The New Mexico Facetor

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In This Issue

Don't forget: next month's meeting is September 11, at 7:00 pm.

The Prez Sez:

by Moss Aubrey, Ph.D.

I recently toured the Denver Museum of Natural History. Being of sound mind, I headed directly for the gem and mineral hall. In fact, I saw little else, as it was easy to spend two hours there. If you have not visited the museum, then let me highly recommend that you do.

I enjoyed several aspects of the displays, which showed a nice breadth of crystal and mineral specimens. Some are arranged in theme groupings consistent with the mining history of Colorado. Many faceted stones were also displayed, apparently donated as collections from private parties. While many of these were fairly common in materials and cuts, there were others, such as faceted rhodochrosite and sphalerite, that were among the nicest I have seen. The museum also exhibits a donated display showing the replicas of the world's famous diamonds, which I found interesting. However, I believe that their replica of the Hope diamond is much too saturated in hue.

I suspect now that you are thinking this seems nice enough, but it probably does not sound out of the ordinary. In fact, you're right. While the displays are good, they are not extraordinary, with one very important exception. This exception is the Alma King, the world's largest gem quality rhodochrosite crystal. Rhodochrosite is a deep red to rose pink manganese carbonate mineral found in association with gold and silver mining. These crystals were of little commercial use, often discarded as a mining by-product. However, they are magnificent as collectible specimens, and Colorado's Sweet Home Mine ranks among the world's best. Crystals from there were sought in the late 1800's for both private and museum collections. Supply ceased when the mine closed at the turn of the century. The mine re-opened briefly in the 1960's, sparking new interest in the specimens.

In 1991, geologist Bryan Lees re-opened the mine specifically to search for more mineral specimens. When he discovered a large vug in the wall of the mine, he invited officials from the Denver Museum to tour the mine with him. They had the foresight to videotape his efforts in opening up the wall, and this video is shown at the museum adjacent to the specimen that he recovered.

The Alma King is acknowledged to be both the premier example of rhodochrosite in the world and the most noteworthy mineral specimen ever recovered in Colorado. This deep red translucent single crystal is a gigantic rhombohedron, measuring five inches by six inches, and weighing several pounds (the exact weight is not known to me). This specimen alone would be worth a trip to the museum. But wait, there's more!

When Lees discovered the vug that held the Alma King, he realized the existence of an entire wall covered in smaller, but magnificent crystals. He wanted to find a way to preserve it as one expansive display, rather than break it up into numerous smaller ones to be scattered across hundreds of collections. With the cooperation of the Museum and the backing of the Adolph Coors Foundation, arrangements were made to preserve the majority of the find. Removal required blasting and broke the wall into several sections. This was done most carefully, and the pieces were kept large, ranging from three to eight square feet each. These then were meticulously reassembled, resulting in a massive slab that measures seven by eight feet. This amazing slab recreates the wall of the vug. It is studded with hundreds of mouth-watering gem quality crystals that range in size up to one inch cubes.

This display alone is worth the price of admission. The Alma King is a singularly spectacular piece; and the reconstructed wall is breathtaking. What I found myself thinking about later was how this all came to be part of a museum. We see more and more the conflicts that arise over private collecting, public rights, and misdirected political agendas (See the article on "Sue," the T. Rex fiasco in the August 1997 Issue of Lapidary Journal.). In fact, the Alma King was owned privately for a year, then was offered for sale. It could have stayed in private hands if it were not for the generous sponsor who assisted the Museum. The same fate could have awaited the crystal wall, but for the serendipitous merger of miner, museum, and sponsor that resulted in a wonderful museum display.

This seems to me the proper way to reach such an end. We must respect the private entrepreneur. Without his efforts to open the mine, these specimens would still remain where they had lain for millions of years. Would it have been fair if he had sold them to private collectors so he could recoup his expenses and (gasp!) even turn a profit? Unfortunate, perhaps, but definitely fair. Unless the government is willing to pay some professionals to mount the recovery efforts and underwrite the costs, there should be no question as to ownership (excluding outright theft). I realize that the issue of the ownership of Sue the T. Rex is complex and includes concepts of public domain, protected status of lands, and what defines a natural resource. What bothers me is the cavalier manner in which government agents interpreted the law, showing a relative lack of concern for the fate of the specimen they were trying to 'protect.' It is irony in the extreme that Sue presently is scheduled to be auctioned by Sotheby's to the highest bidder, be that a public entity or a private collector. Most agree that if she had remained with the private company that both recovered and restored her, she would still be on public display at their facility. That no longer can be assumed, which will be a big loss for all.

Update on AGC:

American Gem Corp. is still in the news. The May 1997 Issue of Colored Stone reported that U.S. mining companies are finding gemstone mining to be challenging, at best. Kennecott is unloading its red beryl operation in Utah. This apparently stems from the uncertainty faced in mining and marketing an obscure gem material. AGC has been attempting to market a much more widely known material, Montana sapphire. AGC thought that they had established a niche in the market with their announcement of contracts with major jewelry manufacturers Michael Anthony and Landstrom's. However, Landstroms backed out of the deal and went with Gem River Corp, a competitor of AGC.

Concerns circulate that AGC does not have the volume of inventory that major distributors want, and AGC denies that by citing their holdings of over two million cut stones. Still, sales are not strong enough to offset costs. AGC reported sales of $1.4 million from April 1995 to December 1996, but recorded a net loss for that period of $7.2 million. The value of AGC traded stock has dropped from a high of over $5 per share in 1994 to less than $.30 per share. AGC's president still speaks optimistically of the company being poised to make a major splash in the market, and that these problems are normal during the build-up phase of any new company. Michael Anthony Jewelers cites satisfaction with their initial efforts to market a line emphasizing Montana sapphire. Another positive note is that Home Shopping Network ran a test program of Montana sapphire last spring, selling over 1,500 rings in less than eleven minutes of air time. (See also the "In the News" section, "A Report of U.S. Mines", and "Montana Sapphire on H.S.N.", found in the May/June 1997 Issue of the *New Mexico Facetor*.)

Minutes of the NMFG Meeting

July 10, 1997

by Nancy L. Attaway

President Moss Aubrey called the meeting to order at 7:15 p.m. and welcomed all members and visitors. The presence of some new members encouraged Moss to have everyone introduce themselves.

Treasurer's Report

Treasurer **Bill Andrzejewski** reported:

Expenses listed were for postage. Expenses for June 1997 were low, because the costs of printing and postage for the March/April 1997 Issue ($130.33) and the May/June 1997 Issue ($168.06) did not yet clear the bank.

Heading	*Total*
Previous Balance	$1,064.30
Expenses	$17.73
Deposits	$42.00
Balance Forwarded	$1,088.57

Old Business

Guild Editor, Nancy Attaway brought the promised sets of back issues of The New Mexico Facetor and distributed them at the meeting. She held aside a few sets she saved for the members who were not present at the July meeting, and she plans to bring those sets to the meeting in September. Thank you for the donations to the NMFG treasury from those who received back issues of the NMFG newsletters. Some back issues are still available.

New Business

The proposed amendments, published in the March/April 1997 Issue of the NMFG newsletter, were entertained by the Guild membership. The first motion regarding the increase of dues and the deletion of both the one half year and the associate memberships was presented by Bill Andrzejewski and seconded by Elaine Weisman and Waylon Tracey. These were then voted upon and passed by the membership. Dues covering a yearly membership in the New Mexico Faceters Guild is now $20.00. The second motion regarding a change of the fiscal year to match the calendar year was also presented by Bill Andrzejewski and seconded by Paul Hlava and Waylon Tracey. This motion was also voted upon and passed. The new fiscal year will now be marked from January 1 to December 31. A slate of officers will be voted upon during the November meeting, and they shall assume their duties during the Christmas party.

Treasurer Bill Andrzejewski also mentioned that the Guild, according to the by-laws, is overdue for an audit of the treasury. President Moss Aubrey needs two volunteers to perform the audit with Bill.

Ernie Hawes announced that Louie Natonek's wife, Harriett had been in the hospital. Nancy Attaway volunteered to send a get-well card to Harriett for the Guild.

Show and Tell

Guild member, Eva Tordsen faceted her first gemstone and brought it to the meeting. Her beautiful round orange cubic zirconia showed very good meetpoints and a very nice polish. Congratulations, Eva! The Guild looks forward to seeing many more such well faceted stones from Eva, our new lady facetor.

Waylon (Dick) Tracey positioned a diamond ring under his microscope to allow members a view of the two garnet inclusions inside the diamond. Lapidary Journal published articles on garnet inclusions in diamonds, with accompanying photomicrographs, in both the January 1993 and the February 1993 Issues. Waylon enabled us to see these two garnet inclusions firsthand.

Susan Wilson displayed a stunning emerald cut aquamarine that she faceted in the rectobrite design. She showed a Russian flux-grown synthetic emerald that she faceted using the squarebrite diagram.

Steve Attaway displayed three pieces of the denim blue chalcedony from South Africa that he carved, and he also brought an Australian chrysoprase that he carved. These are to be set in pendant designs. Steve discussed how he made some carving discs that he cut out of diamond-coated copper laps using a band saw.

Nancy Attaway faceted two matching square barion Tanzanian rhodolite garnets slated for earrings. She faceted another pair of matching triangular Apollo cut Tanzanian rhodolite garnets for earrings, with another larger one for an accompanying pendant. Nancy faceted a pearshape Pakistani peridot of nearly five carats that exhibited a bright green color. She also faceted a square barion Pakistani peridot and fashioned another one into a tablet, ready for a reverse intaglio carving by Steve.

Field Trips

The tour of the Waldo Mine had to be re-scheduled for September 7 at 10:00 a.m. Scott Wilson, trip organizer, had re-scheduled from several dates. The students enrolled at the New Mexico Institute of Mining and Technology give the mine tours, and they were out then for summer break. The Waldo Mine is one of the "teaching" mines operated by the New Mexico Institute of Mining and Technology. Lead, zinc, and copper were mined from the Waldo during its commercial operation days, and much of the equipment still remains.

Driving time from Albuquerque to the mine runs about two and one half hours. The mine is reached by a well maintained dirt road, and any vehicle can be driven to the mine buildings. Crystals of calcite, pyrite, hematite, sphalerite, and smithsonite may be collected from inside the mine and also from the mine dumps.

Touring the first mine level involves walking 1800 feet into the mine on a dirt floor, so wear hiking shoes. Since the temperature inside the mine hovers around 65 degrees F, bring a long-sleeved shirt or a light jacket. The upper level is accessed by a strenuous 110 foot climb up a sturdy ladder. Visitors may access the lower mine level and not be required to see the upper level. Student guides provide helmets and lights for those not having their own. Bring gloves, safety glasses tools, collecting bags, lunch, and water. The mine is dusty and not recommended for those with respiratory problems. Remember to bring sunscreen and a hat for outside mineral collecting.

Future Programs

Vice-President (Programs) Susan Wilson scheduled Jane R. Ward for a presentation on west African diamonds during the September meeting. Jane Ward, a graduate student enrolled at the New Mexico Institute of Mining and Technology, is also in GIA's graduate gemology course. She has planned her talk around the significance of the geochemical and physical aspects of the diamonds from the Akwatia and Tarkwa diamond fields in southern Ghana.

For several decades, Ghana has proved to be a major world producer of diamonds. A recent discovery of a highly altered kimberlite in the Akwatia diamond field prompted more attention to be paid to the economic potential of Ghanian deposits. Physical and geochemical examination of the diamonds and their inclusions have yielded information about the diamonds and the events that led to the genesis of the kimberlite. This information will further define the diamond potential in Ghana.

Akwatia, in southeastern Ghana, and Tarkwa, in southwestern Ghana, are two major diamond producing areas that yield diamonds with physical attributes notably different from each other. The attributes include weight, color, secondary morphology, and fluorescence, and are substantial enough to indicate the existence of at least two separate diamondiferous kimberlite events.

Crystalline inclusions, such as garnet, pyroxene, and olivine, are much rarer in Tarkwa diamonds than in the diamonds from Akwatia. Geochemical analysis of the inclusions found in the diamonds from both areas is currently in progress. The results of this study will determine if the diamonds from these two regions share the same origin, and it will, possibly, recommend where to direct further exploration.

Guild member, Will Moats plans to speak on the geology and the geysers of Yellowstone National Park during the November meeting. Will has researched both the geology and the hydrology of the region and has significant data to present.

Guild Mineralogist Paul Hlava will provide an informative discourse on gemstone phenomenon. He will explain the inclusions and minerals responsible for such effects.

Steve Attaway presented a brief overview of crack propagations in gemstones. Steve said that cracks in large gemstones were much more likely to spread throughout the stone than cracks in small gemstones. More on this in a later article.

Eileen Rosson and Paul Hlava provided refreshments, and Scott and Susan Wilson made ice cream. Thank you all. Eva Tordsen and Nancy Attaway volunteered to bring refreshments in September.

Program Speaker

Scott and Susan Wilson showed their video of the Crown Jewels of England. This fabulous collection of crowns, sceptors, swords, orbs, and robes have all played significant roles in coronations past. Wrapped in legends and historical accounts, the Crown Jewels of England showcase the efforts of artisans and jewelers, whose marvelous creations forged the symbols of the British empire.

Housed in the Tower of London, The Crown Jewels are displayed for public viewing. Jewelers trusted in maintenance and repair take special care of these pieces. Many of these stones set into crowns are of remarkable sizes. The metalwork, the stone quality, and the stone cutting reflect the best to be found during the time they were made. The remarkably large pearls used in the crowns are all natural.

After the video, Scott Wilson presented information regarding the photography of gemstones and jewelry. He explained how to utilize camera, lens, tripod, film, lighting, and what background to use. He mentioned ways to mount the stone and stated the importance of cleanliness. Scott recommended using 91% alcohol, which leaves less water residue than other alcohols. He said to be aware of how nearby objects can be reflected in the stone's facets.

Scott and Susan provided a detailed report regarding tips for gemstone and jewelry microphotography, which is published in this newsletter. Several Guild members photographed their jewelry and gemstones with the equipment provided by Scott Wilson and Steve Attaway.

Designer's Workshop

by Ernie Hawes

As I was thinking about this column the other day, I realized that I've been doing this since 1981 and have only touched the surface of the various design shapes. Most faceters begin by cutting rounds. Therefore, it's no surprise that the vast majority of designs are of this shape. Rounds, ovals, marquises, pears, rectangles, squares, triangles, baguettes, and various cushion cuts are virtually all the shapes we ever see in jewelry. Has anyone ever seen a heptagon? There are eighteen of them in the Long and Steele database. In fact, when Long and Steele set up their database, they defined forty-six different shapes. It might be an interesting challenge for someone to try to name all forty-six without looking them up. I know I couldn't. It would be an even more interesting challenge for someone to cut a stone in every shape that they've never cut! That might take awhile. But if someone decided to do that, then they would certainly have a very interesting collection!

Focusing on the numerous shapes that have never been in this column would provide me with enough material to write bi-monthly columns for five or six years. Maybe I should do that, or at least, I should stop slighting the more unusual shapes and include some interesting examples of the more unusual patterns every once in a while. Well, there's no better time to start than now. I'll ease into this with a couple of patterns that Long and Steele call "barrel" cuts. I would expect that any design in this category to somehow resemble a barrel. I suppose that they do, although they sometimes stretch the imagination. For me, that is somewhat true for the designs for this issue. There is no doubt, however, that these designs are different from those that we usually see. I believe that by cutting a diversity of shapes and designs, we become better faceters, and our collections become more interesting. If you're cutting stones for sale to jewelers, I think that the many jewelers who design contemporary jewelry would be interested in incorporating these unusual faceting patterns in their one-of-a-kind jewelry creations.

The first design is by Norm Steele, and he called it "Highlight Brilliant Barrel". Unless you've been faceting for several years or have been researching the many designs, you probably have not encountered this pattern. Norm published it in the September 1983 Quarterly *Seattle Facetor Design*. At first glance, it resembles a cushion rectangle. A closer look shows that only the ends have the slightly rounded sides that define a cushion. The long sides are straight; therefore, it's a barrel. I think that some of the older large diamonds were faceted in a similar shape. Experienced faceters should have little difficulty in cutting this design. I think that it would be an excellent beginning to a collection representing all the different shapes.

Next, we have a more unusual design by Robert Strickland. He has named this cut the "Stadium Oblong". When you look at it, the name becomes quite obvious. One of the unusual features of this design is the girdle, which is not level. This design may present a bit of a challenge for a jeweler to render a satisfactory mounting. The design was originally published in the July 1992 Issue of the Texas Faceters' Guild Newsletter. Combining step and brilliant facets in a design is not new and often adds interest to the stone. In this case, it is the step facets on the crown that define the barrel. I could readily see this design in a contemporary jewelry piece. Tourmaline would provide an excellent choice of material for faceting this design.

Earlier, I spoke of the heptagon shape. Does everyone know what a heptagon is? Would you like to see some heptagon shaped designs in the next issue? While there are only eighteen patterns in this category, I think that most of the heptagons are quite attractive. Their shape exhibits desirable optical properties. To all you designers out there, eighteen designs in a category isn't enough. If you agree and decide to design a heptagon, then why don't you send it to me. I will gladly have it published.

In the News

Jade Mines of Upper Burma

From Colored Stone July/August 1997, the August 1997 Issue of Lapidary Journal, and the September 1997 Issue of Lapidary Journal

The intrepid Fred Ward journeyed to the famous jade mining region of Upper Burma. His observations revealed the existence of a vast jade bearing region estimated at about 150 square miles, where mountains contain the precious jadeite.

The Burmese work the jade deposits by digging shafts and tunnels. The largest jade mine employs over 10,000 people. Many locals scavenge through the mine dumps in search of jadeite missed by the miners. Much of the jade is found in the alluvial deposits of boulder conglomerates, a mixture of dirt, rocks, and jade. Often, these alluvial deposits became as large as mountains.

Fred weaves history and politics into his remarks of the Burmese jade mining region. He believes Burma holds a strong and steady jade market that can fulfill the needs for jade to a primarily Asian populace showing an increasing wealth. However, he wonders how its society, where the government closed the universities, will manage affairs in the future.

New Machine for Diamonds

From National Jeweler July 16, 1997

AccuGem Corporation reports the development of a machine that plots diamond inclusions and measures clarity without the help from a human eye. The new machine is used on both loose and mounted stones.

New Montana Sapphire Mine

From Colored Stone July/August 1997

A new company, Intrigue, plans to process and market sapphire rough from the Eagle's Nest Mine. This enterprise produced over 16,000 carats of sapphire rough during the fifty-eight days that the deposit was worked in 1996. Reports state that the colors and the sizes appear very good, allowing at least 35% of the rough to be marketed as natural. Goals are set for a production of 50,000 carats to be sold as loose stones and finished designer jewelry.

Tanzanite Supplies Down

From Colored Stone July/August 1997

The Tanzanian Mineral Dealers association reported that a low supply of tanzanite would mean post-phoning their annual auction for some months. Most of the rough recently produced has been low in quality. The price has fallen for lower quality goods, because the market is currently flooded with such material. The demand is not what it used to be, and better educated customers are now willing to pay higher prices for the finer goods. If the tanzanite shortages continue, then a dramatic increase in price will follow, with little negotiation allowed on the finer gem material.

Emerald Filling Alarm

From National Jeweler July 1, 1997

The widespread application of fillers found in both rough and cut emeralds has prompted questions as to its durability and to the ethics of its use. Many gem trade organizations require the disclosure of any emerald treatments, but not all vendors abide by this rule. Questions also remain unanswered as to the stability of such treatments and the possible harmful effects, though GIA is currently investigating these issues.

Most of the new emerald material has been treated with Opticon or a similar type of resin, dipped in oil, and sealed with a hardener. It has become difficult to discern one method of treatment from another. No answers exist that determine how permanent these treatments are, nor whether any of these methods damage the stones over time.

Attention is focused upon a particular court case in Washington, D.C. The case involves a 3.65 carat emerald, purchased for $14,500 and bezel-set into a ring. The stone began to exhibit fractures within the stone shortly after its purchase. The customer has sued the jeweler, the independent appraiser, and the appraiser's insurance company.

More On Tanzanique

From National Jeweler July 16, 1997

Again, two more full-page advertisements in National Jeweler featured the cut gem tanzanique set in 10 Kt. gold jewelry from OroAmerica, Inc. A phone call to OroAmerica, Inc. revealed some interesting information about this gemstone.

The very friendly sales representative from OroAmerica, Inc. told me that tanzanique is a simulant of the natural gemstone tanzanite. This trademarked stone has a composition of 45% synthesized polysilicate and a 55% quartz base, and it is grown from a high temperature flux. With a hardness of 5.8 to 6.0, tanzanique has the same hardness and durability as natural tanzanite. Tanzanique is color stable, free from internal stress, and will also not shatter when placed into an ultrasonic cleaner.

Lab-Grown Gem Wars

From National Jeweler July 16, 1997

A war is being waged in the gem market over the price of lab-grown gemstones, and the major retailers are taking advantage of the situation. The companies who manufacture lab-grown gems in the United States are being undercut in both price and quality by the competition in Russia. In response to losing market shares to the Russians, Chatham Created Gems, J.O. Crystal Company, Manning, and Gilson Created Opal are all maintaining their quality controls in the luxury synthetic gem market. They emphasize the high quality of their products and focus more upon sales to the independent retailer.

Synthetic Amethyst Alert

From Modern Jeweler July 1997

Vendors who purchase faceted natural amethyst still risk having their parcels salted with the synthetic variety. Many vendors use a microscope to check every piece of amethyst that enters their inventory, but even that method is not foolproof.

Synthetic amethyst first entered the gem market from Russia, who was soon copied by Japan and China. Then, the hydrothermal process created a fine quality synthetic quartz, distinguished from natural quartz by the use of a polariscope. This test showed the pattern produced by twinned natural amethyst crystals when examined along the optical axis. Synthetic amethysts back then were grown as single crystals. However, when crystal manufacturers soon discovered how to grow twinned synthetic quartz crystals using twinned seed crystals, the price of amethyst took a fall.

The salting of natural amethyst with synthetic amethyst may now be confidently detected with a new testing method developed by the Asian Institute of Gemological Sciences in Bangkok at a price between $1.00 and $3.50 per stone. The AIGS holds its manner of testing top secret to guard against unscrupulous crystal growers circumventing the testing.

From The Net

The need remains for Russia to sign a formal gem export agreement with DeBeers to allow entry of Russian rough diamonds onto world markets. Under a previous trade contract, Russian diamonds accounted for 26% of DeBeers' worldwide sales.

Broken Hill Proprietary Company, Ltd. of Australia is the 51% owner and operator of the 450,000 acre site near Lac de Gras in Canada's Northwest Territories. Scheduled for an October 1998 opening, BHP plans to run a high-tech $700 million commercial diamond mining operation and produce about 4% of the world's annual diamond supply at revenues of $365 million a year for 25 years. BHP has a partnership agreement with Canada's Dia Met Minerals, Ltd., which owns 29% of the Lac de Gras project. The mining operation plans to process over 9,000 tons of ore from five kimberlite pipes during the first decade to yield 2.2 pounds of clean rough diamonds a day, packaged untouched by human hands. No decision has yet been made in regard to marketing the diamonds, but BHP seems to lean toward independent selling.

Gold is viewed by central banks as a safeguard against unpredictable contingencies. However, Australia's central bank on July 3 sold 167 tons of gold, two-thirds of the country's official holdings. In the week after, gold fell to $319 per ounce. Both the Netherlands and Belgium sold gold reserves to qualify for the European Monetary Union (EMU). Australia's selling reason remains unclear.

New Turquoise Mine In N.M.

From The Albuquerque Journal June 20, 1997 and From National Jeweler August 1, 1997

For the first time during this century, New Mexico has a new source for fine quality green and blue turquoise. Located near Ruidoso on U.S. Forest Service land, the Lost Mine of Enchantment now provides artisans with stable, natural, high quality turquoise. This new site is significant, because a workable source for good turquoise has not emerged since the time of Coronado. The Lowry family holds the claim for the turquoise mine and owns the Turquoise Museum in Albuquerque. They plan to sell the turquoise in limited editions at prices between $3 and $15 per carat.

New Diamond Cut

From National Jeweler July 16, 1997

The famous diamond cutter, Gabi Tolkowsky developed a new cut for diamonds that utilizes 105 facets. He derived the cut during his work on the Centenary Diamond, a 278 carat stone with 247 facets. This new cut, the Gabrielle, increases both brilliance and scintillation by adding many facets. Versions of the Gabrielle may be cut in rounds, ovals, hearts, and pearshapes upward from twenty-five points.

Tips For Gemstone Microphotography

Drs. Scott and Susan Wilson

Introduction

Pick up any issue of the Journal "Gems and Gemology", and you see beautiful close-up photographs of faceted gems. It is natural, and probably correct, to presume that these photographs were taken using specialized and expensive equipment. We will describe herein some techniques that obtain comparable results with ordinary cameras, film, and some inexpensive accessories.

To take quality gemstone photographs requires special consideration of the following aspects:

1. Film
2. Camera, Lens, and Tripod
3. Illumination
4. Magnification
5. Stone Preparation
6. Stone Mounting and Support
7. Exposure and Depth of Field
8. Processing

If you take the time to consider each of these items, then it is actually quite easy to yield excellent photographs of your stones. It is clearly not possible to address these topics in complete detail within this forum. To locate in-depth information, you should consult a good reference book on the subject. We both recommend "*Photographing Minerals, Fossils, and Lapidary Materials*" by Jeffrey Scovil (Geoscience Press, Tucson, Arizona, 1996. ISBN 0-945005-21-0, about $40.00). This book covers a lot of territory and is very readable. It does not, however, contain some of the tricks we are about to offer! We plan to hit just some highlights here in this article.

Camera And Lens

A 35 mm. S.L.R. (single lens reflex) camera with through-the-lens (TTL) exposure metering becomes almost a necessity, unless you are well versed in the intricacies of exposure calculations. TTL metering makes it much easier to obtain a proper exposure. You will also need a means to obtain magnification to have your stone fill in between 50% and 75% of the field of view. This is accomplished in one of two ways:

The Cheap Way

Use your normal camera lens, but buy some extension tubes from a camera store. These tubes, made specially for each kind of lens type, space the lens away from the camera body. This greatly increases the magnification. It also reduces the amount of light that gets in, but results in longer exposure times (not considered a major problem).

The More Expensive Way

Get a macro lens for your camera. A plain macro lens will give a much better image quality than the more common zoom-macro lenses. Macro lenses can be expensive. Give a zoom-macro a try if you have one.

We have used a Canon AK-1 body (old technology by current standards) with the standard 50 mm. lens and a 50 mm. extension tube, and we obtained very good results. This combination gives sufficient magnification to fill in 75% of the field of view using a 10 mm. stone.

Make certain to use a remote shutter release, a little cable with an actuator on one end that attaches to the shutter release on the camera. It allows you to release the shutter without jiggling the camera, essential for obtaining sharp pictures.

Use a tripod, and it must be rock solid. You may find it convenient to set up the tripod to have the camera point down at the edge of the table for your work. This allows you to place the lamps on the table, along with the stone mounting arrangement, while keeping the tripod stable on the floor.

Film

Film is a bag of worms. Questions regarding color balance (daylight versus flash), speed, slide versus print, etc. all need to be addressed. For our purposes, we found that ordinary 200 ASA Kodacolor Gold print film provides acceptable results with tolerably long exposures. You may need to experiment some, depending upon both the color of your stone and your camera lens and lighting setup.

If you are using extension tubes for magnification, you will have a difficult time getting enough light on the subject when using film slower than 200 ASA. Sticking with reasonably fast film allows your exposures to be easier to shoot.

Illumination

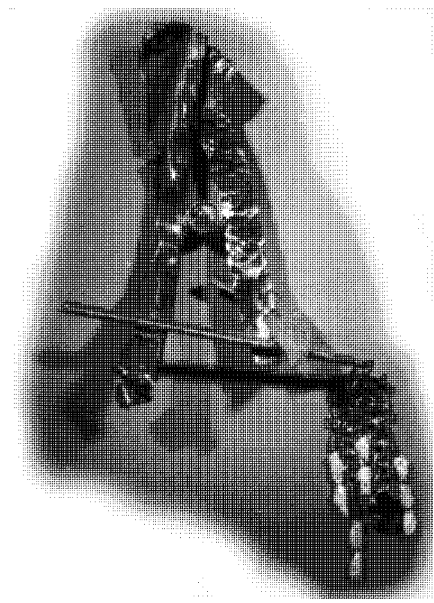
Professional mineral photographers utilize an entire array of lighting sources and arrangements. They select the lighting to best highlight aspects of the specimen being photographed. They often use a combination of a light box (a box with a translucent top upon where the specimen rests, lit from below), direct lighting, and diffused lighting. You might expect that some kind of light illuminating the stone from all points in a circle around the lens might produce good results. Such a light is called a ring light, and it is used often in industrial inspections. These generally do not do well for gemstone photography, because they make the stone look flat and lifeless.

We found that a small incandescent table lamp, with a non-patterned, white shade, and a bright Tensor-type light, are sufficient to obtain nice photos of faceted stones. Avoid fluorescent lamps, as they flicker on and off 120 times per second. This is faster than you can see, but it is often sufficient enough to confuse your camera's exposure meter. Fluorescent bulbs also have a different color spectrum than tungsten incandescent bulbs, and this also may throw off the color balance.

If the lamp has an adjustable intensity, it is best to set the intensity near the maximum level and leave it there. You can adjust the amount of light that falls on the stone by backing the light away from the stone. The reason for leaving the power level fixed is that the color spectrum of the light produced by the lamp may change greatly, depending upon the power setting. You want the color spectrum to remain constant for all of your exposures for preserving whatever color balance you have available.

The Tensor light should, in general, be very close to the lens barrel for obtaining nice internal reflections in the stone. Make certain that you do not generate enough of a rise in temperature to heat the lens! The table lamps can be moved around to provide some balance and overall illumination. These can be adjusted to highlight a specific internal reflection or to produce a pleasing illumination gradient on the background.

The exact illumination setup is best determined essentially by trial and error. Look through the viewfinder at your stone while it is in the position for being photographed. Adjust the lights (use an assistant) until you get pleasing results. Pay attention to strong shadows (either minimize them, or use them creatively), highlights within the stone, and "hot spots" (very strong, annoying reflections from a facet). These all require time to orchestrate, but remember that the camera will see exactly what you see in the viewfinder. Make the time an investment.



An example of jewelry photography using a pin designed and rendered by Elaine Weissman. (The photo was taken during our July meeting.)

Magnification

As mentioned earlier, you generally will want a single stone to span 50% to 75% of the field of view. If you use too little magnification, then your stone will be difficult to appreciate in the photo. Too much magnification brings out imperfections in the stone, as well as dust on the surface of the stone. Unless you are intentionally trying to photograph the inclusions in your stone, do not push the magnification too far. High magnification also reduces the depth of field so much that it becomes impossible to have the table and the back facets in focus at the same time.

Stone Preparation

Both the crown and the pavilion of your stone must be absolutely clean. This includes removing dust, a real irritant in this type of photography. Use whatever magic recipe you customarily employ to clean a stone. The use of lens tissue is recommended to avoid the dust and fibers that ordinary soft tissues may leave behind. Use tweezers to move the stone to its mount and arrange it there. The use of gloves is generally a waste of time, due to the lint and dust that is produced from the glove fabric. Anti-static precautions may be helpful to keep dust from settling on or near a freshly cleaned stone.

Be especially wary of tiny water spots that may appear when using typical 70% isopropyl alcohol to clean the stone. The alcohol may evaporate and leave the water residue behind as very tiny droplets. These droplets will cause the surface to look slightly fuzzy, allowing the stone to look less brilliant than it should. Instead, find some 91% isopropyl alcohol, available in well stocked pharmacies. The reduced water content eliminates this problem. As a side note, water residue can also be a problem when cold dopping a sensitive stone, since the water droplet film will keep the adhesive from properly bonding to the stone!

Stone Mounting And Support

Stone mounting and support is one of the aspects of gemstone photography that really makes quite a difference in the quality of the photo. Some common ideas are:

Using black velvet: One might think that resting the stone upon a piece of clean black velvet would be just the trick. In practice, you will find that the little hairs of the velvet glisten and make a very distracting background. The velvet backing will also show through as a distraction.

Modeling clay or putty: No matter how small you make the clay wad, it will show through on the pavilion. It will also droop while you are working.

Using black paper: The grains and fibers in the paper will show up as a distracting background.

Toothpicks and paper clips: These invariably become visible, either through the stone, under the pavilion, or stick out from behind the stone.

Professionals often use a piece of glass as a place to rest the stone. If done right, and you have paid particular attention to the reflections in the glass, this can work well. Many photos in "Gems and Gemology" are done this way. Sometimes, a special kind of very black, fine grain paper is used to rest the stone upon and also used to form a backdrop. This, too, can be very effective, particularly if you want to light the backdrop and enhance the stone.

We discovered that by using the reduced depth of field, resulting from magnification (also influenced by exposure setting; see the next section), it is possible to make a support that is nearly invisible and shows no background pattern whatsoever. It also allows the application of light through the bottom of the stone for enhancing brilliance. The trick is to construct a setup like that found in Figure 1. Here, a piece of black velvet or other backdrop is placed over a small slab of stiff styrofoam. A set of three or four long (several inches in length), thin needles (depending on your stone geometry) is inserted through the backdrop into the styrofoam. The placement of the needles is vertical and parallel to each other. The ends are adjusted to provide distinct points for resting the stone.

By setting the stone upon the ends of needles, the needles cannot be seen when looking directly at the stone mounting with the camera. The ends, being so small, disappear into the internal reflections of the stone. Because of the limited depth of field, the backdrop is very much out of focus, and does not add distracting patterns of its own. This technique takes some time for proficiency. It also requires a steady hand for placing the stone where it cannot fall onto something hard if it falls off the needles. The results are worth it!

Take time with the lighting. Try lots of variations in light position and intensity while looking through the viewfinder. Do not neglect the background and the possible shadows that may fall on the back -ground, because they will appear as out-of-focus blobs in your photo. Eventually, a combination will be found that will make your stones look absolutely breathtaking!

Exposure And Depth Of Field

Getting the exposure right can be a bit tricky. You must accomplish a number of things at the same time:

1. Get the right amount of light in to make the exposure.
2. Keep the depth of field long enough to have the entire stone (table down to pavilion) in focus, but not enough for the background to be in focus.
3. Keep the exposure short enough to avoid reciprocity failure. This happens when you try to use the film outside its designed exposure limits. This should not be a problem until you start getting exposures of several seconds (for ASA 200) or longer.

The depth of field is greatly influenced by the aperture setting. A large diameter aperture (small aperture number) gives a short depth of field, and a small diameter aperture (large aperture number) gives a long depth of field. The depth of field is the distance parallel to **the lens** axis where the subject will be in focus. You need to play with your setup to find the best aperture setting. We found that we needed about an f/5.6 aperture to get the correct depth of field. Note that on automatic cameras, you must find a way to keep the aperture fixed and then vary the exposure using the exposure time.

Set the exposure time to have the camera think it has a "normal" exposure. Often, this means that the TTL metering should indicate 5.6. Note that you may need to find out how your camera "weights" the picture for its exposure calculations and then make the appropriate adjustments.

In general, it is best to "bracket" your exposures by one stop. This means that you take a picture at one stop in the normal exposure, one stop underexposed (via the exposure time, not the aperture, to avoid changing the depth of field), and one stop overexposed. Keep a log to help account for what your exposure conditions were for each picture. This information is vitally important when your photos are returned and you want to know which combination worked the best.

When you snap a picture, make certain that both the table and tripod are held steady. Use the remote shutter release to gently take the picture. Take precautions to eliminate any vibrations of the table and tripod during the exposure, such as those from a nearby refrigerator, dishwasher, or overly interested pet.

Processing

Even if you do everything right, processing can still make the difference between success and failure. The film development itself is a simple matter. The processor dips the film in various

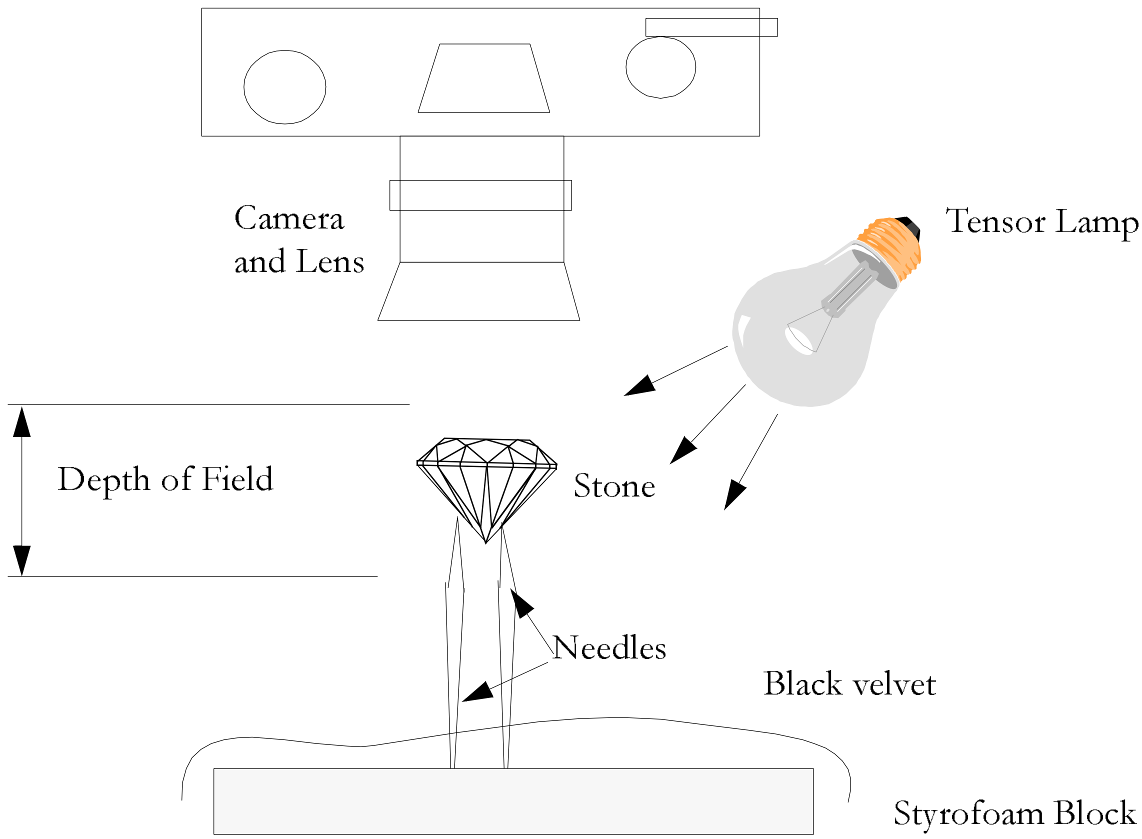


Figure 1. A simple but effective arrangement for mounting stones for photographing.

chemicals according to the manufacturer's recipe.

Printing is where some additional trickery needs to happen. First of all, avoid mail-in processing (as opposed to one-hour type service) at first. Mail-in processing is generally done fully automatically with no person ever coming into the loop. The one-hour processing normally has a person sitting at the machine to make the exposures during printing. Find a processing center you can trust (and not go broke with) and talk to the operators who print the photos. Tell them that your pictures are of a technical nature, not scenery, and that you may need them to adjust the "density". Suggest that they start out at "plus one density" and adjust further if necessary. The density is similar to the exposure made with the camera, only now the exposure is applied to the print and not the film.

You might also want to tell them what colors they should see to better balance, to some extent, the color for you. Tell them that you bracketed the exposures, which ones are plus one stop, and which ones are minus one stop. This may help them determine how to obtain the best results. If the operators ignores you or do not understand what you are saying, then find a different processing center. You will eventually find one willing to work with you.

Additionally, you may want to purchase an 18% gray card from a photo or an art store. You take a picture of it in the same configuration used for photographing your stones. A gray card is printed to have a controlled reflectance and color. Take a picture of the card (or the edge or a piece of it, since they are usually 8x10 inches) as the first exposure. Tell the processing operator that the first photo is an 18% gray card. They can then set their machine to give an approximately corrected color balance, even if your lights and film are not matched. This will, hopefully, make the color of your stones in the prints come out closer to their actual color. This is not entirely foolproof, however, and experimenting will obtain the best results.

As you become more familiar with how it all works and what to ask for, you may find that some mail-in or drop-off processing facilities will allow you to include special instructions that will suffice for your needs at a reduced cost relative to the one-hour film processing.

Conclusions

Expect to spend at least 10 minutes on each arrangement of the stone. We suggest using 12 exposure rolls to facilitate getting feedback on your work. Using your log book (you did keep one, did you not?), see which combination of settings works the best. You still need to bracket your exposures, but, at least, you will know where to start.

Using the general guidelines given here, you can expect to obtain some high quality photos. Experiment and try out new ideas, and your efforts will be rewarded!

The Hits and Misses with Developing

Stephen and Nancy Attaway

Nancy and I began to experiment with gemstone photography and experimented with some of Scott and Susan Wilson's techniques. The results have shown what we consider to be very good success. However, we still have a lot to learn to reach professional standards. Anyway, we are having fun.

Film processing seems to be hit and miss. We are using Kodak Royal Gold 200 with tungsten lights. Of course, the tungsten lights caused a color imbalance. The negatives are coming out just fine, and we can correct the color balance from the negatives using Adobe Photoshop. We recently purchased an 80a filter that should help with the color balance. We are also making use of an 18 percent gray card to help us find the best exposure and color balance.

The problem is that the entire development process, it seems, has been automated by artificial intelligence. When we try to take a picture of a piece of jewelry on a black background, the automatic development machines insist upon correcting the image so that it will, on average, look like a photo of Sally's birthday cake. Even if we tell the operator that the first image is an 18 percent gray card, the automatic development machine insists upon adjusting the image, photo by photo. As long as we shoot an entire roll of film with nearly the same composition, we get okay results. If we take pictures of widely varying scenes, the automatic development machine insists upon adjusting each one separately. It seems as if all those tricks used to control the exposure, lighting, and depth of field are now overridden in the development process by these automatic development machines. One operator informed us that his machine automatically adjusts the exposure three f-stops. Even if you bracket the exposure of your photos, the automatic developer will cause the prints to come out almost the same.

After interviewing multiple photo processing labs, it seems Albuquerque only has automated photo processing. What we would like to know is how professionals handle their development process. We will continue to investigate the development process to see what the Pros are doing.

If you explain what you want to achieve, the developer at Picture Perfect on Juan Tabo Blvd. will adjust each print photo by photo. However, this special processing cost runs more than normal, and you will need to make a couple of passes to get the photos right.

pendant and photo by Steve and Nancy Attaway

A photo of a carved and faceted aquamarine with two pink tourmalines adjusted using Adobe Photoshop.

Lets Talk Gemstones

By Edna B. Anthony, Gemologist

The Silicates

An Introduction

In the earlier articles written on andalusite, kyanite, and sillimanite, (polymorphic forms of the aluminosilicate group of the Nesosilicates), I made the observation that few people were aware of the relationships between so many gemstones. Only now am I beginning to grasp the complexity of some of these relationships. I find it much easier to remember important information if I fully understand the underlying structure wherein these relationships exist. In my gemology training, we did not have the time to explore these structures, nor comprehend how a gemstone fitted into the overall picture.

My acquisition of an old textbook, *The Manual of Mineralogy*, after J. D. Dana, 19th Edition, published by John Wiley & Sons, authored by Cornelius S. Hurlbut, Jr. and Cornelus Klein has been one of the best investments I have made. Its systematic organization and concise explanations will influence every article that I write. For this reason, I will begin with its basic definition of a mineral. "A mineral is a naturally occurring homogeneous solid with a definite (but not generally fixed) chemical composition and an ordered atomic arrangement." The orderly arrangement of the atoms of interacting elements create the multitude of earth's minerals.

The *Manual of Mineralogy* states that "--- the earth's crust can be regarded as a packing of oxygen ions with interstitial metal ions, such as Si^{4+}, Al^{3+}, Fe^{2+}, Ca^{2+}, Na^{+}, K^{+}, etc. The dominate minerals of the crust are thus shown to be silicates, oxides, and other compounds, such as carbonates." For the purposes of this article, the discussion herein will be limited to the silicates.

Silicates comprise about a quarter of the known minerals and almost 40% of the common ones. The basic unit of structure of all silicate crystals is the tetrahedron. There are four oxygen atoms, one located at each apex of a regular tetrahedron. A single silicon atom is located at the center of the tetrahedron. This silicon atom has a valence charge of 4, meaning that it is looking to acquire four electrons through sharing with other atoms to complete its outermost energy shell, known as the valence shell.

An oxygen atom has two electrons in its outermost shell that are available to bond with the silicon atom. If four oxygen atoms surround one silicon atom, where each oxygen atom offers one electron, then the silicon atom's outermost shell will be complete and stable. The resulting arrangement comprises a silicate molecule. One electron remains, allowing those oxygen atoms to search for another silicon atom to share an electron and form another tetrahedron. Tetrahedrons are linked together through oxygen bonds.

The arrangements of links between the basic tetrahedral units determines the classification of the silicate. When the tetrahedra are not linked together, as each exists in isolation, the material is classified as a Nesosilicate. If groups of two tetrahedra are linked together, the material is then classified as a Sorosilicate. If all of the tetrahedra link back onto each other to form a closed ring, then the material becomes a Cyclosilicate. These arrangements represent three of the classes of silicates.

The linking of the tetrahedra and the incorporation of other elements, such as aluminum, zinc, magnesium, iron, beryllium, calcium, manganese, sodium, and titanium, into these structures, create the multitude of mineral species of the six classes of silicates. Only relatively few of these species are suitable for use as gemstones, but a greater number are cut or faceted for collectors. Their crystals are often of great beauty and highly prized.

Nesosilicates or Orthosilicates

Isolated tetrahedra are classified as Nesosilicates. These SiO_4 tetrahedra, connected to each other only by ionic bonds from interstitial cat-ions of other elements, are called Orthosilicates or Nesosilicates. (This sentence is a paraphrase of information found in the aforementioned *Manual of Mineralogy*.)

Here, the tetrahedra are held together by other charged atoms that exist in the voids between the silicon and the oxygen atoms in the host tetrahedral lattice. Ions are atoms that have either gained electrons, called an anion, or lost electrons, called a cat-ion. Whenever an electrically charged atom is near another such charged atom, there will be forces of attraction or repulsion between those atoms. In the case involving the isolated tetrahedra, the charged atoms of the crystal voids or interstitial ions subsequently attract each other. This sets in motion the associated tetrahedra to attract together. The metal ions of aluminum, zinc, magnesium, iron, beryllium, calcium, manganese, sodium, and titanium comprise the ions in the voids.

The nesosilicates include datolite, sphene, (titanite), zircon, phenakite, the aluminosilicates, olivine (peridot), garnet, and the humite groups.

Datolite [$CaB(SiO_4)(OH)$] contains SiO_4 and $B(O,OH)_4$ tetrahedra. The sphene structure involves SiO_4 tetrahedra with CaO_7 and TiO_6 polyhedra. Zirconium is the connecting element in zircon [$ZrSiO_4$]. Aluminum takes the role in the aluminosilicate group (staurolite, topaz, and the polymorphic Al_2SiO_5 gems andalusite, kyanite, and sillimanite). Beryllium in phenakite [Be_2SiO_4] and zinc in willemite [Zn_2SiO_4] are "connectors" in the phenakite group. The gemstone peridot is a member of the forsterite [Mg_2SiO_4] to fayalite [Fe_2SiO_4] solid solution series (olivine), where magnesium replaces iron.

It should be noted that in a lower temperature H_2O saturated environment, the minerals of this series have frequently altered to serpentine minerals of the phyllosilicate class. Garnets, which also undergo alteration to serpentine minerals, include the subgroups known as pyralspite, ugrandite, and hydrogrossularite. These several species yield a wide range of gemstone varieties. The four species of the humite group, humite, clinohumite, norbergite, and chondrodite, are less known as gemstones.

The garnet, olivine, and humite groups involve additional elements in their composition, as do topaz and staurolite of the aluminosilicate group, and are the more complicated nesosilicates.

Sorosilicates

Double SiO_4 tetrahedra that share a single apical oxygen atom to create the Si_2O_7 groups distinguish the Sorosilicates. Here, two silicon atoms and seven oxygen atoms are present, where both tetrahedra share one oxygen atom. Most of the more than seventy known sorosilicate minerals are rare. Hemimorphite, lawsonite, idocrase (vesuvianite), and the epidote group yield gemstone material.

Independent SiO_4 tetrahedra, as well as the double tetrahedra, are found in the epidote structure. This group includes epidote, allanite, piedmontite, hancockite, clinozoisite, and zoisite (tanzanite, thulite, and green zoisite). Calcium, aluminum, zinc, iron, manganese, magnesiumand, sometimes rare earths, are often incorporated in the sorosilicate structures. Hydrogen, in the forms of OH and H_2O, appears in some of the minerals.

Cyclosilicates or Ring Silicates

Cyclosilicates or SiO_4 tetrahedra joined into rings can take three configurations. Benitoite [$BaTiSi_3O_9$] is the gem mineral of the simplest ring configuration. The axinite group has a more complicated form. The most complex ring, Si_6O_{18}, constitutes the framework for dioptase, the beryls (aquamarine, emerald, golden beryl, goshenite, morganite, and red beryl), the polymorphs indialite and cordierite [$(Mg,Fe)_2Al_4Si_5O_{18}$], and the extremely complex tourmaline group. The nine species of tourmaline (elbaite, liddicoatite, dravite, chromdravite, ferridravite, tsilaisite, buergerite, uvite, and schorl) all differ widely in chemical composition. However, they all share, essentially, the same crystal structure.

Inosilicates

The Inosilicates consist of two related structures. When single tetrahedra share an oxygen and a link together to form a single chain, this forms the basic structure for the pyroxenes. The sodium pyroxene group is composed of jadeite, ($NaAlSi_2O_6$), aegirine ($NaFe^{3+}Si_2O_6$), and spodumene ($LiAlSi_2O_6$), where lithium replaces sodium. The enstatite-orthoferrosilite series is a solid solution series wherein increasing amounts of iron replace magnesium. This group also includes enstatite [$MgSiO_3$], bronzite, hypersthene, ferrohypersthene, eulite, and orthoferrosilite [$FeSiO_3$]. The silky sheen of bastite (a pseudomorph of serpentine after bronzite, named for its composition including barium, silicon, and titanium) makes it a suitable gem material for cabochons.

Iron is also the element that replaces the magnesium in the diopside [$CaMgSi_2O_6$] to hedenbergite [$CaFeSi_2O_6$] series, along with its intermediate members, salite and ferrosalite. Various elements, including manganese, zinc and chrome, are all incorporated into the structures. The star and the transparent diopsides are used as gemstones. Chrome diopside is better known than the color varieties alalite, baikalite, malacolite, and violane (purple). Dr. Joel Arem's *Color Encyclopedia of Gemstones* tells us that alalite is the local name for the fine green crystals from the Ala, Piedmont region in Italy.

Deposits of the green minerals baikalite, malacolite, and chrome diopside are found in Slyudyanka near Lake Baikal in Russia. Slight variations of the single chain structure create the pyroxenoid group. The pectolite to serandite series, where manganese replaces calcium, furnishes cabachon material of various colors that include the lovely blue variety of larimar, found in the Dominican Republic. Very small crystals of pectolite from Asbestos, Canada are the only known facetable gemstone material from this series.

Rhodonite [$MnSiO_3$ + Ca] is a second member of this pyroxenoid group. Rare transparent crystals from Australia and Japan are faceted, but most of the pink to rose-red material is massive to translucent and usually used for beads and carving.

A third pyroxenoid is the abundant rock-forming mineral, wollastonite. Again, the only source of facetable crystals is Asbestos, Canada. Catseyes are cut from fibrous material, but fashioning the stone is complicated, due to its pronounced tendency to cleave.

Double chaining, the second inosilicate structure, produces the amphibole group. Here, side by side single chains of tetrahedra are linked together by a shared oxygen atom. The most familiar gem material from this group is in the tremolite to ferroactinolite series. The compact variety nephrite, [Ca2(MgFe)5(Si4O11)2(OH)2], with its unique "felted" structure, is often confused with the single chain structured jadeite.

The intermediate member, actinolite, is seldom faceted. However, fine catseyes are obtained from the chatoyant fibrous material. In the partial series of glaucophane to riebeckite, the familiar tigereye gemstone is created by the psuedomorphic replacement of crocidolite, the asbestiform variety of riebeckite, by quartz.

Phyllosilicates

Various arrangements of layers of six-fold rings of hydroxyl [OH] bearing tetrahedra create the brucite, antigorite, and pyrophyllite structural forms of the serpentine, mica, clay mineral, and also the clorite groups of the Phyllosilicates. The phyllosilicates form in lower temperature environments than pyroxenes and amphiboles, frequently replacing previously formed minerals through hydrothermal alteration. The four species of the serpentine group (antigorite, chrysotile, clinochrysotile, and lizardite) yield several varieties with the same composition [Mg3Si2O5(OH)4+Ni] but show differing properties.

Among the varieties used for ornamental objects, cabochons, and some faceted gemstones are bowenite, williamsite, antigorite, lizardite, ricolite, satelite, pseudophite (stryian jade), verde antique, and connemara marble. A mica group mineral, lepidolite, is used for ornamental objects, such as book ends and paperweights. Perfect cleavage and varying hardness within these crystals make faceting the rare transparent crystals found in Brazil extremely difficult. Of the clay mineral group, pyrophyllite, {Al2Si4O10(OH)2}, used for carvings and cabachons, is a main constituent of the Chinese material known as agalmatolite.

The aforementioned *Manual of Mineralogy* states that the clorite group is "characterized by its green color, micaceous habit and cleavage, and by the fact that the folia are not elastic." (With the exception of kammererite, ironically, a delicate cranberry red material, I was unable to find any gemstone material specifically identified as a member of the clorite group).

The *Manual of Mineralogy* does note that apophyllite [KCa4Si8O20(F,OH).8H2O], prehnite [Ca2Al2Si3O10(OH)2+Fe], and chrysocolla [(Cu,Al)2H2Si2O5(OH)4.nH20] are all closely related to and very difficult to distinguish from the clorite group. In apophyllite, "the sheets of tetrahedra are composed of four-fold and eight-fold rings", rather than six-fold rings, "linked by Ca, K, and F ions." Another complicated arrangement of layers of aluminum tetrahedra, as well as the silicon tetrahedra, form the structure of prehnite.

Chrysocolla is a most interesting material for several reasons. It is a gelatinous precipitate that contains an impaired crystalline structure of layers of Si4O10. Thus, its generally amorphous nature calls into question its classification as a mineral. When the gel includes sufficient silica, however, the very fragile substance becomes hard chrysocolla-saturated quartz, very suitable for gemstone use. Its name is derived from its resemblance to the substance, chrysos (gold) kolla (glue), used by the ancient Greeks in soldering metals, much as borax is used today.

Tectosilicates

Most of the silicate gemstone varieties are Tectosilicates. In tectosilicates, a very stable three dimensional framework is created by the sharing of all of the oxygen ions of the SiO4 tetrahedron with adjacent tetrahedra. Four groups, SiO2, feldspar, feldspathoid, zeolite, and the scapolite series, all provide gemstone materials. The SiO2 group includes tridymite, cristobalite, the numerous cryptocrystalline and crystalline forms of quartz, and the amorphous opal. Quartz has the lowest symmetry and the most compact structure of the three SiO2 polymorphs. The related opal has an orderly arrangement of SiO2 spheres. Many varieties of the potassium (alkali) feldspars, the plagioclase feldspars, and danburite of the feldspar group have been and are still used as gems.

Again, a quote from the *Manual of Mineralogy* best describes the complex nature of this group. The feldspar structure "consists of an infinite network of SiO4, as well as AlO4 tetrahedra" with "concomitant housing of Na+ (or K+ or Ca2+) in available voids. In the plagioclase structures, the amount of tetrahedral Al varies in proportion to the relative amounts of Ca2+ and Na+; but not as to maintain electrical neutrality; the more Ca2+, the greater the amount of Al3+". The feldspathoid group exhibits a chemically similar anhydrous framework, containing about two-thirds the amount of silica as alkali feldspar, often incorporating unusual anions, such as S, Cl, CO3, or SO4. The zeolite group consists of very open frameworks of AlO4 and SiO4 tetrahedra.

According to Dr. Joel Arem, very few faceted chabazite [CaAl2Si4O12 . 6H2O} gems of this group exist. Suitable crystals are extremely rare, and its softness makes it inappropriate for wear. Calcium replaces sodium in the solid solution series natrolite, mesolite, to scolecite. This series is the source of most of the gemstone material. Again, its softness, distinct cleavage, and lackluster appearance make its rarity its greatest appeal. A more complete discussion of the numerous varieties of tectosilicate gemstones will be conducted in future articles devoted to the specific groups of the tectosilicates.

Meanwhile, my sense of continuity prompts me to return to writing of the cyclosilicate, “ring”, class of the silicates. The previous articles on benitoite and the tourmaline group began the discussions of gemstone material from this class. Articles on the beryl and axinite groups, the polymorphic cordierite and indialite, and dioptase will complete the coverage. I must admit, too, that Nancy Attaway's experience with the orange rough that was purported to be beryl material from Brazil has piqued my curiosity. Wish me luck!

Extinct Gems

By John Rhoads
D & J Rare Gems, Ltd.
http://www.djraregems.com

We are often asked whether we have in stock certain gems no longer generally available. Both Kashmir sapphires and Paraiba tourmalines are examples of what we consider extinct gems. Extinct gems are gems where the source deposits have been completely worked out and no longer exist on a commercially producing basis.

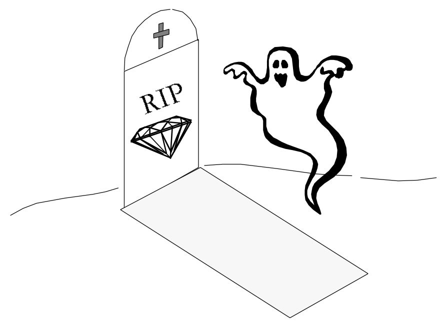
Kashmir sapphires from the Kashmir province of India were very popular during the early part of the 20th century. However, the deposit has been worked out for years now. Although an occasional piece of the rough may find its way out of the region, the only probable way of finding a Kashmir sapphire nowadays would be through estate sales or by a purchase from an old collection.

Paraiba tourmalines, whose rich colors could be attributed to minute impurities of gold and copper, made a brief, but dramatic, appearance on the gemstone markets in the early 1990's. Today's Paraiba gems are coming from old inventories or from rough that was stored away when it was available. We have not seen any Paraiba rough available for several years, and what Paraiba gems are available seem to get smaller and smaller each year.

Tugtupite, a rare gem of very fine pinkish-red color, is another extinct gem. Tugtupite was mined in Greenland, where the entire deposit has since been removed.

Bohemian garnets, a pyrope variety very similar to chrome pyrope garnets, are no longer mined. These deposits produced many of the red garnets used in jewelry manufactured around the turn of the century. Today, pieces of jewelry set with these gems are considered collectors' items. Replacement gems are nearly impossible to find.

Other gems face the potential of becoming extinct. Tanzanite, tsavorite garnet, benitoite, and red beryl are all mined from a single deposit. These deposits could, conceivably, become exhausted in our lifetime. The effect this would have on their price depends a lot upon how much has been mined and how much will be mined until the day their extinction occurs. It will be interesting to see how the situations may unfold during the next ten years or so regarding the availability of these particular gems.



Rumor has it that some gemstones may come back from extention.

Tucson, SNAG 1997, and a Miata Car Club Run to Los Alamos

By Elaine Weissman

Being the rock nut that I am, 1997 has already been a great year! Sometimes I wonder if I am not as much a jeweler as a stone collector who makes jewelry. During late January and early February, my husband, Al and I drove to Arizona for that premiere rockophile's festival in Tucson, the one everyone has already written about. In April, the society of North American Goldsmiths (SNAG) held its annual conference in Albuquerque and in Santa Fe. In July, the Road Runner Chapter of the Miata Car Club of America sponsored one of its yearly drives north and west into the scenic Jemez Mountains of New Mexico.

The later included a stop at Soda Dam, then on toward Valle Grande, finishing up at Los Alamos. The drive a was delightful combination of wonderful geological landscapes and ever-changing views. While in Los Alamos, we visited Otowi Station, the shop near the Bradbury Science Museum. I was looking for a model of the Sojourner Mars Rover. Of course, they did not have one. I understand that their stock of Rovers sold out day the little vehicle began scurrying allover the Red Planet. To keep the visit from being a total loss, I picked up a piece of quartz. It had one polished side and an almost clear interior. I thought that it would be interesting to drill into the piece and inlay gold, silver and/or copper wire into the channels cut by the bit...just maybe.

The previous event, the SNAG conference, hosted by the organization for metalsmiths, artists, academics, designers, gallery owners, and curators, whose stated purpose is to promote jewelry making and the makers thereof. Unlike other jewelry oriented organizations, SNAG promotes metalsmithing primarily as an art form. Their quarterly publication, "*Metalsmith*", always features at least one or sometimes several jewelers who render unique contemporary work based on concepts that rarely have anything to do with the intrinsic value of their materials.

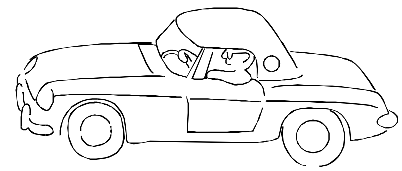
The 1997 SNAG Conference, coordinated by Carey Adell of Santa Fe, invited attendees to share diversity and to explore the traditional and innovative metalwork of New Mexico. After registration, the festival began with one of the most interesting mixers that I have ever seen or attended: a pin swap.

At this frenzied affair, a great many people milled about in the reception area and traded original pins of all types. Most of the pins were inexpensive, many were simple, but a few were more elaborate. Some were cast, but most were fabricated. Often, the ones made by attending students were funky. A large proportion were metal, but some were not. The procedure was to approach someone with a box or a bag pins and ask if they would like to trade, whereupon the swap took place. It was delightful chaos, and I had never seen such a great variety work. Since I only brought 15 pins, I did not make a great haul. I did have a lot of fun, met a lot of people, and came away with some really nice pieces, as well as some amazingly zany ones!

The serious part of the conference revolved around lectures, presentations, panel discussions, historical expositions, contemporary metalwork slide shows and exhibits. Invitations were extended to us to tour the new facility at Rio Grande, who sponsored part of the conference. We could also visit Santa Fe and tour galleries, museums, and generally hang out. We could also shop at the suppliers' room, a small intimate version of Tucson. Ask me if I bought something!!

Speaking of Tucson, what else can be said? We have been attending the Tucson Show every other year since 1991. We use it as a good excuse to see our youngest daughter, who now lives in Bisbee, Arizona. After driving into Tucson each day, the first order of business was to attend an AGTA lecture or seminar. These sessions are one of the major reasons why I try to attend the Tucson Show as often as I can afford it. It is open season on free information there, given by experts in every field from gem carving and pearl buying to tool use, new gem finds, and the latest trends in designer jewelry. We shopped and we ate, then we shopped some more, and then attended more panel discussions. We often drove back to Bisbee, having spent beyond the stated budget, but having completely enjoyed a sheer sensory overload that is Tucson.

What does the Miata drive have to do with jewelry? It is all connected. The landscape we drove through, the geology, the earth, and the materials we remove from the earth to survive and to create the art and the jewelry. And so it goes.



Wedding Bells

Mr. and Mrs. Paul Hlava announce the marriage of their oldest daughter, Heather Hlava to Blake de Pastino on October 4, 1997. Bride and groom currently reside in Albuquerque, New Mexico. The Guild sends its best wishes of happiness to Heather and Blake as they begin life together as husband and wife.

Advertisements

Faceting Machines for Sale

James Westcott lists for sale a nearly new faceting machine with all index gears and many supplies. The faceting machine set-up includes an electronic stop, all dops, some dyna laps, a transfer block, and four steel laps. Asking price is $1900.00. Please contact James in Tyrone, New Mexico at 505-534-0727.

Ernie Hawes lists for sale a used Facetron faceting machine acquired from an estate sale. Ernie, our local Facetron dealer, cleaned and refurbished the faceting machine himself. Please call Ernie in Albuquerque at 505-821-3201 for details and price.

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TABLE 1. Shows of Special Interest

Name	*Location*	*Date*
Atrium Productions Gem, Mineral, and Jewelry Show	Tucson, Arizona	Sept. 4 -7
Pacifica Trade Shows	Tucson, Arizona	Sept. 4 -7
Great American Gem, Jewelry, Mineral, and Fossil Show and Sale	Denver, Colorado	Sept. 9 -14
USGE Gem, Mineral, Fossil, and Jewelry Show	Denver, Colorado	Sept. 10 -14
Colorado Mineral and Fossil Show	Denver, Colorado	Sept. 10 -14
Gemfaire Show	Denver, Colorado	Sept. 10 -14
Gem and Mineral Show	Denver, Colorado	Sept. 12 - 14
Chaparral Rockhounds' Gem and Mineral Show	Roswell, New Mexico	Oct. 18 & 19
First Annual Best Bead and Glass Show	Albuquerque, New Mexico	Nov. 7 - 9
Albuquerque Gem Artisans Trade Expo (AGATE)	Albuquerque, New Mexico	Nov. 29 & 30
Los Alamos Geological Society's Earth Treasure Show	Los Alamos, New Mexico	Dec. 6 & 7