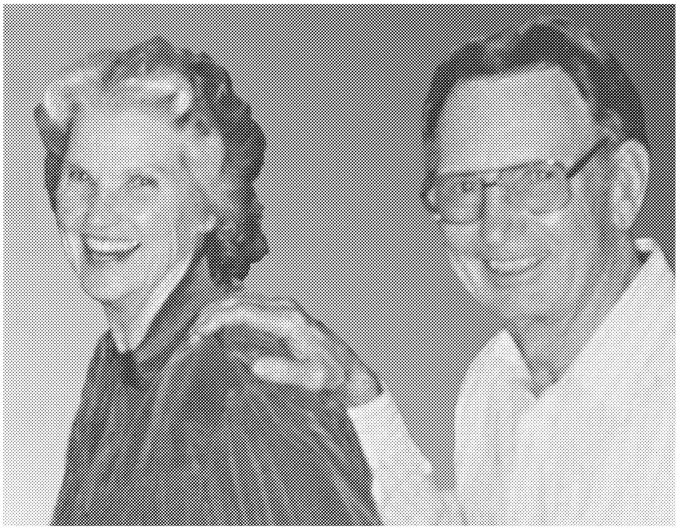
The world's supply of diamonds is relatively large and requires huge investments. New sources, such as the recent ones in Russia and the new mine in Canada, adds to the steady supply of diamonds and increases the stockpile of diamonds that is held in reserve for many years. Should new diamonds from known sources begin to decline in number, these stockpiles will be tapped. Because such reserves exist, we are assured of a reliable supply of diamonds for many years to come.

Major Changes at D & J Rare Gems, Ltd.

As of August 1, 1999, D & J Rare Gems, Ltd. will split into two companies: D & J Rare Gems, Ltd. and The Gem Factory. D & J Rare Gems, Ltd. will remain a source for loose gemstones through mail order, through the internet, and at gem shows. John A. Rhoads will continue within this company as corporate president, as editor of the D & J newsletter, as a gemcutter, as a salesman for phone, internet, and gem show sales. Customers may schedule appointments to view and purchase gems. The Gem Factory will be a new company operated by Mark Krivanek that will take over the store location in Salida, Colorado. The Gem Factory will offer both fine and custom jewelry, custom gem cutting, gemstone repair, and gemological services.

Let's Talk Gemstones

By Edna B. Anthony, Gemologist



Edna and Tony

The Uncommon Sorosilicate Gemstones: Hemimorphite, Lawsonite, Idocrase, And The Epidote Group

The sorosilicate class of minerals is composed of more than seventy minerals. Most are rare, and only a few are used as gemstones or are cut for collectors. The exception, the lovely tanzanite of the zoisite group that forms in the orthorhombic crystal system, was discussed in a previous article. Since the optical and physical properties of the lesser known varieties vary and their use as gemstones is not common, each will be discussed in paragraph form and the "properties" table will be omitted in this article.

HEMIMORPHITE: (calamine) $Zn_4Si_2O_7[OH]_2.H_2O$; hydrous zinc silicate

The crystallographic polar symmetry of orthorhombic hemimorphite gave this mineral its name. A crystal displays polar symmetry (hemimorphism) when the ends of the central crystallographic axis are not symmetrical. In the hemimorphite structure, the $ZnO_3[OH]$ tetrahedra link groups of Si_2O_7 tetrahedra with bases parallel and apices oriented in one direction and with H_2O molecules occupying the spaces. The usually tabular crystals exhibit terminations of a pyramid at one end and a combination of domes and pedion at the other. Granular, botryoidal, stalactite, massive, and fan-shaped forms can develop from such crystallization. The directional orientation of the tetrahedra causes its strong piezoelectric and pryoelectric characteristics. Crystals are brittle and exhibit a vitreous silky lustre, perfect cleavage in one direction, an uneven to sub conchoidal fracture, a Mohs hardness of 4.5 to 5 and a specific gravity variation of 3.4 – 3.5. It has a greater density than prehnite, which it sometimes resembles. The streak is white and the diaphaneity ranges from transparent to opaque. Refractive indices of 1.61 - 1.617 - 1.636 result in a birefringence of 0.022 for the biaxial positive mineral. Walter Schumann tells us in *Gemstones of the World* that the absorption spectrum is not usable, that there is no dispersion, no pleochroism and that weak fluorescence may be present, but it is not characteristic. Exposure to strong acids results in the formation of a silica gel.

Found worldwide, hemimorphite contains as much as 54.2 percent zinc in its composition and is valued as a rich source of zinc. Crystals are often associated with smithsonite, sphalerite, cerussite, galena, and anglesite in oxidized areas of the deposits. Until the middle of the eighteenth century, it was believed that smithsonite and hemimorphite were the same mineral called calamine. At that time, it was discovered that smithsonite is, instead, a zinc carbonate.

Dr. J. Kourimsky states in his *Illustrated Encyclopedia of Minerals and Rocks* that hemimorphite "most frequently occurs as the product of the oxidation of the upper parts of sphalerite accompanied by other secondary minerals that form the so-called 'iron-cap' or 'gossan'." By the process of metasomatism, the limestone is gradually replaced by less soluble materials from the surrounding waters. Mexico has been the only source of facetable hemimorphite crystals. Colorless gems of more than three carats are rare. Very little of the delicate blue material has been available. Cabachons of the massive blue material can be confused with smithsonite and turquoise. Specimens of white, brown, yellow, pale green, pale blue, gray, and colorless crystals are often found in mineral-enthusiasts' collections. A perfect plane of cleavage and its lack of durability limit the use of hemimorphite as a gemstone except in cabochon form.

LAWSONITE : $CaAl_2Si_2O_7[OH]_2 \cdot H_2O$; hydrous calcium aluminum silicate

In the structure of orthorhombic lawsonite, Si_2O_7 groups link [AlO,OH] octahedra with spaces filled by Ca^{2+} and H_2O molecules in the chains. It is related to ilvaite and dimorphic with monoclinic partheite, which is related to the zeolite group. The vitreous to greasy lustered, translucent, frequently twinned crystals are found in association with glaucophane, quartz, chlorite, sphene, epidote, and garnet in gneisses and glaucophane schists formed under low temperature and high pressure, like those of the Tiburon peninsula of California. Two planes of perfect cleavage make it a fragile mineral. Dr. Joel Arem lists a hardness of 6+, but Dr. Cornelis Klein and Dr. Cornelius S. Hurlbut, Jr. state in the *Manuel of Mineralogy after J. D. Dana* that it is "characterized by its high hardness" of 8 and "fuses to a pebbly glass."

Lawsonite occurs in granular and massive forms and in tabular or prismatic crystals with a density of 3.05 to 3.12. Moderately high refractive indices of 1.665 -1.674 to 1.675 – 1.684 to 1.686 and a birefringence of 0.019 help to give it a high rate of dispersion. The crystals are colorless or white and can occur in delicate tones of gray, blue or pink. It is biaxial positive with pleochroism colors of blue/ yellow-green/colorless or pale brownish-yellow/deep blue-green/ yellowish. The spectrum is not helpful, and it is inert to ultra-violet light.

The name lawsonite was chosen to honor Professor A. C. Lawson of the University of California. Few reference works list lawsonite, and Dr. Joel Arem tells us it "is extremely rare as a faceted stone, seldom reported and generally unavailable." Faceted gems probably would not exceed two to three carats and are likely be pale blue in color. Faceted lawsonite is truly a collector's gemstone.

IDOCRASE: $Ca_{10}Mg_2Al_4[SiO_4]_5[Si_2O_7]_2[OH]_4$ + Be,Cu,Cr,Mn,Na,K,Ti,B,H_2O,U,Th,Zn,Sn,Sb,

rare earths [Vesuvianite] Calcium magnesium aluminosilicate hydroxide

From the chemical composition formula shown above, taken from Dr. Joel Arem's *Color Encyclopedia of Gemstones*, it is apparent that a multitude of elements can replace elements in the tetragonal crystal structure of idocrase [vesuvianite]. It is a complicated sorosilicate, where isolated SiO_4 tetrahedra and Si_2O_7 groups occur in the chains with the calcium, magnesium and aluminum and with the substitute elements occupying various sites available. The structure is closely related to and sometimes intergrown with grossular garnet. This helped to give it the name, derived from the Greek words "eidos" (likeness) and "krasis" (composition). Richard T. Liddicoat, Jr. observes in his *Handbook of Gem Identification* that both minerals are "calcium-aluminum silicates", and that green hydro grossular material from South Africa "grades into idocrase." Andradite garnet and diopside are also associated with idocrase.

Idocrase is found in several forms, including granular or compact aggregates, striated columnar masses, pyramidal crystals, and acicular forms, as well as the usual elongated prisms. The rather fragile vitreous to resinous crystals exhibit no plane of cleavage, a conchoidal fracture, a hardness of 6 – 7 and a varying specific gravity of 3.32 – 3.47. Intumescence accompanies fusion at 3 to produce a greenish or brownish glass. The associated minerals and the environment where the deposits developed greatly influenced the optical properties of the frequently twinned crystals.

Idocrase is double refractive and can exhibit positive or negative uniaxial optic character and sometimes anomalous positive or negative biaxial characteristics. Refractive indices of crystals found in serpentinites are highest with 1.705-1.750 and 1.702-1.761 readings with a birefringence of 0.018. A contact metamorphic environment produces material with indices of 1.655-1.733 and 1.674-1.737 and a birefringence of 0.015. Deposits in igneous formations have indices of 1.655-1.727 and 1.715-1.731and a low birefringence of 0.004. Readings of 1.697-1.698 and 1.705-1.707 with a birefringence of 0.008 occur in crystals produced in regionally metamorphosed zones. Dispersion is low at 0.019 – 0.025, no fluorescence occurs with exposure to ultraviolet light, and only the strongly colored specimens exhibit pleochroism. A weak line at 5285 and a strong one at 4610 in the spectrum can help in its identification. It can be confused with garnet, tourmaline, peridot, diopside, axinite, and with red-brown and yellow-red zircon.

Idocrase is most commonly known as vesuvianite, but the location of deposits and its colors have caused it to be known by several other names. It was differentiated from garnet by the mineralogist Abraham Gottlob Werner after he analyzed crystals from the volcanic extrusions of Mt. Vesuvius. He gave it the name vesuvianite**.** The famed Hazlov deposits near Eger in Bohemia yield the brown acicular variety, egeran, in association with hessonite garnet, wollastonite, and albite. The blackish green vilyuyite recovered from the banks of the Vilyuy river in Siberia, and the green variety that Dr. Joel Arem refers to as wiluite that is found near the Wilui River may be the same material. The massive green californite is sometimes sold as "California" or "Vesuvian" jade. A yellow variety is known as xantite**. T**he unusual pale blue crystals are called cyprine.

Near Achmatovsk in the Ural Mountains, a delicate green matrix hosts lovely green to blue-green columnar idocrase crystals, which are highly prized by collectors. Beautifully transparent green crystals are retrieved from deposits near Ala in Piedmont, Italy, and brown and green varieties are produced in Kenya. Kristiansand and Eiker in Norway are famous for material with a square cross-section, and dark brownish-green druses of the same configuration are found in the limestones of Sanford, Maine.

Magnet Cove, Arkansas is the source of exceptionally large bi pyramidal crystals up to 30 centimeters in length. Idocrase is one of the many minerals that occurs in the specimen-rich gem deposits at Franklin, New Jersey. The delicate blue cyprine variety is found there. Chrome green and the unusual violet crystals accompany the numerous minerals in the noted gem deposits of Asbestos, Canada. Gem quality yellow-brown and green crystals are associated with pink grossular garnet in the Lake Jaco and Xalostoc, Morales regions in Chihuahua, Mexico. The asbestos-bearing formations near Eden Mills, Vermont yield crystals of exceptional beauty. Although it is known to collectors, idocrase is a lovely gemstone for jewelry when well cut.

(Part Two will cover the Epidote Group.)

New Mexico Mineral Symposium

The New Mexico Institute of Mining and Technology in Socorro announces its **20th Annual New Mexico Mineral Symposium** scheduled for **November 13** and **14** at the Macey Center on campus. Dr. Virgil Lueth is coordinating the event and has arranged for many excellent speakers to give presentations, including **Guild Mineralogist, Paul Hlava**. Paul will address the audience with his interesting talk, "The Causes of Color in Gemstones". Guild President Susan Wilson will bring registration forms to the meeting in September. General registration is $22, senior citizens pay $16.50, and students pay $13. The fee for attending the Saturday evening cocktail hour and banquet is $16 for adults and $6 per child.

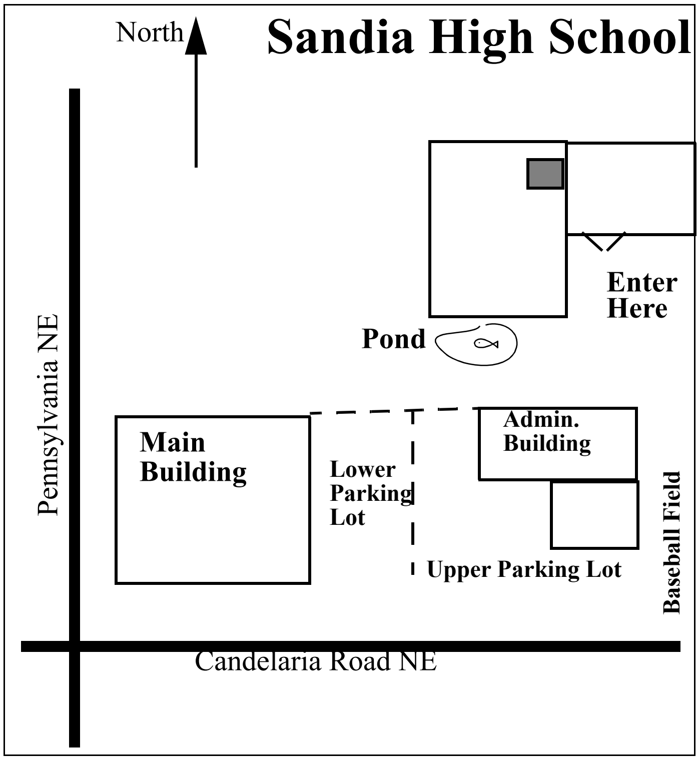
A Change in the New Mexico Faceters Guild Meeting Location

for NMFG meeting date September 9, 1999

Location: Sandia High School

Due to the construction problems at the New Mexico Natural History Museum, Guild member Ernie Hawes has graciously arranged for the New Mexico Faceters Guild to meet September 9, 1999 at 7:00p.m. at Sandia High School, located at Pennsylvania and Candelaria Roads NE. We will be meeting in Room K6, the same geology/astronomy room where we held our faceting symposium a few years ago. Please park at the north end of the lower parking lot.

The science teacher whose room we will be using would greatly appreciate any donations of New Mexico rocks and minerals you may wish to give. Thank you. to those who left mineral donations during the July meeting.


North
Sandia High School
Pennsylvania NE
Enter
Here
Pond
Main
Building
Lower
Parking
Lot
Admin.
Building
Upper Parking Lot
Baseball Field
Candelaria Road NE

We exchange newsletters with the following guilds

Anglic Gemcutter, Beaver Creek, Oregon
Facets, Portland, Oregon
Tacoma Faceters Guild, Tacoma, Washington
Stoney Statements, Houston, Texas
The Permain Faceter, Midland, Texas
Angles, Woodland Hills, California
Texas Faceters Guild, Cedar Park, Texas
Albuquerque Gem and Mineral Club, Albuquerque, N.M.
The Roadrunner, Big Springs, Texas
Intermountain Facetors Guild, Port Townsend, Washington
The Midwest Facetor, Birch Run, Michigan
The Transfer Block, Sacramento, California
USFG, Kalispell, Montana
Facet Talk, Ashgrove West, Queensland, Australia
Calgary Faceters Guild, Saskatoon, Saskatchewan, Canada
North York Faceting Guild, Markham, Ontario, Canada
Ottawa Gem Facetor's Guild, Ottawa, Ontario, Canada

{Please let me know if I have accidently omitted any group.}

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TABLE 1. Shows of Special Interest

Name	*Location*	*Date*
Grant County Rolling Stones Gem and Mineral Society's 16th Annual Show	Silver City, New Mexico; Silver City Recreation Center	Sept. 4 - 6
Gem, Lapidary, and Mineral Show	Tucson, Arizona; downtown buildings	Sept. 4 - 12
Gem and Lapidary Wholesalers, Inc.	Tucson, Arizona; The Rodeway Inn; Holiday Inn/Holidome	Sept. 9 - 12
Pacifica Trade Show	Tucson, Arizona; Howard Johnsons	Sept. 9 - 12
Denver Expo 1999; Gem, Mineral, Jewelry, and Fossil Show	Denver, Colorado; Best Western-Denver Central Hotel	Sept. 15 - 19
Colorado Mineral and Fossil Show	Denver, Colorado; Holiday Inn-Denver	Sept. 15 - 19
Denver Four Points Expo	Denver, Colorado	Sept. 15 - 19
International Gem and Jewelry Wholesale Show	Denver, Colorado; Merchandise Mart	Sept. 15 - 19
27th Annual Bisbee Mineral Show	Bisbee, Arizona; Convention Center	Oct. 8 - 11
Flatirons Mineral Club's Annual Gem and Mineral Show	Boulder, Colorado; Crossroads Mall	Oct. 22 - 24
Albuquerque Gem Artisans Trade Expo (AGATE)	Albuquerque, New Mexico; UNM Continuing Education Building	Nov. 20 & 21