The New Mexico Facetor

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In This Issue

Don't forget: next meeting is March 9, 2000 at 7:00 pm. Dues of $20 are due.

Meeting Location: NM Museum of Natural History

The Prez Sez: by Susan Wilson, Ph.D.

Welcome back from the Tucson Gem and Mineral Shows everyone! I trust that all enjoyed your shopping adventures in Tucson and found the best deals at the hottest prices! I hope to hear lively stories at the next Guild meeting about great deals regarding huge parcels of divine faceting rough picked up for a song! Don't forget to share!

During the month of February, there was a NOVA special that ran on PBS about the large, colorless synthetic diamonds manufactured by General Electric and the Russians in Novosibirsk, and it covered how DeBeers plans to deal with the subsequent competition in diamond sales. About this same time, the new Winter 1999 edition of the journal *Gems and Gemology* arrived in my mailbox. It contained a short article entitled "Clues to the Process Used by General Electric to Enhance the GE POL Diamonds", written by Karl Schmetzer. Both of these topics caught my eye. It made me wonder a bit more about the GE POL diamonds and what their effect on the gemstone industry could be. I did a bit of web surfing on both the Rapaport site (http://www.diamonds.net/news), as well as that of the magazine *Professional Jeweler* (http://www.professionaljeweler.com/archives/news) and found excellent articles chronicling the appearance of the GE/POL diamonds on the market. I would like to share with you a little bit of the story surrounding the GE/POL diamonds, why the Gemological Institute of America (GIA) is at odds now with Lazare Kaplan, Inc. over the disclosure of a new diamond treatment. Lazare Kaplan's subsidiary, Pegasus Overseas Ltd. (POL), actually facets and markets the diamonds.

General Electric claims that they stumbled upon what they describe as a high pressure, high temperature (HPHT) treatment for naturally occurring, Type IIa (i.e. low-nitrogen containing) brown diamonds. The process whitens them by reducing the structural defects in the brown diamond crystals. What makes this story an eye catcher, though, is the fact that Lazare Kaplan Inc. does not want to disclose that the diamonds have undergone a HPHT treatment. Their reasoning is that the color change from brown to white is not a reversible process and cannot be accurately described as a "treatment". Liz Chatelain of MVI Marketing is the communications liaison for GE/POL in the US, and she performs some beautiful spin doctoring in her description of the diamond treatment process. “Irreversible color is why it is called ‘processed’ rather than ‘treated’. The word ‘treated’ implies something has been added or subtracted, while the word ‘process’ puts the diamond into its natural environment with nothing added or subtracted. In this case, nothing has been added or subtracted.”[1] Ms. Chatelain’s comment is not completely valid and sounds incredulous to me as a scientist with a semiconductor processing background. I would guess that the GE “top secret processing technique” is based upon a defect removal process, wherein the chemical impurities within the diamond are trapped and “neutralized” so that the defects cannot absorb light A crystal containing defects that absorbs all spectral wavelengths would appear black, while a crystal with no defects would transmit all incident light and appear colorless.

Changes in the number of diamond crystal defects may be detectable using a measurement technique borrowed from semiconductor processing called Deep Level Transient Spectroscopy (DLTS). DLTS is a transient capacitance measurement. A simplified way of thinking about this is, the more defects found in a crystal structure, the more a researcher will measure a higher capacitance across the crystal for a given applied voltage.

Why is LKI so worried about the technicalities of using the word “processed” versus “treated”? According to the jewelers ethical guidelines set forth by the Federal Trade Commission in its “Guides for the Jewelry Industry”, a jeweler or jewelry manufacturer must disclose to the public whether a gem material has been treated to alter its appearance, which significantly affects the value of the gemstone prior to its sale.

Disclosure of emerald treatments made the front page of national newspapers only a few years ago. How could we forget the disagreements that stemmed from the eons-old accepted practice of oiling emeralds as they are mined, or the addition of Opticon to fracture fill emeralds prior to sale to make them look better and command higher selling prices? A recent poll of the jewelry trade found that most jewelers would term the GE process a “treatment”. The HTHP conditions that the brown diamonds undergo are not a part of the “normal” processing steps, like acid boiling that removes the green “skin” on a diamond crystal, or laser cleaving that allows for more precise control of the crystal cleaving steps. Neither of these “normal” diamond processing steps alters the diamond grade or affects its value, as the GE process inherently does.

The GIA Gem Trade Laboratory is hot on the trail of discovering a means of detecting the GE/POL diamonds, and they have examined over 800 treated stones thus far, as reported in the article by Karl Schmetzer in the latest issue of *Gems and Gemology*. Unfortunately, GIA has not been able to develop any scientific criteria as yet for the identification of the treatment (Maybe GIA will read about DLTS here!). Even a review of the current and past patent literature has not yielded any clues to the GE processing technique. It is quite probable that GE/POL has declined to patent the process in order to keep the process propriety. Perhaps, the process is already in the current literature (but unidentified by GIA thus far) and not patentable. Further spin-doctoring was evident in the comments made by Leon Tempelsman, president of LKI, when he said that the real reason “GE is not planning to patent the GE/POL treatment due to concerns that unethical companies could copy the undetectable process without disclosing it to the public.”[2] It seems rather ironic that LKI now claims to be looking out for the public’s best interest.

The most disturbing aspect of this story to me is that LKI does not believe that they should have to disclose this process, which so drastically alters the color grade of the diamond. Thus far, the only identification on the altered diamond is the laser inscription of “GE POL” on the stone’s girdle, which can easily be polished off by a faceter. (There is one instance where it has been removed.)

GE requested that the FTC exempt the GE/POL diamonds from the disclosure guidelines, because GE voluntarily laser-marks the processed diamonds. GE wrote, “Even were such an erasure to go undetected, a consumer would not be exposed to a ‘laser-drilling’ type of injury.”[3] Any consumer or jeweler who subsequently purchases this erased diamond cannot tell and, therefore, they suffer no financial loss. In other words, the evidence of the diamond being altered is gone, so it should have no effect on the subsequent resale value! The GE statement further says, “In the case of an undetectable permanent process that improves the color or brilliance of diamonds, but does not physically add to or detract from their (diamonds’) natural content, the absence of disclosure does not put the consumer at risk in the same way”.[3]

The above implies that the surface inscription may be easily removed. How could this really happen? Would someone actually resort to these deceptive sales practices? We already know the answer, and it is **yes!**

The GIA Gem Trade Lab has already documented one such case. Some unscrupulous gem merchant had the girdle of a treated GE/POL laser inscribed stone repolished, thereby removing any trace of LKI's disclosure. In an odd turn of events, GIA's Gem Trade Lab had already graded the diamond before the inscription was removed and then found the same stone back in their lab for grading afterwards! One very observant diamond grader recognized the internal pattern of inclusions in the stone and made the connection. The owner of the stone, who had sent it to GIA for grading, requested that GIA re-inscribe the diamond's girdle with the GE/POL marking. Now, here is the truly amazing thing. Yet, once again, the same diamond was recut and resubmitted to GIA for a grading report![4] You can see the distinct possibility for public deception is tremendous. Just to let you know what the monetary stakes are here, I quote, "LKI plans to sell up to $200 million of the 'processed' diamonds over the next three years, with only $30 million slated for the first year."[5] Only $30 million, they say.

I know that I will be watching carefully the response of the FTC to Lazare Kaplan's request for exemption to the disclosure rules. It will be interesting to see whether GIA's Gem Trade Lab uses more of its status to bully LKI into compliance. Otherwise, I fear that other companies will also follow suit and elect to withhold from the public, GIA, and other jewelers information on gemstone treatments. The monetary rewards are great, and the ethical issues are easy to ignore for some merchants. I will keep the Guild posted on developments as I read them.

References

1. "First GE/POL diamonds hit retail counter", Professional Jeweler Magazine Article Archives, 3 December 1999.

2. "Tempelsman: Consumers mixed on GE POL Pricing", Professional Jeweler Magazine Article Archives, 14 October 1999.

3. "GE requests exemption from FTC guides disclosure", Professional Jeweler Magazine Article Archives, 22 September 1999.

4. "Unmarked GE/POL stone returns to GIA lab", Professional Jeweler Magazine Article Archives, 20 October 1999.

5. Rapaport: Trade Alert: 03/19/99 by Martin Rapaport.

Heidi Ruffner and Guild President Susan Wilson

Emerald Origins Revealed

Source: New Scientist; February 5, 2000

Geochemists in France and Columbia analyzed oxygen levels in famous emeralds and proved that some of the emeralds did originate from forgotten mines in Asia. Researchers used the ratio of two oxygen isotopes to determine the origin of a collection of emeralds owned by the Nizam of Hyderabad in the 18th century. The proportions of oxygen-18 varies relative to oxygen-16 from 0.06 to 0.25 per cent. The ratio remains fixed for a particular place, so origin may be precisely determined.

Half of all emeralds came from mines discovered 400 years ago in Colombia by the Spanish. The only established sources for emeralds before then were in Egypt and Austria. The origins of the "old mine" emeralds sold by Indian traders in the 16th century remained a mystery until now.

The isotope content matched that of emeralds from the Panjshir Valley in Afghanistan. These deposits lie along the banks of the rivers, part of the ancient Silk Route that connects Egypt and Afghanistan. Are Rubies and sapphires the next gemstones to test for origin?

Minutes of the NMFG Meeting

January 13, 2000

By Nancy L. Attaway

President Susan Wilson called the meeting to order at 7:10 p.m. and welcomed all members and guests. Susan announced that the New Mexico Faceters Guild had formed in the autumn of 1981, and she congratulated the Guild on its upcoming nineteen year anniversary. She then asked for everyone to introduce themselves to the group. Susan announced that dues are now due for this year.

Old Business

President Susan Wilson declared the Guild Christmas party a rousing success. She thanked **Ina Swanter** and **Eileen Smith** for their help in organizing the event. Susan said that the pictures from the party were in the Guild photo album. **Heidi Ruffner** had made a replica of the Victoria Secrets' "Ten Million Dollar Millennium Bra". This ultimate fantasy bra is covered in 533 carats of diamonds, both round and star shapes, and 1,739.5 carats of round diamond-cut blue sapphires. Heidi reproduced the bra in rhinestones and presented it to **Steve Attaway**.

Susan Wilson asked Guild members to vote on the winner of the "Millennium Cut Challenge". The vote entertained cut stones, four new diagrams, and jewelry. **Ernie Hawes** won the popular vote for his new millennium diagrams, and **President Susan Wilson** presented him with a set of engraved crystal champagne flutes.

New Business

In her last "Prez sez" column, **Susan Wilson** mentioned the substance *cubic boron-nitride.* It is considered to be the second hardest material known to man, after diamond. However, researchers at Ames Laboratory in Iowa recently discovered that an aluminum-magnesium-boron compound with a small amount of silicon mixed in actually deserves second place. Their tests revealed that the compound's hardness is about 46 gigapascals, and that cubic boron-nitride's hardness is 45 gigapascals. The hardness of diamond lies between 70 and 100 gigapascals. The new compound has a great potential market for cutting iron and steel and is more stable than diamonds. Diamonds cannot be used in these processes because diamond reacts with iron at high temperatures. The new compound is less expensive than cubic boron-nitride. Susan said that we may see this compound in polishing agents for gems.

President Susan Wilson announced the upcoming New Mexico Regional Science and Engineering Fair scheduled in mid February. She volunteered to serve as a judge. The New Mexico Faceters Guild awards a first place and a second place U.S. savings bond for the winners with crystal related and/or geological projects.

Susan said that Dr. Cornelis Klein will teach another class at UNM's Earth and Planetary Science on the properties and aspects of colored gemstones, with two guest lectures from Ron Beauchamp of Beauchamp Jewelers.

Ernie Hawes announced that Sandia High School, where he works as vice-principal, is holding an internal science fair competition.

Susan Wilson announced that the Museum of Natural History, where we have held our regular Guild meetings, has allowed the Guild to resume our meetings at the museum's newly completed meeting room. **We will meet at the Museum of Natural History for March 9, 2000.**

Steve Attaway said that Dr. Jill Glass was preparing an investigation that will measure the hardness and fracture toughness of various gems. Steve asked Guild members to give examples of gemstones, stones in our gem rough and gem inventories that are chipped or unsuitable for faceting, to Dr. Glass for test samples. She will also study how the crystallographic directions of gems relates to hardness and fracture toughness.

Nancy Attaway mentioned that Mamadou Dramah has returned from Nigeria and brought gem rough back to sell. He has large chunks and small pieces of rubellite, small pieces of orange Mandarin garnet, and one huge, splendid chunk of blue/green tourmaline. Call Nancy for details on prices, Mamadou's phone number and address.

Nancy Attaway said that she made reservations for a Guild get-together at Tucson during the Tucson Gem and Mineral Shows. The dinner will be at El Parador on 2744 East Broadway for 7:00p.m. on Saturday, February 5.

Show and Tell

The show and tell case tonight held some lovely new gems and jewelry items.

Larry Plunket displayed his beautiful Nigerian liddicoatite bi-colored crystal that he had redefined the faces of and had polished. The crystal was flawless and showed green saturation at one end and red color in the other.

Larry also showed a dark pink Nigerian liddicoatite tourmaline that he cut in a barion oval, a favorite design of his. He remarked that the liddicoatite was hard to polish. Larry used 50K diamond on a tin/lead lap for the polish.

Susan Wilson displayed a large Zambian amethyst that she cut in Nancy Attaway's "Third Tri" triangular design for darker stones. The design helped to brighten the deep color saturation of the amethyst, typically seen in Zambian material. She polished it with alumina oxide. Susan also showed a small, bright green tourmaline that she cut in the "Octobrite" hexagonal design. She cut the green tourmaline parallel to the C axis and polished it with alumina oxide. Susan remarked that when she is experiencing trouble with polishing a gemstone, she calls Merrill O. Murphy for help.

Nancy Attaway displayed a large emerald cut blue Nigerian tourmaline, a large Ukrainian yellow beryl pear-shape, and three small square Russian chrome diopsides. She made up a design for the tourmaline and used shallow angles for its pavilion. She did the same for the intense green chrome diopsides. The tourmaline was polished with alumina oxide, and the yellow beryl and the chrome diopsides were polished with cerium oxide. Nancy showed the Arkansas quartz that she cut in the "Millennium Magic" design, done totally without the aid of GemCad. She mentioned that she cut, but did not have, a two-carat oval Mozambique aquamarine with a dark blue hue, and two matching 6mm flasher cut rounds of chrome diopside.

Steve and Nancy Attaway displayed three pieces of cast gold jewelry set with stones that Nancy cut. These jewelry items were designed with a special CAD/CAM computer-generated design package that makes wax patterns. A large gold ring held a large emerald-cut Mozambique aquamarine, a gold pendant held a large triangular "Third Tri" Nigerian liddicoatite rubellite that was accented with diamonds, and another diamond-accented pendant held a big shield-cut Mozambique aquamarine with a freshwater pearl drop. Two other similar items were mentioned but not shown: a large gold ring that held a large square liddicoatite rubellite, and a gold pendant that held a New Mexico peridot with a pearl drop. Other jewelry pieces are in the works. Steve and Nancy Attaway plan to write an article about using SolidWorks Cad/Cam computer design for jewelry.

Refreshments

Betty Annis and **Nancy Attaway** brought home-baked refreshments to the January meeting. Nancy brought gourmet coffee. **Susan Wilson** made lemonade and iced tea. Thank you very much. **Rainy Peters** and **Eileen Smith** volunteered to bring refreshments to the meeting in March.

Future Programs

Master jeweler, Mark Guerin will talk on how to start a jewelry and gem business. Mark will cover the laws that govern our state and will explain costs for rent, insurance, inventory, advertisement, and other overhead expenditures. Mark Guerin and Karen Fitzpatrick own and operate Harris Jewelers/Casa de Oro in Rio Rancho, New Mexico.

Program Speaker

By Susan Wilson, Ph.D.

John W. Husler, a staff chemist with the Earth and Planetary Sciences Department at the University of New Mexico, spoke to the New Mexico Faceters Guild in January. John Husler manages and operates an x-ray fluorescence instrument that allows a researcher to identify unknown specimens by determining its mineral content.

John began by telling us a little bit about himself. He was born in Madrid, New Mexico, attended Madrid elementary school, Monroe Junior High, Highland High School, and UNM. Madrid, a very small town, was a coal mining town that supplied coal to the then secret Manhattan Project in Los Alamos. Madrid suffered hard times after the war when most of the town's residents moved away. The town nearly disappeared before it was revived in the 1970's as an artist enclave. It now draws tourists from everywhere.

Life changed quickly for John. All in one week he was married, graduated from UNM, and moved to his first job working for the Department of the Army in Dugway, Utah. There, he and his wife made friends with other folks with lapidary interests, and they soon learned to cut and polish geodes at the Army base-sponsored lapidary/hobby room. The town of Dugway is famous for its geodes, and the rockhounds would often collect fifty pounds of geodes a day and haul them back to make Christmas gifts. Near Dugway is Topaz Mountain and trilobite collecting areas.

One day, some of the lapidary friends decided they should do a rock collecting trip to Bruneau Canyon in Idaho for red and green gem quality jasper. John, his new wife, and three men set off on their adventure, only to get as far as the State Line casino in Windover, Nevada. The three men wanted to gamble rather than rockhound, and they immediately set off for the blackjack tables. To their surprise, they began winning and soon conned John into playing. John had learned blackjack at an early age, and he won 26 out of 28 hands! The men began betting on John's hands rather than playing themselves! They made enough money that night to skip camping out and stayed at a nice hotel and ate steak dinners. The next morning, the group began again their rockhounding trip, only to get as far as the casino in Jackpot, Idaho. Once again, the odds were in their favor playing blackjack. By the end of the day, a hotel room and restaurant dinner were realities again. The next day, as the three men were sleeping off their numerous drinks, John decided that he had best make this adventure a legitimate rockhounding trip and collect some rocks. John found nice quartz and agate in the area, which was fortunate because the rest of the group never did make it to Bruneau Canyon! The final take showed John and his wife arriving home with $8 more than when they left.

An interesting turn brought John and his wife back to Albuquerque. John received a phone call from ACF, which occupied what later became the GE plant in town. ACF wanted John to interview for a position. He thought this was really odd, since he had not sent his resume to this company. Unknown to him, his wife sent a resume she had written for him because she wanted to return to UNM and finish her degree. ACF offered John a job doing wet chemistry, the precursor to modern instrumental methods. He analyzed stainless steels and various alloys for their elemental content. As he advanced in the company, he worked on an atomic absorption instrument that premiered in 1955. This was to become the workhorse tool in the study of geochemistry. ACF later folded, and John returned to UNM to work toward a master's degree.

While a student, he heard about a job opening in the Geology Department working with geochemistry professor Ed Cruft. John was soon working full-time in the lab and spending his evenings working on his master's thesis.

One night while John was studying in the lab, a man entered the room. He introduced himself as a lawyer from Dayton, Ohio and said that he had invested in a copper mine near Cuba, New Mexico. He had received an ore sample and wanted John to test it for the presence of copper. John did not want to interrupt his own thesis work, as he was quite focused and intent on finishing it. At this point, the visitor pulled out an enormous wad of bills and waved them at John, saying he was prepared to pay whatever he needed to get the analysis done in short order. Magically, John found the time to complete the analysis and told the man that there was no significant copper content in the sample. The man then explained that a fellow from Dayton, Ohio was obviously trying to bilk investors out of their money with this "copper deal".

Most of the investors were heirs to the Bendix Corp. and did not seem interested enough to check on the validity of the copper mine. Only this one lawyer had spent the time and effort to come to New Mexico, and he had invested only $5,000. John told his professor about the situation, and the professor agreed to visit the mine site in Cuba with the lawyer. Instead of finding 100 tons of 12% copper ore, as was promised, they found about 5 tons of 2% copper ore at the site. The investors had been led to believe that new mining equipment had been purchased and that it also had a viable milling plant. In actuality, all that remained at the mine site was an rickety old mill.

John's professor, Dr. Cruft, convinced the lawyer that the copper mining deal was indeed a sham, but he said that there was this great investment opportunity in Namibia in southwest Africa regarding a tungsten mine. The professor must have been convincing, because John soon found himself on an airplane headed to the capital of Namibia to establish a laboratory! The lab was completed, and a German lady chemist was trained to run it. With the lab up and running, John was invited to fly over the Kalahari Desert with the geologist. They staked out areas of geologic interest and performed geochemical prospecting.

At this time, Dr. Cruft and his wife drove out in a Land Rover to join John and the geologist for a short time. They decided to fly back in the airplane and left John and the geologist with the Rover. Unfortunately, the Rover had a flat tire, and both spares were not in good enough condition to make it back all the way to the Atlantic coast, where the lab was located.

The geologist and John decided to slowly make their way to the nearest town, which ended up being a South African army camp. The soldiers had been stuck there for three years and unable to travel to the coastal German resort town of Swakopmund. John and the geologist took a chance and stopped at the army camp for the night. They played cards with the soldiers. The largest town nearby was Windhoek, where John purchased a cut tourmaline and chrome dioptase crystals, which he had to show us.

John traveled to Africa twice. In those days, one could make as many stops along the route for the same price as a direct-flight ticket. John took this opportunity to stop in Brazil on one journey to southwest Africa. The Brazilian children would run up to the cars carrying tourists and offer gemstones for sale, which they would streak on the windows to show hardness. John visited Angola and Uganda, two places he would not go now, and also Egypt.

John had always wanted to visit Cairo, Egypt, but he had unfortunately chosen the timeframe in the 1970's, when Egypt was gearing up for war with Israel. He persevered and made it out alive to talk about it. He recalled how there were mobs of taxi drivers outside the hotels in Cairo, just waiting to take tourists to the pyramids. Of course, John wanted a picture of himself sitting atop a camel in front of the pyramids. He also got to see the Mohammed Ali mosque and other standard sightseeing destinations.

On the way back to Cairo, his taxi driver asked if John wanted to stop by a shop and purchase something for his wife. John agreed but soon found himself in a really shoddy part of town. He then was fully aware that if he were to disappear, no one would ever have the slightest idea where to look for him. It so happened that the shop belonged to a relative of the driver. John was looking about the shop when, all of a sudden, he noticed the driver had pulled out a Colt 45 and was tossing it back and forth between his hands. The driver looked at John and asked him "What'dya think of this?" John thought, "Well, that's the end of me!" However, the driver had just bought the gun and, since he was enormously proud of it, he wanted to show it to John. That evening they were going to shoot the gun at a family wedding celebration. Needless to say, John was greatly relieved and decided he needed buy something pretty nice in the store to appease the driver. He purchased a beautifully cut alexandrite, which he brought with him to show the Guild.

Meanwhile, back at UNM, his analysis lab was being inundated with requests from people anxious to have their gold jewelry assayed, since the price of gold shot to $800 per ounce (in the late 1970's and 1980)! At this time, a former UNM geology student, Fred Bushy, who was working for Shell Minerals, contacted John at the lab. He asked if he could bring in soil samples to be tested for gold.

According to Mr. Bushy, fifty miles north of Las Vegas, Nevada, Shell Minerals claimed to have found an area with a gold concentration they felt could become a major gold strike. John was asked to travel to the site in Nevada and check it out personally, and he complied. Upon arriving at the site, he was amazed to see a bulldozer going back and forth across the area without really accomplishing anything. This was the first indication to John that something was amiss.

The lab had an atomic absorption instrument. The people there assured John that they were extracting gold. They showed John some of their experimental data, which did indeed show a blip where the gold signal should be. John learned that the group was using sodium cyanide for the leaching process. He knew that the presence of sodium during the burning of the sample in the flame could cause a bogus signal, due to interference. The signal would be small, though, signifying only a few milligrams/liter of gold. That was possible, and John informed them their "gold signal" was really due to an uncalibrated background. In the next room, elaborate glass tubing was erected, comprising what they termed an "ozonation process" that could extract gold from soil samples.

The Shell Company gave John some samples to take back to UNM and test on his own equipment. The results proved negative. Apparently, a sample had also been sent to Canada, where neutron activation was performed. Again, no gold was found in the sample. At this time, the owner of the property told John that he would pay him to personally bring the soil sample back to Nevada. The owner himself would extract the gold right in front of John's eyes.

John knew something was wrong there, and he devised a plan of his own. He would take their sample back to Nevada, but he would also take a second sample comprised of dirt from the UNM Biology Department flower bed! He decided to switch the labels on the two samples!

After arriving in Nevada, John presented the sample with the flower bed soil and stood back to watch what would happen. The soil sample was placed in the ozonation instrument. Fifteen minutes went by, and nothing happened Another fifteen minutes passed, but still no gold signal. And then, to great surprise and fanfare, suddenly the instrument recorded a huge gold spike! The fellow running the machine (who was from Hollywood, California and who wore striped suits) remarked to John, "That's not background now is it?!" John just chuckled. He knew that if there had been actual gold in the sample, it would have been evident from the start of the test and not suddenly spike as it had. John knew someone had tampered with his Biology flower bed dirt sample! John figured that he should not confront this fellow. He would rather leave walking on his own and not carried out in a pine box! As you might guess, neither this flashy-dressed fellow from California nor Shell paid John a dime for his effort.

John returned to Albuquerque, and he phoned Mr. Bushy in Houston to tell him what had transpired. Within five minutes of that call, the man in the striped suit from California phoned John and called him names, which John claims he has not heard the likes of since leaving Madrid! John explained to the guy, "Hey, you should be thanking me. I just saved you a bunch of money! Somebody in your lab salted your sample!" John, of course, knew that the fellow himself had done the salting! Interestingly enough, Mr. Bushy's boss at Shell insisted that John still run a test on the soil sample (the flower bed soil!). John did, and the results were negative, as expected.

Currently, John runs the x-ray fluorescence unit at the Earth and Planetary Sciences Department at UNM. In August of 1999, John made his television debut to great acclaim. It so happened that one day, Mineralogy Professor, Dr. Cornelis "Case" Klein walked into John's lab and told him that the noted investigative television reporter, Larry Barker, was outside. Larry had some turquoise that he believed was fake, and he wanted John to test it. John agreed to look at the material. Soon, the television crew was inside his lab busy setting up lights and cameras.

John commented that for once in his life he was thinking ahead of the curve. While the television crew was occupied, he put the sample on the x-ray spectrometer and scanned it for the presence of copper, aluminum, and phosphate, the chemical composition of turquoise. If any of these chemicals is missing, then the material cannot legitimately be called turquoise. John immediately saw there was no copper present in the sample, so it was not turquoise at all! Larry Barker had wanted to burn the sample to prove it was not turquoise, even though, at this point, the test would have been redundant.

A piece was broken off, set into a platinum crucible, and heated to 1000 degrees F. The piece did not melt, which you would expect from a plastic, organic-based fake. Rather, the piece turned into a white powder at the bottom of the crucible. This material was inorganic. Being in powder form now, it was ideally suited to being tested in the x-ray diffraction tool. X-ray fluorescence can determine how much of each element is present. It is a quantitative tool. X-ray diffraction yields what is termed the "fingerprint" of the composite. The analysis of the ash, using x-ray diffraction, showed it to be pure aluminum oxide. The next step was to grind up a piece of the original sample and run it through the x-ray diffraction tool also. The original sample was aluminum hydroxide, also known as gibsite. This made complete sense, because in the process of burning the sample, the water had been driven off, leaving alumina behind. Someone had taken a piece of gibsite and dyed it with a believable "turquoise" color and had gotten the dye to permeate the entire stone.

The national newsmagazine "Dateline" viewed the Larry Barker piece with interest. They contacted John and asked if he would participate in a segment that they were producing on fake turquoise. Soon, the "Dateline" crew arrived at UNM and spent nine hours filming in the lab. Unfortunately, by the time the segment was aired on national television, only fifteen seconds of the footage was actually shown! It's tough to break into show business.

Here is a little information about X-ray fluorescence. Every mineral is composed of atoms from the periodic table. Each atom has a specific electron shell configuration that dictates how it absorbs energy that is incident upon it from an external source. In the case of the X-ray fluorescent instrument, X-rays are the energy source. X-rays are very energetic and capable of exciting inner shell electrons into higher outer shells. When the electron falls back down to its original inner shell, energy has to be released again (because energy absorbed must equal energy emitted, i.e. conservation of energy). The electron decides on the trip back, that it will not go directly to his original shell where it belongs, but makes a pit stop for a short time at an intermediate shell along the way. In this manner, the energy will be released in two parts, each segment consisting of a fraction of the total. The wavelength of the energy emitted in these two segments will be different from the wavelength of the incident energy.

In other words, the wavelength(s) of the energy emitted is not the same as the wavelength of the input energy. For many minerals, the emitted wavelengths are in the fluorescent range. Those of you who are rockhounds are quite familiar with fluorescent minerals, which are often described as being "glow in the dark". Rockhounds obtain the fluorescent reaction by using a short wave ultraviolet light source, shining it on the rock for a period of time. Upon removal of the light source, they observe the rock "glow" or emit light at a different wavelength.

In a similar manner, the X-ray fluorescence instrument uses the X-rays to excite the atoms composing the minerals. When the atoms relax to their natural state, appropriately placed detectors, sensitive to the fluorescent energy range, collect the signal. The distribution of the signal is unique for a specific atom, just as fingerprints are unique for humans. Previously calculated tables of atom "fingerprints" are searched for a match with the experimental data, and the mineral is then identified.

We thank John Husler for an entertaining and informative talk that helped explain X-ray fluorescense and its many uses. Everyone enjoyed hearing about John's trips overseas and were very interested in the real-life applications of X-ray fluorescense. It is reassuring to know that this scientific tool is available, and that it can make determinations of mineral content without a shadow of doubt.

In the News

Huge Diamond Mine

Source: JCK January 2000

The Lomonosov field off the White Sea near Finland may hold $12 billion in diamonds. Found by Russian geologists, the mine could produce $300 million a year over an estimated 40-year life span. DeBeers has a 27% stake in the venture.

Sierra Leone Diamond Ban

Source: National Jeweler 1/1/2000

Two U.S. Congressmen are calling for a ban on Sierra Leone diamonds, because money from the diamond sales funds the violent rebels in Angola. They want the embargo modeled after the United Nations resolution that bans diamonds from Angola, where sales were used to buy arms for Unita rebels. Industry members feel that consumers will want a guarantee against buying "dirty diamonds", as described by *Time Magazine* and *The New York Post* articles.

New Process for Diamonds

Source: National Jeweler 1/1/2000 and JCK February 2000

NovaDiamond Corporation of Provo, Utah, operating with the European Gemological Laboratory, has a patent for a new color-treatment process for diamonds that turns browns into greenish-yellows. Their process is similar to the one developed by General Electric. GIA says NovaDiamond uses the type *1a* stones that are easier to detect and occur more frequently in nature. G.E.'s type *2a* stones are more difficult to detect.

Natural Green Diamond

Source: JCK February 2000

Sotheby's auctioned a rare natural green diamond that weighed 0.90 points for a record selling price of $670,000 per carat, or $600,000. This stone is the largest natural-color fancy "vivid grade" green diamond ever examined and graded by GIA.

Gem Controversies 2000

Source: JCK January 2000

There are several issues that the jewelry industry must face. One is the hype of the Ideal Cut for diamonds. Does it truly represent maximum sparkle, or can it really be improved? Another is General Electric's color enhancement process for diamonds. Will it throw a diamond's value into question? Still another is the fallout from treated emeralds. What treatments are acceptable for colored gemstones, and which are unethical? Will demand for natural gems (versus treated gems) push up their price? The industry may find that education and enforceable standards may be needed.

New Australian Ruby Deposit

Source: Colored Stone Jan/Feb 2000

A large ruby deposit was found in Gloucester, New South Wales on the property of wealthy media baron, Kerry Packer. The site is worked by Cluff Resources Pacific NL, an Australian gem mining company. This alluvial deposit contains an estimated four million carats of ruby, as well as blue, yellow, and green sapphire. The ruby tends to be small, as the rough averages less than a carat each piece. The best quality faceted rubies will sell for $600 per carat. Kerry Packer will receive 10% of the royalties, plus an option to buy 51% of the project.

Myanmar Closed Its Borders

Source: Colored Stone Jan/Feb 2000

The military government of Myanmar closed its borders with Thailand on October 2, 1999. The gem trade has been affected very little as a result, and business still thrives. Although the government has limited travel by foreigners to Mogok, people continue to visit the ruby mines there.

The Carolina Prince Emerald

Source: JCK February 2000

The large 72-carat (mis-reported as 88 carats) emerald rough unearthed from the Hiddenite mine in North Carolina last year yielded two marvelous stones: the pear-shaped Carolina Queen and the oval Carolina Prince. The Carolina Queen weighed 18.88 carats. The Carolina Prince weighed 7.85 carats and was sold for $500,000.

A group of twelve retail jewelers have formed the Southeast Emerald Consortium. They purchased a two-piece, 858-carat (total weight) emerald rough from the Hiddenite mine named "the Empress Caroline".

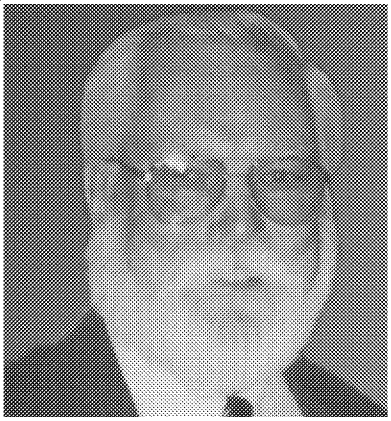
More on "Dirty Diamonds"

Source: JCK February 2000

In the aftermath of reports from *Time* magazine, ABC's *World News Tonight*, and the *New York Post*, the diamond industry has now realized that it must address the problem of diamond sales from war-torn countries. One group, Global Witness, compared the diamond trade to "a lethal dinosaur that places profits over people." The United Nations and the US State Department has joined several consumer groups to brainstorm solutions to this problem. The industry continues to feel the pressure.

Facet Designer's Workshop

By Ernie Hawes



Question: Do an odd number of mains result in a livelier stone? Some faceters think so. My own experience with nine-main brilliants tends to confirm that idea. I have not experimented with other designs with an odd number of mains, so I cannot speak with any authority. However, the concept of light reflecting off one facet to two or more facets on the other side of the pavilion or crown, splitting the ray into two or more rays of light, certainly sounds like a logical way of achieving a livelier cut gem.

Someone who has been experimenting with designs with an odd number of mains is that very well-known and prolific designer, Charles Covill. In early October of last year, Charles sent us a disk with over forty new designs with an odd number of pavilion mains. The designs have seven, nine, and eleven mains. He created patterns using 32, 64, 72, 80, 84, 88, 96, 99 and 120 indices.

At first glance, most of them appeared to be fairly normal patterns. However, a little closer study quickly revealed that these were quite unusual. The symmetry that we usually expect to see, the rows of like facets, was not always there. Even rows that appear to be the same may have one or more facets cut at a different angle.

Along with the disk, Charles sent completed drawings of two variations of his ***SQUARE WITH NINE MAINS***. One has a scissors crown, and the other has a step cut crown. Charles suggested that we consider publishing them. Our answer was, of course, we would be delighted to include these very interesting and unusual designs in our newsletter. We had already scheduled other designs for the September/October 1999 and November /December 1999 issues, but quickly decided that these designs from Charles would go into the January/February 2000 newsletter. Charles has kindly given us permission to share these patterns. If any Albuquerque area guild members who have GemCad or GemPrint would like to see the entire set of designs, then they may do so by bringing a 3.5 inch IBM formatted diskette to the next meeting. Be sure you have labeled it. I will make copies of everything Charles sent and have them available for pickup a few days later at my office at Sandia High School.

Take a close look at the designs we have printed here. When you facet them, be sure to follow the sequence carefully. They are not hard to cut, as Charles indicates on the diagrams, but be sure that you note the mast height change required for pavilion steps 3 and 4. I encourage everyone cutting one of these designs to also facet the other variation, as the optical effect is different for each one. It would be interesting to view two stones side by side that were cut from these designs. It may surprise you which has the most fire.

On a different note, Merrill Murphy recently gave me some drawings for designs that he created many years ago, long before any of us had even dreamed of a personal computer, much less owned one. Merrill did not calculate any angles or indices when he drew his designs, so they are basically concepts, ideas to be fulfilled at some future time. They look very interesting. I will work on them in collaboration with Merrill, if not in the next few months before I retire, then certainly soon thereafter. When they are done, you will see them in *The New Mexico Facetor.*

{Editor's comment: Several of the issues of American Gemcutter in late 1987 and early 1988 published articles from Paul Smith, who created the *Apollo Cuts.* The *Apollo Cuts* came from Paul's interest in the retro reflector, which subjects light rays to three reflection points. The retro reflector obtains its special optics from its triangular form, produced by cutting off one end of a cube. It is able to return nearly all light that enters the table. NASA used the retro reflector in laser beams to bounce light experiments between the Earth and the moon, and Paul wanted to apply this concept to gem cutting. When light rays enter a cut stone, the interior angles of reflection within the stone will be different. However, the exiting path will always be parallel with the entering path. Paul's mathematical models of ray tracings in retro reflectors showed that the three-reflection idea allows better optical performance. The pavilion accepts and reflects more light rays, an advantage for stones with low refractive indices. As faceters, we might also consider the affect of a number of pavilion mains that are divisible by three, like nine or twelve.}

Gem Myth of the Month

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

Gem Myth: "Gemstones are great investments." We often hear this myth voiced, particularly from people who have traveled overseas and purchased jewelry and loose gemstones based upon this statement. They said that the dealer who sold them their items expressed this idea.

In order for an item to be an investment, it must have some degree of liquidity and carry a value recognized by a wide range of people. Gemstones have a value recognized by a wide range of people, but the liquidity aspect can be somewhat limited, depending upon supply and demand.

Suppose you purchase a loose gemstone for $5,000 as an investment. Suppose that, some time later, you meet with unforeseen circumstances that force you to sell the gemstone. Where do you go to sell it? The source where you made the original purchase might buy it back from you. However, will they pay you the original price, or will they offer you less money? Profits and costs were factored into the original price when you purchased the gemstone, and these will certainly be deducted from this resale.

We know a customer who purchased a gemstone from a well-known firm in the Midwest. This company claims that it will buy back any gemstone it sells for the same price. The gemstone in this case was not expensive, and our customer had it only a few weeks when he decided to return it. The payment received from the company was minus 10% for restocking, making the company's promise of a full refund not true to their advertising. Add to this deduction a large shipping and handling fee, and you can understand where this company makes its money, regardless of whether or not the customer keeps the stone.

There have indeed been cases where certain gemstones appreciated in value over the years, and these proved to be a good investments. However, few people outside the gem-trade can really profit regularly in such ventures. My advise is to purchase a gemstone that you will enjoy having for its beauty and meaning. Should someone try to sell you a gemstone using the word "investment" to entice you, however, keep your money in your wallet and run.

Let's Talk Gemstones

By Edna B. Anthony, Gemologist

Al_2SiO_5 GROUP
TOPAZ
A NESOSILICATE

Previous articles discussed the polymorph gemstones andalusite, sillimanite, and kyanite of the Al_2SiO_5 group of the nesosilicates. Topaz and staurolite are the two remaining minerals of this group used as gems. In the nesosilicate structure of orthorhombic topaz, independent SiO_4 tetrahedra cross-link chains of AlO_4Fe_2 octahedra parallel to the *c* axis. The perfect basal cleavage of the commonly stubby prismatic crystals breaks only the AlO and the AlF bonds, leaving the SiO_4 bonds intact. A close packing arrangement of fluorine and oxygen atoms causes its rather high density. Of the well known gems, topaz is the only one with a refractive index range of 1.61 to 1.63 to exhibit a specific gravity range above 3.32.

Topaz occurs most frequently in non-gem granular and columnar forms that bear a resemblance to fat. These non-transparent forms derive their name "pycnite" from the Greek word "puknos" meaning fat. Either the Sanskrit word "tapas" meaning fire or the Red Sea Island known as Topazion in ancient times is the source of the name for crystalline topaz. The usual upward growth habit of the crystalline form of topaz often causes the pyramidal terminations of the frequently vertically striated prisms to be visible only at one end. The crystals develop in a pneumatolytic environment from fluorine-bearing vapors in igneous rocks that contain abundant free silica. Topaz is found in contact zones, in cavities in granite and rhyolite lava rocks, pegmatites, high temperature quartz veins, and as worn pebbles in alluvial deposits. The alluvial deposits in northeast Brazil yield colorless pebbles called "pingos d'agoa" (drops of water).

Gemmy topaz crystals can weigh in the hundreds of pounds. The American Natural Science Museum in New York has a magnificent 300 kilogram translucent specimen from Minas Gerais, Brazil on display. The Mining College Museum in St. Petersburg displays a giant blue specimen recovered from Murzinka in the Urals. The legendary 1,640 metric carat colorless Braganza stone is reputed to have been found in Minas Gerais in 1740. The King of Portugal, believing the crystal was a huge diamond, claimed it for his own. It disappeared after having been worn as a rough suspended gem by King John VI from 1816-1826. In *The Illustrated Encyclopedia of Minerals and Rocks*, Dr. J. Kourimsky tells us it is the cut and polished 1680 carat topaz now set in the Portuguese crown. The Smithsonian Institution's collection of gemstones contains three magnificent faceted topazes from Brazil: the very large American Golden of 22,892.5 carats, a blue of 3,273 carats, and a 1,469 carat yellow-green gem. The 21,327 carat faceted light blue, treated, emerald-cut Brazilian Princess gem resides in a private collection. Natural pink topaz crystals seldom occur in sizes above a few carats. However, an exception is the 150 kilogram translucent specimen found in Minas Gerais now displayed in the Mineralogical Institute in Florence, Italy.

Before the advent of chemical, mineralogical, and crystallographic techniques were applied to identify Earth's minerals, the name "topaz" was used by our ancestors to designate many golden-hued gem minerals. The olivine found on the Red Sea island of Topazos (St. John's Island, now known as Zebirget) is an example. Today, some jewelers still refer to the yellow andradite garnet as "topazolite". We can be even further confused by the terms "topaz citrine" and "smoky topaz" that have been applied to yellow and brown quartz. Yellow sapphire was frequently called "oriental topaz" in the past, but the term is seldom used now. The name topaz began to be applied to the aluminum silicate containing fluorine and hydroxyl in the early part of the eighteenth century. The wine-yellow crystals from the Saxony region of Germany were the first to be scientifically identified as topaz.

We know now that topaz also occurs in blue, pale green, pink, and colorless crystals. The various tones of pure yellow material are often referred to as honey and golden topaz. The term "precious topaz" is slowly disappearing. "Sherry topaz" is the rich, brownish golden yellow variety. Both the natural and heat-treated brownish red-orange stones are sometimes called "burnt" topaz. A vast range of color gradations exists from these through the pure pinks to those of red and almost violet tones of the darker colored gems. The deep pinkish-orange and reddish-orange toned materials are the prized "imperial topaz." Some Brazilian crystal tips yield the extremely rare red topaz known locally as "Brazilian ruby."

Natural pink topaz is very rare. Katlang, Pakistan is the source of fine rich pink crystals. Most pink topaz is obtained by carefully heating brownish red-yellow chrome-bearing crystals found at Ouro Preto in the Minas Gerais region. Although the color of some natural crystals fades when exposed to sunlight, this heat-induced color-change is permanent. Irradiation and heat-treatment of colorless and greenish-brown crystals can produce smoky grey, cinnamon-brown, yellow-orange, and blue materials. The yellow-orange, which develops in a matter of minutes upon exposure to the process, can closely resemble "imperial topaz". Its color fades rapidly. A longer period of exposure is needed to produce the more slowly fading brown. Greenish-brown crystals exposed to such treatment yield the popular permanent blue colors not found in natural topaz. These are known by such terms as "London blue", "Swiss blue", and "sky blue." In his *Color Encyclopedia of Gemstones*, Dr. Joel Arem states "no detection test exists for the irradiation treatment". Dr. Kurt Nassau confirms this in his book, *Gems Made by Man*.

The processes of linear acceleration use neutron bombardment and gamma radiation to effect the color changes in topaz. Since this is a well known practice, the National Regulatory Commission requires that all imported topaz gems and material undergo examination and meet strict safety standards. A strictly monitored facility in Missouri processes irradiated topaz gems produced in the United States. A consultation with Mr. Ray Zajicek of Equatorian Imports in Dallas, Texas and Mr. Moghadam of MP Gem Corporation in Los Angeles, California shed more light on the processes. They agreed that undetectable gamma cobalt 60 radiation is the most commonly used process. Linear acceleration processing may leave faint residual radio-activity, which dissipates within a few days. This method can be detected only with the use of very sophisticated equipment. They also said that the less-used neutron bombardment is the most apt to be discovered.

In spite of its perfect plane of cleavage, topaz can be an excellent choice as a gem for almost all types of jewelry. A superb cut will enhance its dispersion. With the attribute of its hardness of 8 on the Mohs scale and a variety of colors in a wide range of sizes, one can make very desirable additions to a jewelry wardrobe at a very reasonable cost.

TABLE 1. Gemstone Properties

SPECIE	*topaz*
Composition:	$Al_2SiO_4(F,OH)_2$ + CrHydrous aluminum fluorosilicate
Class:	silicates
Group	Al_2SiO_5
Species:	topaz
Crystal System:	orthorhombic
Variety:	by color
Colors:	colorless, yellow, orange, red-brown, pale blue, pale green, pink, and red
Phenomena:	none
Streak:	white
Diaphaneity:	transparent, translucent
Habit:	prismatic, granular, massive
Cleavage:	indistinct and poor
Fracture:	conchoidal, uneven
Fracture Lustre:	vitreous
Lustre:	vitreous
Specific Gravity	3.53 to 3.57
Hardness	8
Toughness:	poor, brittle
Refractive Index	*a*=1.607 - 1.629; *b*=1.610 - 1.632; *y*=1.618 - 1.649

TABLE 1. Gemstone Properties

SPECIE	*topaz*
Birefringence:	0.008 - 0.010
Optic Character	biaxial positive
Dispersion:	0.014
Pleochroism	Distinct Yellow = greenish-yellow/honey-yellow/pale yellow; Brown = yellow-brown/yellow-brown/pale yellow-brown; Red Brown = yellow/reddish/reddish; Red = red/yellow/rose-red; Pink = pale violet/violet/yellow; Pink (treated) = rose/rose/colorless; Pale Blue - distinct blue/pale pink/colorless; Green = colorless/blue-green/distinct green
Luminescence	Blue and Colorless = LW/weak yellow-green, SW/weaker; Brown and Pink = LW/orange-yellow, SW/weaker or greenish white
Absorption Spectrum	strong line at 6828
Aqua Filter	Blue = blue-grey
Chelsea Filter	Blue = green; Bright Blue = brownish pink
Solubility	not resistant to sulfuric acid
Thermal Traits	infusible
Treatments	heat treatment and irradiation
Inclusions	planes of small liquid inclusions occupied by gas bubbles; three-phase inclusions are not uncommon

New Mexico Faceters Guild Meeting Location

We are finally returning to the Museum of Natural History on Mountain Road near Old Town for our New Mexico Faceters Guild meetings. Please note that the March 9, 2000 meeting will be held there. We profusely thank Ernie Hawes for arranging the Guild meetings at Sandia High School last year, during the time that the museum was undergoing massive reconstruction.

Special Dates for Guild Members

Steve Attaway celebrated his birthday on February 10. Ina Swantner celebrated her birthday on February 23. Both Gary Peters and Nancy Attaway will celebrate their birthdays on March 5. Waylon Tracy will celebrate his birthday on March 8, and Louie Natonek will celebrate his birthday on March 25. Congratulations to all.

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NMFG Back Issues

Back issues of the *New Mexico Facetor* are available for all of 1999, all of 1998, and much of 1997. Please contact the Editor for requests for back issues. Thank you.

Treasures of the Earth

Jewelry, Gem, and Mineral Expo - 2000

March 24-26, 2000

(Dollar Day) Friday - 10:00 am to 7:00 pm
Saturday - 10:00 am to 6:00 pm
Sunday - 10:00 am to 5:00 pm

UNM Conference Center

1634 University, NE