The New Mexico Facetor

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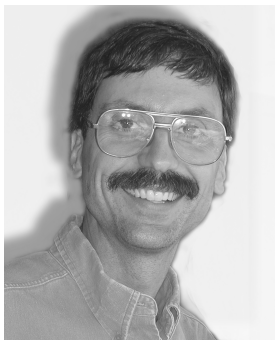


NMFG President Scott Wilson

In This Issue:

The Prez Sez:

by Scott R. Wilson, Ph.D.

The annual trek to the Tucson Show is now history. I noticed that attendance and purchasing, in general, appeared to be quite diminished from last year, but it was easy to find booths overwhelmed with customers. Top-end goods often lacked for buyers, while pedestrian-grade items usually sold out. This is an indication of the state of the economy. Buyers were not ceasing to buy, simply setting sights a bit lower.

Only one dealer had a supply of the spectacular Cambodian zircon rough, but prices were way too high for me. With the relative abundance of cut stones available at reasonable prices, I thought there might be a chance for good deals on gem rough. Apparently, not this year.

MDR showed a new design for a faceting machine that had a mast, but the quill and head floated on an assembly coupled to the mast by a parallelogram of linkages. This constrains the stone to travel straight up and down, rather than in an arc as on other machines. The design was quite complicated. It would lend itself to automated stone faceting.

The Tucson Show increased in size this year, as new big shows were added. Shows that were crowded to the point of being unsafe last year were re-organized and improved this year. Prices varied wildly for similar items. It is always that way but seemed more so this year. For example, good specimens of Moroccan vanadinite were in abundance. A specimen with large gemmy crystals nicely colored and attractively arrayed could be found for around $40. I saw one like this. Across the isle was another specimen of vastly lesser quality marked at $1500.

The annual NMFG party organized by Nancy and Steve Attaway for Guild members and special guests was attended by 28 people. Among the guests were Lapidary Journal Editor Merle White and her husband John White, former Curator of the Smithsonian, Assistant Editor Tammy Honaman, Cutting Edge Award Winner John Rhoads and his wife, and Fred Ward's Assistant Michele. The event has become a Tucson highlight. Thanks, Steve and Nancy, for making it happen!

I look forward to hearing tales from Guild members who attended the show. Please bring your cool goodies to the meeting for Show and Tell to keep everyone updated on the state of faceting and the gem materials available.

Minutes of the NMFG Meeting

January 10, 2002

by Nancy L. Attaway

President Scott Wilson called the meeting to order at 7:10 p.m. and welcomed all members and guests. He asked everyone to introduce themselves to the group. Several guests attended tonight's meeting.

Old Business

President Scott Wilson reported on the Guild Christmas party and thanked **Rainy Peters** and **Eileen Smith** for their work in arranging the event. The membership declared the Christmas party a huge success. The thirty party attendees enjoyed the rousing gift exchange. Thanks to Steve and Nancy Attaway for the wine and appetizers.

Ernie Hawes reported on the faceting workshop held at the home of Steve and Nancy Attaway on December 8. Members attending the workshop faceted stones for most of the day in order to learn hands-on faceting techniques. Ernie plans to devote the morning session of the next workshop to other topics relating to faceting, such as the selection, orientation, and purchase of gem rough for faceting.

New Business

The **next workshop** is scheduled for **January 12** from 9:00 a.m. until 5:00 p.m. at the home of **Scott Wilson**. Ernie provided a sign-up sheet and directions to Scott's home. The entire morning session will cover rough selection, what to look for when purchasing gem rough, what shapes are best indicated by the individual rough pieces, and orientation for best color and carat yield. Members will facet their stones after lunch. All members attending workshops are asked to give $5 towards food and the copies of information and faceting designs. Please contact Ernie regarding all workshops and any questions related to workshops. Ernie has a few faceting machines available for those who do not own their own machines. Please call him to reserve a machine for you at the next workshop.

Nancy Attaway reserved a party room at **El Parador** Restaurant, **2744 East Broadway** in **Tucson**, for a party on Friday, **February 8** at **6:00pm.** Her annual Tucson party is for members of the New Mexico Facetters Guild, their spouses, and honored guests. This is a great time to visit with some of our out-of-state members, like Brian Cowger, and honored guests, like famous gem book author and photographer Fred Ward, famous American gem carver Steve Walters, award-winning facetor John Rhoads and his wife, Lapidary Journal Editor, Merle White, and Assistant Editor of Lapidary Journal, Tammy Honaman.

Show and Tell

The Show and Tell Case tonight held many faceted and carved stones and jewelry rendered by Guild members.

Larry Plunket displayed the four oval blue zircons that he purchased. He set two of them into earrings, one into a ring, and one into a pendant, all in 14Kt. white gold. **Steve Attaway** remarked on the difficulty in working with white gold. **Paul Hlava** mentioned the stress corrosion cracking sometimes seen in white gold, mostly due to the nickel content. **Russ Spiering** said that there is a white gold now that contains palladium instead of nickel. Larry did a good job setting the stones in white gold.

Will Moats displayed three stones that he faceted in the nine-mains round cut, a pyrope garnet from Arizona, a light pink beryl, and a goshenite. The epoxy failed Will while he was faceting the crown of one beryl, giving him a challenge in finishing the stone. Also, part of the crown crashed on the pyrope garnet, forcing Will to shallow the crown angles and completely eliminate the star facets to allow a finished gem. He polished the pyrope garnet on aluminum oxide and polished the two beryls on cerium oxide. An experienced facetor, Will found workable solutions to the faceting problems encountered with these stones.

Dylan Houtman displayed five Burmese rubies that he cut, a heart, a pearshape, and three large baguettes. He also showed a tray full of his carved opals from Lightning Ridge, Australia. Dylan's work is well done.

Gary Peters displayed the two peridots that he worked on during the workshop in December. One peridot was a long and very slender emerald cut. The other had a marquise shape with blunted ends at the 24 and 72 facets, due to the elimination of internal inclusions at those ends. He polished the peridots on Last Lap with diamond. Gary mentioned that he bought a brand of epoxy at Albuquerque Hobby on Eubank at Constitution. Those long, slender emerald cuts are somewhat difficult to render, and the modified marquise was a design that Rainy and Gary wanted to work with in jewelry. Gary did a very good job with both.

Ernie Hawes brought a carving that was beautifully rendered years ago by **Merrill O. Murphy.** The five-inch high carving depicted a horsehead much like that seen in chess sets of the knight pieces. Merrill rendered his carving in blue/gray Apache Creek agate, with the druzy inside the neck of the horse. Apache Creek lies near Reserve, New Mexico. The workmanship of the carving was excellent and quite remarkable. Thank you, Ernie for bringing it.

Carsten Brandt displayed the amethyst that he faceted at the workshop in November, the same stone that he had to re-cut during the workshop in December. The culet had been chipped. **Steve Attaway** remarked how difficult stone repair was and congratulated Carsten on his endeavor.

Bryony Carter, a guest brought by Paul Hlava, was asked to display her two yellow gold rings that she fabricated for her goldsmithing class. One ring held a tourmaline in a tension mount accented by a gypsy-set diamond. The other held a triangular garnet in a fabricated bezel mounting. Members voiced compliments on her work.

Nancy Attaway displayed a 34.5x8mm emerald cut green tourmaline from Brazil that weighed 18.58 carats. The color of the stone was a bright grass green. Nancy faceted a traditional step cut, and she cut the ends, facets 24 and 72, at 80 degrees. She displayed a natural black Tahitian pearl with green tones under the green tourmaline, as both are slated to be set into an 18Kt. gold pendant. The green tourmaline rough was purchased by Louie Natonek some years ago at Tucson and bought by Nancy last year.

Steve Attaway displayed several of his carved stones that he set into jewelry. He showed three South African deep blue chalcedony carvings, one carved Australian translucent green chrysoprase, one carved Australian opal with pinfire, and one Bolivian ametrine carving. All were set in 14Kt. yellow gold pendants that Steve and Nancy cast during Christmas break. He also showed three unset South African deep blue chalcedony carvings, one large, unset ametrine carving that resembled an orchid, and one small chalcedony carving set into a cast yellow gold ring. Steve explained how he used wax sheets for making wax patterns that wrapped the carvings the way he wanted. He placed prongs at strategic locating on the carvings that did not interfere with the carvings' undulating curves. Steve also mentioned that he was now using new wheels and bristle brushes made by 3M for carving and polishing stone. Some of these had the abrasive built into the tool. Steve also mentioned a new polish compound made by Mountain Mist of Morgantown, West Virginia that gives excellent results on polishing gemstone carvings. Steve's recent carvings seemed to have gone to a new level. Congratulations.

Refreshments

Rainy Peters, **Nancy Attaway,** and **Scott Wilson** brought home-baked refreshments to the January meeting. Gourmet coffee was served. Thank you very much. **Rainy Peters, Elaine Weisman,** and **Mark Price** volunteered to bring refreshments to the meeting in March. See you there.

Future Programs

As **Vice President/Programs, Paul Hlava** will appreciate any suggestions for ideas from Guild members regarding future programs. If there is any topic that members wish to have presented, or if you know of a particular speaker who you want to hear, please notify Paul. Thanks.

Nancy Attaway toasts the New Mexico Faceters Guild members and guests at her Tucson party at El Parador. (photo by Steve Attaway, camera by G. Peters)

Program Speaker

by Nancy L. Attaway

Vice-President/Programs Paul Hlava presented his talk on **"Emeralds, Part 2."** In Emeralds, Part 2, Paul discussed the history, lore, and the important parts emeralds played in world history. Paul explained the cutting of emeralds, the known treatments, the methods of emerald synthesis, emerald substitutes, and the inclusions in emeralds. He remarked on the costs of emeralds and the factors influencing cost, along with the recommended care of emeralds.

Paul stated that emeralds were nearly as old as civilization itself. He began his emerald story in ancient Egypt around 3500 B.C. and cited the Mines of Cleopatra. Egyptians mined emeralds in the desert hills of the Sikait-Zabara region between the Nile River and the Red Sea in southern Egypt. Paul said that Cleopatra's emerald mines had a long history, as the Egyptian miners unearthed emeralds in the region for over 3,000 years. The Romans mined emeralds there as well and produced the most gems during their occupation. Examples of jewelry set with emeralds have been unearthed from ancient Egyptian and Roman times.

The Turks and Arabs later worked the mines until the 13th century, and the mining area was all but abandoned during the 1700's. The location of Cleopatra's emerald mines became lost for a time and was thought to have been refound in 1816. Smaragd is the old name for emerald.

During their empire expansion, Roman legions moved north and discovered an emerald deposit in the mountains of Habachtal, which is now Austria. Marco Polo reportedly carried emeralds back to Italy with him from his epic journey to China at the end of the 13th century. Likewise, the Crusaders returned from the Middle East with emeralds. India stood as the world's leading gem market for thousands of years, and Indians valued large, fine emerald crystals. Paul said that it is now certain that Egypt established the oldest and most worked emerald mines in the ancient world. However, chemical analysis performed in the late 20th century revealed that the emeralds thought to have been from Egypt were actually from certain areas in Austria, Pakistan, and Afghanistan. And, much of the stones that were believed to be emeralds from Cleopatra's mines were later discovered to be green beryls. Paul reminded us that emeralds are colored by chromium or vanadium (or both), and that green beryls are colored by iron.

Paul explained that many medicinal cures were attributed to emeralds. Emeralds were reputed to be able to neutralize poisons, cure dysentery, cool a fever, stop bleeding, assist in the delivery of babies, cure bad eyesight, and ward away snakes. Some folks even thought that emeralds could foretell future events and improve one's memory. Emeralds were held in very high esteem by ancient people, and the value for emerald continues in the world gem market today.

Paul said that native people in Colombia used emeralds in jewelry and in religious ceremonies 500 years before the Spanish conquest of the America's. Paul remarked that Pizarro's men were reputed to have broken many fine emerald crystals, thinking that an emerald was hard enough to sustain a blow from a hammer. In their constant quest for gold, the Spanish brought back many fine emeralds from the New World and then traded them to the royals in India, Europe, and Persia for gold, diamonds, and pearls. Paul stated that the Spanish were responsible for the dramatic increase in the trade of emeralds during the 1500's, largely through the amazing emerald supply found in Colombia. Paul mentioned the Atocha emerald cross, and that the ship carrying it and other emeralds sank off the Florida coast in 1622, only to be found by Mel Fisher et.al in 1986.

Paul said that all green gems found in Brazil were known as "Brazilian emeralds" until the 19th century, when emeralds were distinguished from green tourmaline. The term "Brazilian emeralds" refers to green tourmaline. During the 20th century, emeralds were found in Africa, Pakistan, Afghanistan, Russia, and North Carolina. Paul explained that the deposits in Afghanistan were actually re-discovered in the 1970's, having been lost for a time.

Paul discussed the logic behind emerald cutting. Beryls cut rather nicely, he said, but emeralds are more difficult to cut, due to their inclusions. Emeralds are usually faceted to show off their fine green color and not necessarily cut to show fire and brilliance. Emeralds are often cut with very deep pavilions to maintain carat weight, and, thus, increase their per carat value. Paul said that you can get bluer stones by cutting the crystal perpendicular to the C axis.He said you can get more saturated, yellow green stones by cutting parallel to the C axis. The rectangular "emerald cut", the square, and the octagonal shapes are the most common

shapes used in faceting emeralds. These particular shapes best accommodate the natural crystal outline of the rough emerald crystal to retain the most carat weight and value.

Paul remarked that ovals and pearshapes are also common, in that their yield from the natural crystal shape of the emerald is good. Cutters usually go for maximum yield on emeralds to retain the most carat weight and get a better price on the finished gem. Calibrated stones are not really normal for emerald, in that emeralds are rare and yield certain shapes better than others. Rounds, marquises, and heartshapes are very unusual to see in cut emeralds.

Paul said that emeralds can be cut en cabochon in rounds and ovals, like the magnificent cabochon-cut emeralds set in the famous Topkapi Dagger. Emeralds are also carved, and Paul mentioned several famous carved emeralds, like the 217-carat Mogul Emerald. Famed Canadian gem carver Thomas McPhee carved a large emerald crystal years ago that represented historical figures related to Canada's history. The gem was estimated at over $2 million.

In discussing treatments, Paul remarked that the good news was that no heat-treatments or irradiation is ever used on emeralds. The bad news, he said, was that oiling is used on both rough and faceted stones. Impregnation with plastics is also used, as well as dyes. Terms describing synthetic emerald include "man-made", "lab-grown", "cultured", and "created". Paul said that synthetic emeralds contain the same chemistry and properties as natural emeralds.

Paul stated that emeralds cannot be made by flame fusion, nor by the Verneuil process. He said that synthesized emeralds are flux-grown. The flux-grown process involves molten chemicals in a platinum crucible. A crucible is placed in an oven at high temperatures (1200 degrees Centigrade or higher). Emeralds are also grown hydrothermally, where solid chemicals are placed in pressurized vats at medium temperatures (600 degrees Centigrade or higher) for months. Emeralds can also be made through the chemical vapor deposition method, which has chemicals bled into a vacuum chamber and deposited on a hot substrate.

Paul stated that Carroll Chatham was the first person to synthesize emeralds (in 1935). (It is thought that he died from beryllium poisoning.) Paul listed the synthetic emerald manufacturers. Flux-grown emerald producers include: Bijoreve /Seiko; Chatham; Gilson/ Nakazumi; Inamori; Kyocera; Lechleitner; Lennix/ Lens; CIS; and Zerfass. Hydrothermal emerald growers include: Biron/Biron Minerals (previously Pool); Lechleitner "overgrowth"; Quintess/Linde; Regency/ Vacuum Ventures; and CIS. Those manufacturers of created emeralds by the chemical deposition method are ANICS/Adachi Shin.

Paul also listed the various emerald simulants and said to beware of fakes. Green glass is used as an emerald substitute, which started in antiquity and still continues, of both cut stones and crystals. Paul said to look out for doublets and triplets, coated stones and foil-backed stones, fractured and dyed stones, hollowed-out beryl crystals filled with green-colored plastic, manufactured emerald crystals glues on matrix, green-colored synthetic spinels, green cubic zirconia, tsavorites, chrome tourmalines, some peridot, chrome diopside, green colored plastic, and more. Paul believes that disclosure is very important in selling emeralds. Oiling is considered dishonest if not disclosed.

Paul explained that emeralds are usually included, often richly included. These inclusions are the consequence of stress, where chromium atoms enter the aluminum site in the beryl crystal's atomic lattice. Chromium atoms can break the atomic lattice bonds of emerald, because the chromium atoms are larger than the spaces in the atomic lattice. Paul said that even synthetic emeralds contain inclusions. Inclusions, known as "jardin", are considered part of the "charm" of emeralds. "Jardin" is French for garden; a garden of inclusions. Paul remarked that inclusions often provide clues to the origin of the emerald, and, consequently, inclusions in emeralds are much studied.

Paul explained that inclusions are all the things found in a cut stone that keep it from being perfectly clear, with the exception of color and color zoning. These include fractures, cavities, crystals of other minerals, and dirt. Cavities may be empty, fluid-filled, fluid and vapor filled, filled with fluids, vapors, and with one solid or more.

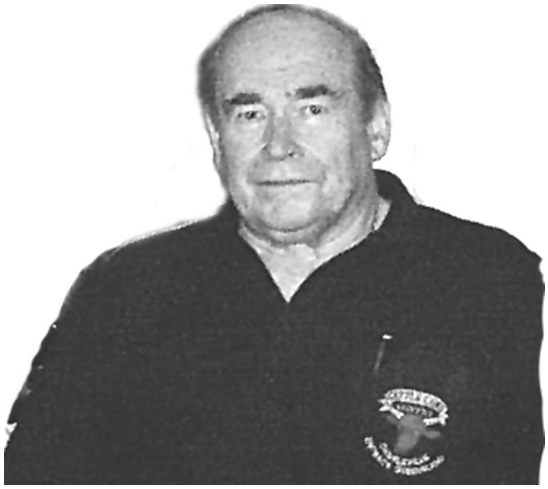
Paul stated that inclusions offer the best clue to the origin of the stone. Inclusions can even determine whether an emerald is natural or synthetic. Certain inclusions are indicative of certain mines or mining districts. Certain inclusions in synthetic emerald provide evidence of the method used in its manufacture. Mineral inclusions include: carbonates (like the parasites found in Muzo emeralds), micas, oxides, sulfides, and silicates. Paul said that pyrite was a common inclusion found in emerald. There are both two-phase inclusions and three phase inclusions in emerald. Metals may also be inclusions in emerald, like the platinum platelets found in flux-grown emerald.

Paul mentioned the cost and factors associated with emeralds. He said that emeralds are precious and rare. Therefore, they command a high price. Paul explained that emeralds are priced per carat and can run hundreds of dollars per carat for medium grade emeralds to thousands of dollars per carat for fine emeralds. Factors that determine the value of an emerald depend upon depth of color, clarity, jardin, size, cut, and origin. Colombian emeralds provide the benchmark of comparison for fine grade emeralds.

Paul ended his talk on emeralds with the care of the gem. He said that emeralds are hard but brittle. Emeralds can be highly flawed, where the crystal structure is stressed. He said to avoid mechanical shock and thermal shock. Paul warned to never clean an emerald in an ultrasonic and to never steam clean an emerald. Instead, Paul advised using warm water, a mild detergent, and a soft brush to clean an emerald. He also said to store emerald jewelry separate from other jewelry to avoid scratching the gems. Over time, emeralds can dry out and show more inclusions, and Paul said that emeralds can be re-oiled.

Paul delighted his audience with slides of beautiful emeralds in marvelous jewelry creations. Paul is a fountain of knowledge on gems and minerals. Everyone thoroughly enjoyed his well-prepared talk on emeralds. Thanks, Paul.

{Editor's comment: Please see the two excellent books on emeralds by noted author and photographer Fred Ward for more information. Also, please see the Summer 1999 Issue of Gems and Gemology on "The Identification of Various Emerald-Filling Substances". And, please see the Winter 1999 Issue of Gems and Gemology on "Classifying Emerald Clarity Enhancement at the GIA Laboratory". The book, *Emeralds and Other Beryls* by John Sinkankas is a classic reference to have in your library.}



Herb Traulsen, who knows and loves opals.

Donna and John Rhoads, Cutting Edge Award Winning Facetor of D & J Rare Gems, Ltd.

(All photos on this page by Gary Peters.)

NMFG Tucson Party. Clockwise from top: Tammy Honaman, Assistant Editor of Lapidary Journal*, Steve Attaway, Scott Wilson in his new hat, Ernie Hawes,Larry & Glenda Plunket, John White, former Curator of the Smithsonian, and Merle White, Editor of* Lapidary Journal, *all sitting at one of the three full tables in the El Parador Restaurant party room.*

In the News

FireScope Used for Re-Cutting Diamonds
Source: JCK Monday on the Net 12/10/01

Richard von Sternberg, President of EightStar Diamond Company in Santa Rosa, California, proved that even the most beautiful diamond cut by conventional methods can benefit from his company's scientific approach to diamond cutting. He paid in excess of $1 million for a 14.89-carat, D-color, internally flawless diamond with a very good polish and excellent symmetry, according to GIA's Diamond Grading Report. Then, he re-cut the stone. The result was the "American Star", a D-color, internally flawless, 13.41-carat EightStar round brilliant with excellent polish and symmetry and a 57% table, according to another GIA report. To re-cut the stone, a device called a FireScope was used that showed the cutters where to place every facet to eliminate light leakage and maximize brilliance and fire. EightStar Diamond Company claims to cut every diamond for maximum light performance with specially-designed equipment to render an intense study of the crystal's growth pattern. The project took ten months of preparation, but the actual re-cutting took only six weeks. For more information, call 707-939-7960 or e-mail: eightstar@aol.com

More Emeralds Unearthed in North Carolina
Source: JCK Monday on the Net 1/21/02

Using high-tech subterranean radar imaging equipment, James Hill located two large emerald crystals from his North Carolina property on January 11. The exposed area of one crystal was about 25 carats, and the other was over 100 carats, both showing an intensely rich "glow-in-the-dark" green color. The ground-penetrating radar imaging allowed the viewer to see geophysical plotting of potential emerald pockets that indicated where to dig. Plotting one small section revealed more than 30 potential pockets.

This latest find was 12 feet directly beneath where James Hill had parked his backhoe two years ago, when the North Carolina state government ordered him to stop digging. Since then, he has made his way through mounds of regulatory paperwork and fees, paying costly permits and everyday expenses in order to obtain the state's approval for operating an emerald mine. He also was required to prepare the site to meet the state's ecological requirements.

New Treatment for Corundum
Source: GIA Insider on the Net 1/29/02

GIA is investigating a new treatment for corundum that is currently being used in Thailand. This process changes pink sapphires from Madagascar into pinkish orange/orangy pink padparadscha colors, turns dark-purple rubies from Thailand into bright orangy red rubies, and causes green sapphires from Tanzania to become orange. It was noted, however, that the orangy color did not penetrate all the way through many of the stones. These stones exhibited a similar color-zoning previously seen in diffusion-treated stones. None of the identifying characteristics of diffusion treatment were present, such as an abnormal concentration of the color-producing metallic ions used in the diffusion process (titanium or chromium). A few stones had the color throughout, and some stones showed uneven coloration. GIA suspects a type of high-temperature heat treatment is the method used and is concerned about the coloration not extending through the entire stone. GIA is not ruling out the possibility of a new type of diffusion treatment either.

Mail Sterilization Changes Color in Gems
Source: JCK February 2002

A system to eliminate threats of anthrax slated to be used by the U.S. Postal Service can produce color changes in certain gemstones. The device from Titan Scan Technologies (parent company is SureBeam Corporation) that is being considered uses an electron-beam. The technology has already been used to turn topaz from colorless to blue, changes tourmaline from pale pink to bright red, and changes clear quartz to smoky. However, GIA experiments with the technology revealed the occurrence of dramatic color changes in pearls, sapphire, quartz, kunzite, fluorite, zircons, topaz and cubic zirconia. There is also the possibility of changes to the transparency of diamond from this technology, typically associated with GR1 radiation change. GIA advises gem dealers to use alternative methods of shipping parcels other than the U.S. Postal Service.

The Real Story on Diamonds
Source: National Geographic Magazine March 2002

National Geographic weaves a story surrounding diamonds that involves a "labyrinth linking multimillion-dollar mines, bloody wars, and timeless beauty", as the report tracks a rough diamond from Africa to New York City.

Faceters Guild Workshop

by Nancy L. Attaway

The New Mexico Faceters Guild held a workshop at the home of **Scott Wilson** on **January 12** that lasted all day. **Ernie Hawes** organized the workshop and served as its moderator. **Ernie Hawes, Scott Wilson, Steve Attaway,** and **Nancy Attaway** also served as instructors.

During the morning session, Guild members listened to the discussions that surrounded the selection and purchase of gem rough for faceting while sipping coffee. **Ernie Hawes** and **Steve** and **Nancy Attaway** presented personal experiences regarding the purchase of gem rough at past Tucson shows. They all advised to look carefully at each piece to determine clarity, best color orientation, and what shapes would be possible to cut. Natural gem rough may contain inclusions, and some of these inclusions can be worked around while faceting or can be totally eliminated. Ernie recommended shopping around to check prices, as prices can vary greatly on the same gem material.

Steve and Nancy explained the differences between buying a single piece of gem rough and buying a parcel of gem rough. Much gem rough is sold by the kilo, and, usually, the best prices on rough are marked at kilo prices. Hence, the more in quantity purchased, the better the price of the rough will be. The Attaways recommended buying amethyst, ametrine, and citrine in kilos. They also said to purchase aquamarine rough, tourmaline rough, and rhodolite garnet rough in kilos, half kilos, or some quantity of a large parcel, if possible. The money saved when buying gem rough in quantity can be significant. Steve and Nancy related several very interesting stories of buying rough at Tucson. They also recommended sharing a kilo or a large parcel of gem rough with other cutters, and they have done so several times. Guild members might consider doing this.

Steve and Nancy explained that certain gem rough not normally found in great quantities would be sold in "lots" or smaller parcels. That would include gem rough for high grade tanzanite rough, high quality aquamarine rough, tsavorite garnet rough, imperial precious topaz rough, the rarer colors of tourmaline rough, and emerald rough. They remarked that some of this type of gem rough would be sold by the "lot", where the dealer would not break up the lot for selling individual pieces. They said that cutters looking for a piece or two of different types of gem rough would likely pay much more for "pick" or "selection" of individual pieces, but that these were usually available. Dealers selling individual pieces of gem rough usually mark them at very high prices.

Scott Wilson ordered pizza for lunch and served chips and salsa. **Rainy Peters** baked an apple crisp coffee cake. **Elaine Price** baked date-filled scones. **Nancy Attaway** baked her famous chocolate-cherry cake. Scott Wilson provided iced tea, and Nancy Attaway brewed gourmet coffee. Thank you all very much. We are blessed with many accomplished cooks in the Guild.

Gary Peters brought his Facetron faceting machine and cut an orange/red garnet into an oval. He wanted the experience in cutting an oval, seeing how the stone would evolve. Nancy assisted Gary with his cutting. The oval is a difficult shape to render, and Gary wanted to learn the cut.

Nancy helped **Linda Vayna** with her large synthetic blue spinel on her Graves faceting machine. Progress is being made on the stone, and she is learning how to use her faceting machine. The stone is now ready for transfer.

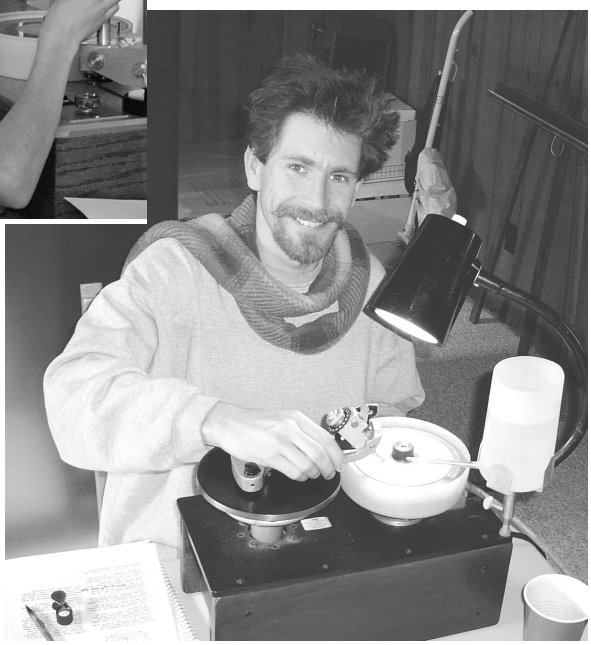
Carsten Brandt had another amethyst to work on, and **Mark Price** worked with his UltraTec on several stones. Mark has an outline that he created for himself to learn to work with different gem materials and cutting designs.

Laura Kirkpatrick used one of Ernie's Facetron faceting machines to cut a large round, pale-colored Oregon sunstone. She cut and polished her stone that afternoon, and her stone is ready for transfer. Good job, Laura.

Steve Vayna, Rainy Peters, Elaine Price, and **Magail Medina** observed the proceedings. We all had a lot of fun sharing our experiences and recommendations. It is very good to have a large group of folks all faceting stones again, like we used to see years ago.Thanks to all who participated. We look forward to the next workshop.

January Faceting Workshop

Left: Ernie Hawes tutors Laura Kirkpatrick as she cuts her round Oregon sunstone (Scott Wilson and Joe Spindin are in the background.)



Carsten Brandt faceting away with a big smile.

An afternoon faceting workshop at the home of Scott Wilson in January. Left to right: Mark Price and Gary Peters faceting stones, with Steve Vanya (center) watching; Nancy Attaway checking the meets on a stone being cut by Linda Vanya; and Ernie Hawes.

(All photos on this page by Gary Peters.)

LET'S TALK GEMSTONES

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Garnet Group

[A NESOSILICATE]

The Pyralspites

It has been noted earlier that the garnets are sometimes classified as the **Ugrandites**, those species where calcium occupies the A site in the general structural formula $A_3B_2(SiO_4)_3$], and the **Pyralspites**, those species where the B site is occupied by aluminum. Little solid solution occurs between these two categories, but solid solution series are formed between members of the same category. Pyrope, almandine, and spessartine comprise the pyralspite category. Solid solution series are formed between almandine and pyrope, pyrope and spessartine, and between almandine and spessartine. A simple way to illustrate the relationship of these species is to draw a triangle with lines connecting the points representing the pure "end members" of the three species. Progression along the line connecting the end members of two species indicates a ratio change of the atoms in the elements that compose the chemical compositions from the solid solution series' end members. Such a change in the ratio often affects the physical and optical properties of the varieties formed by the change. Pure end members of the various series rarely occur. Therefore, the intermediate varieties provide an important portion of the material for gemstones. Such varieties often bear trade names that give no clue to their relationship to the species. This "relationship triangle" provides the basis for the sequence in which the pyralspite species and their varieties are presented.

Almandine [Almandite]$Fe_3Al_2Si_3O_{12}$Iron Aluminum Silicate

This most common of the garnet species (an end member of two solid solution series) occurs in a wide variety of locations and environments. Regional metamorphism of clay sediments has made it an abundant constituent of metamorphic rocks worldwide. Igneous rocks, alluvial deposits, and less frequent occurrences in pegmatic granite are other sources. The major sources of gem material occur in India, Sri Lanka, Australia and Brazil. Exceptionally large gem crystals are produced from mines in Madagascar. Excellent material exhibiting asterism is found in Idaho in the United States. [The Smithsonian Institution in Washington D. C. has a 175-carat star gem from Idaho in its collection.] Slate deposits near Wrangell, Alaska yield unusually well formed crystals.

Because pure almandine is rare, the term almandine is used when the iron in its chemical composition exceeds that of magnesium in its solid solution series with pyrope. The same is true of manganese in its solid solution series with spessartine. Its iron content causes it to fuse at 3-3.5 to a magnetic globule. Spectral examination always reveals a distinct and diagnostic pattern. From 3 to 5 wide bands and a possible 2 or more lines create a vivid spectrum. The presence of elements associated with pyrope and spessartine produce the range of almandine's hues from red, violet-red, orange-red, and reddish-brown to brown.

The asterism of the star garnets is caused by asbestiform pyroxene and amphibole inclusions. Translucent and transparent almandine material frequently houses short, stubby, low-relief crystals of biotite, ilmenite, spinel, quartz, apatite, monazite, haloed metamict zircon crystals, rod-like hornblende, and asbestiform needles of augite and acicular rutile crossed at 70 and 110 degrees. The iron content and inclusions can cause variations of density from 3.95 to 4.30. Simon & Schuster's *Guide to Gems and Precious Stones* states "the density increases parallel to the (refractive) index". Refractive indices between 1.785-1.83 are the norm. Readings below 1.78 indicate an intermediate member of the almandine-pyrope series.

Joel Arem lists the dispersion as 0.027 in his *Color Encyclopedia of Gemstones*, and it is shown as 0.024 in Walter Schumann's *Gemstones of the World.* The vitreous luster sometimes borders on adamantine. Despite its lesser hardness (6.5 – 7.5), almandine's distinctive fracture makes it much more effective than quartz for use in abrasive materials. The major source for manufacture of these abrasives is the extensive garnet deposit at Gore Mountain in New York. The condition of the huge crystals there, extremely shattered by nature, precludes their use as gemstones.

Almandine's name is a corruption of the name of the ancient city of Alabanda, located in what is now southwest Turkey, near where it was discovered. It is a gem with an ancient history. Noah is reputed to have hung garnet in the ark to disperse light. It was used in windows of temples and cathedrals and is believed to have been one of the gems representing the twelve tribes of Israel decorating the "breastplate of Aaron". The finest almandines from the alluvial gemstone deposits in Sri Lanka are often called "Ceylon rubies". A careful examination of its physical and optical properties is sometimes needed to distinguish almandine from red spinel. Paste (glass) is used as a simulant. Almandine is not produced synthetically for use as gems. The expense of production by the flux growth method is prohibitive, and the high temperature of the melt method causes the conversion of the necessary ferric iron to ferrous iron in the chemical composition with unsatisfactory results.

Intermediate Members of the Almandine - Pyrope Solid Solution Series

The chemical composition of the intermediate members of the series grades almandine to pyrope as the presence of iron decreases and magnesium increases. Without chemical analysis, the major criterion for determination and designation of an intermediate member of the series is the refractive index. The refractive index for the series exhibits a range from 1.785-1.830 for almandine to 1.714-1.742 for pyrope. The presence of chrome can usually be discovered by spectral analysis.

Rhodolite

This gem garnet variety has increased enormously in popularity within the last few years. Its purplish undertones have led to the use of the term "raspberry garnet" in the trade. In *The Illustrated Encyclopedia of Minerals and Rocks*, Dr. J. Kourimsky indicates the distinctive color "is caused by the presence of iron and chromium". Upon spectral examination, it exhibits the almandine spectrum. Determination of its position in the series requires chemical analysis. Without such analysis, most gemologists apply the name rhodolite if the refractive index reading is 1.77 or below. In addition to the inclusions common to garnets, apatite crystals are sometimes present.

Chrome Pyrope

The presence of chrome creates the especially vivid red of this intermediate member of the series. Its position in the series lies closer to pyrope than does that of rhodolite as the ratio of magnesium increases in the chemical composition.

Pyrope

The red hues of the pyrope-almandine series nearest the end member pyrope are commonly called pyrope. The Greek word *pyropos,* meaning "fiery-eyed", gives them the name. Volcanic rock and alluvial deposits in Argentina, Australia, Brazil, Myanmar, Scotland, Switzerland, Tanzania, and the desert sands of the southwest in the United States are sources of this popular garnet. Pyrope often is associated with and appears as inclusions in diamonds in pipes located in Africa and Canada. Pyropes are usually pea-sized or smaller. The slopes of the Bohemian Highlands in Czechoslovakia are famous for the production of especially fine pyropes called "Bohemian garnets". Dr. Kourimsky tells that Anselmus Boetius de Boot, in his *Gemmarum et lapidum historia,* "writes not only about the garnet the size of a pigeon's egg but about other large pyropes" found there in the sixteenth century and that "pyropes the size of a hazelnut were valued as highly as rubies". Pyropes from this source were used extensively in Victorian jewelry. "Cape ruby" is a name applied to the pyrope found in deposits at the Cape of Good Hope in South Africa. Although pyropes are notably free of inclusions, sometimes octahedra, tiny needles, and rounded irregularly outlined quartz crystals (snowballs) are present.

Pyrope$Mg_3Al_2Si_3O_{12}$Magnesium Aluminum Silicate

This end member of the two solid solution series almandine- pyrope and pyrope-spessartine would be colorless in the pure state. Its refractive index range of 1.714 –1.742 is the lowest of all the garnets. The existence of pure pyrope as a gem is unknown.

[Author's note: A future article will address the pyrope-spessartine and spessartine-almandine solid solution series.]

Facet Designer's Workshop

By Ernie Hawes

Inspiration F10rom Tucson

During some leisure hours in Tucson this past February, I mulled over a number of ideas for new designs. My laptop goes everywhere with me, so I spent a lot of time experimenting with various possibilities for several different shapes. Two of the completed patterns are presented here.

It had been some time since I had worked on a design for a round. There are considerably more round designs available than for any other shape, so I seldom consider designing a round pattern. I was inspired by a spiral pattern that I saw in a mosaic. After several experiments, I settled on the design presented here. It reminds me of a number of pictures of spiral nebulae that I have seen on NASA's website, so my choice of a name became obvious. Although the outer rim of the design appears darker than the rest of the pattern, the considerable contrast actually seems to help the nebula-like appearance. Because of the large number of facets, the ***Spiral Nebula*** is recommended for stones 12 millimeters and greater.

The next design is a continuation of my desire to create some easy patterns in shapes other than the rounds that most beginners spend a lot of time cutting. When viewed straight-on, a jagged step-like image is apparent, similar to designs used by various native American tribes in weaving, pottery, and basket making. For this reason, and because I created the design while in Tucson, I have chosen the name, ***Tucson Triangle***. It should be an easy and quick pattern for anyone to cut. Although the brightness figures are not very high, the finished stone has a surprising amount of scintillation, especially considering the small number of facets that were used.

NMFG FACETING WORKSHOP MARCH 16, 2002

The next faceting workshop will be held on Saturday, March 16 from 9:00am to 4:00pm. We will again be at Scott Wilson's home in Corrales. A map will be provided at the Guild meeting on Thursday, March 14 for those who have not been out to Scott's place. The first part of the workshop will be a short pros and cons discussion of various expert's recommendations for cutting angles. A handout will be provided. Also, a new book on faceting will be on display for your examination. The rest of the day will be spent in faceting instruction and practice. As usual, there will be a $5.00 fee per person to cover the cost of pizza, beverages, and to help pay for materials and handouts. Any home-baked treats brought for the day will certainly be appreciated. Thanks.

AGMC Gem and Mineral Show

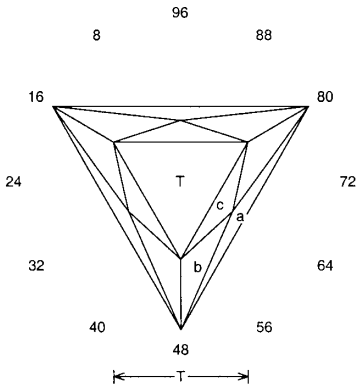
Treasures of the Earth
TotE 2002 - 33rd. Annual
Gem, Mineral, and Jewelry Expo - 2002

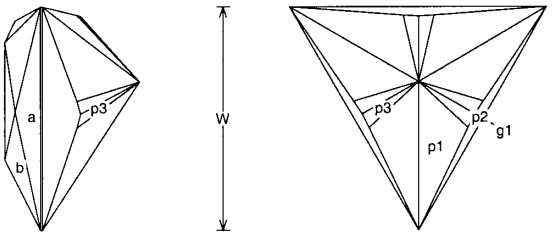
March 22-24, 2002

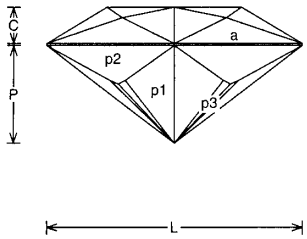
Friday - 10:00 am to 6:00 pm
Saturday - 10:00 am to 6:00 pm
Sunday - 10:00 am to 5:00 pm

New Location:
School Arts/Flower Building
State Fairgrounds, Abq.

Regular Admission $3.00



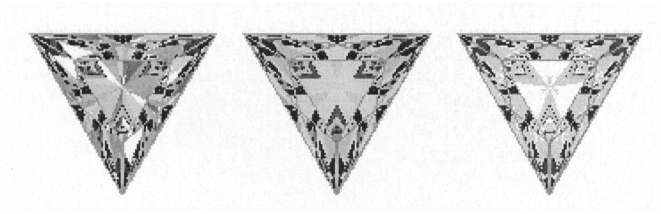




Tucson Triangle

By Ernie Hawes

Angles for R.I. = 1.54
28 facets + 3 facets on girdle = 31
3-fold, mirror-image symmetry
96 index
L/W = 1.155 T/W = 0.607 T/L = 0.526
P/W = 0.440 C/W = 0.162
H/W = (P+C)/W+0.02 = 0.621
P/H = 0.708 C/H = 0.260
Vol./W^3 = 0.176
Brightness: COS = 53.6%; ISO = 69.5%



PAVILION

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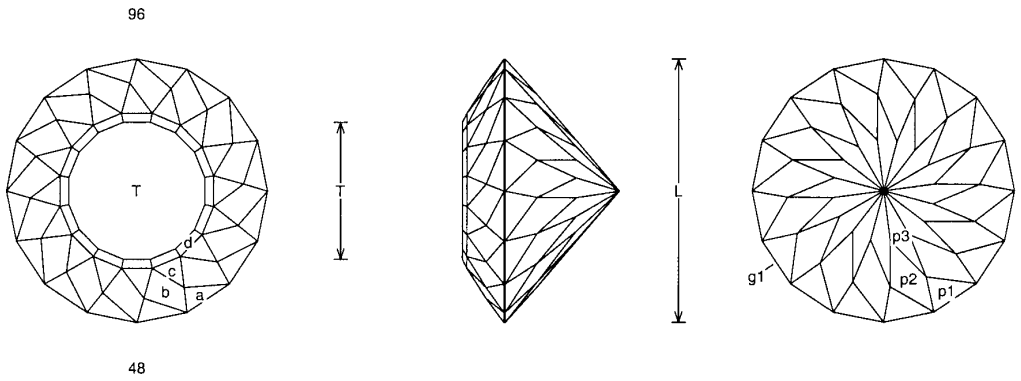
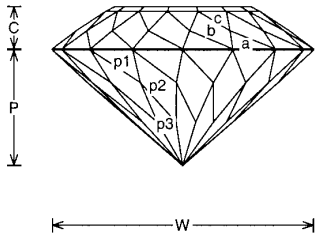
p1	43.00	04-28-36-60-68-92
p2	76.50	96-32-64
p3	43.00	03-29-35-61-67-93

CROWN

a	61.60	96-32-64
b	40.00	02-30-34-62-66-94
c	25.90	96-32-64
T	00.00	Table

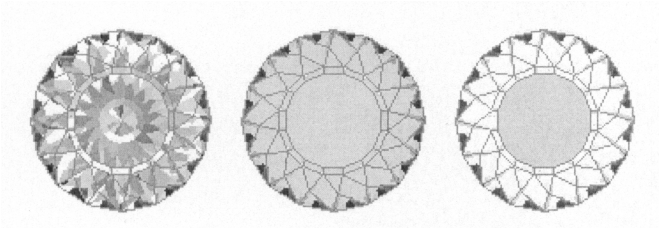




Spiral Nebula

By Ernie Hawes

Angles for R.I. = 1.76
113 facets + 16 facets on girdle = 129
16-fold symmetry
96 index
L/W = 1.000 T/W = 0.521 T/L = 0.521
P/W = 0.439 C/W = 0.160
H/W = (P+C)/W+0.02 = 0.618
P/H = 0.709 C/H = 0.259
Vol./W^3 = 0.195
Brightness: COS = 83.4%; ISO = 89.9%



PAVILION

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p1	44.00	03-09-15-21-27-33-39-45-51-57-63-69-75-81-87-93
p2	42.00	02-08-14-20-26-32-38-44-50-56-62-68-74-80-86-92
p3	41.00	01-07-13-19-25-31-37-43-49-55-61-67-73-79-85-91

CROWN

a	39.00	03-09-15-21-27-33-39-45-51-57-63-69-75-81-87-93
b	36.00	02-08-14-20-26-32-38-44-50-56-62-68-74-80-86-92
c	33.00	96-06-12-18-24-30-36-42-48-54-60-66-72-78-84-90
d	27.00	96-06-12-18-24-30-36-42-48-54-60-66-72-78-84-90
T	00.00	Table

Vikings and Iolite

by Scott Wilson

Many of us have heard that the Vikings used iolite, the gem form of the mineral cordierite, to assist navigation on the open seas on cloudy days, when the sun was not visible. I have often wondered how they did that, and I have finally found out how it works. In *Contemporary Optics for Scientists and Engineers* by Nussbaum and Phillips, a short report appeared on this subject. I have condensed it here.

The basis for the technique is that clouds scatter light, and scattered light can become polarized in certain directions. In the case of a cloudy day, you would find that the light coming from the sun directly towards you is unpolarized. However, light coming at you from a direction at right angles to that path is strongly polarized. To get the feel for this, consider looking up at the direction of the sun on a cloudy day, assuming you knew where the sun was.

That light is unpolarized. Now, look at the clouds above the horizon off your left shoulder. The light coming at you from those clouds is polarized. Your eyes cannot tell that the light is polarized (unless you are wearing polarizing sunglasses, which the Vikings did not have!).

Now, back to the iolite. This gem material has a particular crystal axis along which polarized light is extinguished, where it looks dark. For directions perpendicular to that axis, the crystal is more or less transparent (usually a bit brownish-bluish). To find the sun, a Viking navigator would look through an iolite crystal while rotating it. He would try to find a direction where, no matter how the crystal was oriented, the light would NOT extinguish.That would be the direction of the unpolarized light, and, thus, the sun. All other directions would exhibit some degree of extinction of the light as the crystal was rotated. Knowing where the sun now was, the navigator could then proceed to sail in the desired direction.

It would have been a strange sight indeed, seeing the navigator standing in the boat twirling a pretty crystal. He would gaze all about in different directions, and then he would announce the direction to sail. This would likely have struck awe in the sailors who did not know the secret. The iolite situation might have allowed the command structure some additional power over their subjects.

The Vikings found their iolite crystals in Denmark. It would be interesting to see how they prepared the crystals. Were they polished or cleaved? Were they used in the natural crystal state?

The Vikings did not really know why this technique worked. Their explanation was that the rays from the sun were so powerful that they simply could not be extinguished. We know now that it is a simple application of a strongly dichroic biaxial crystal as a polarization analyzer to qualitatively characterize the polarization state of light in a scattering medium. I tried this with a little iolite cube I got at Tucson and it works!

Digging North Carolina's Gems

by Merrill O. Murphy

For those who may not know, my wife, Jerry, and I lived in Winston-Salem, North Carolina for five and a half years. In that time, we visited the state's gem and mineral sites, including the Hiddenite emerald sites. I think that we visited the Hiddenite sites at least four times. We found numerous tiny bits of emerald, rutile, and other unusual things, but we certainly did not find any ten-carat emeralds.

That was a lot of years ago. Even then, Hiddenite was heavily picked over by others seeking gems. One needed more than a shovel to get below the old but refilled holes dug by people who arrived there before us. Back then, each digger was required to fill his diggings. On one trip, we dug a hole about two feet in diameter by five feet. At that depth, we found an old tennis shoe. We laughed about that and then refilled the hole.

We normally think of the western states as being the most mineralized states in the US. Actually, the western half of North Carolina contains far more exotic minerals than any other state in the Union. A good friend back there has promised to visit us toward the end of April this spring. Perhaps, he can be talked into speaking to the New Mexico Faceters Guild in May.

New Mexico Faceters Guild Website

The New Mexico Faceters Guild has a website that may be accessed at: www.attawaygems.com/NMFG. The site contains many interesting articles written by Guild members, informative reports on our noted guest speakers, and gemological articles composed by Guild Gemologist, Edna Anthony. We will update the archive section to include selected articles from the 2001 issues. We need also more photographs of jewelry made by Guild members for the Gallery section.

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Don't forget: next meeting is March 14, 2002 at 7:00 pm.

Meeting Location: NM Museum of Natural History.

Dues are $20.