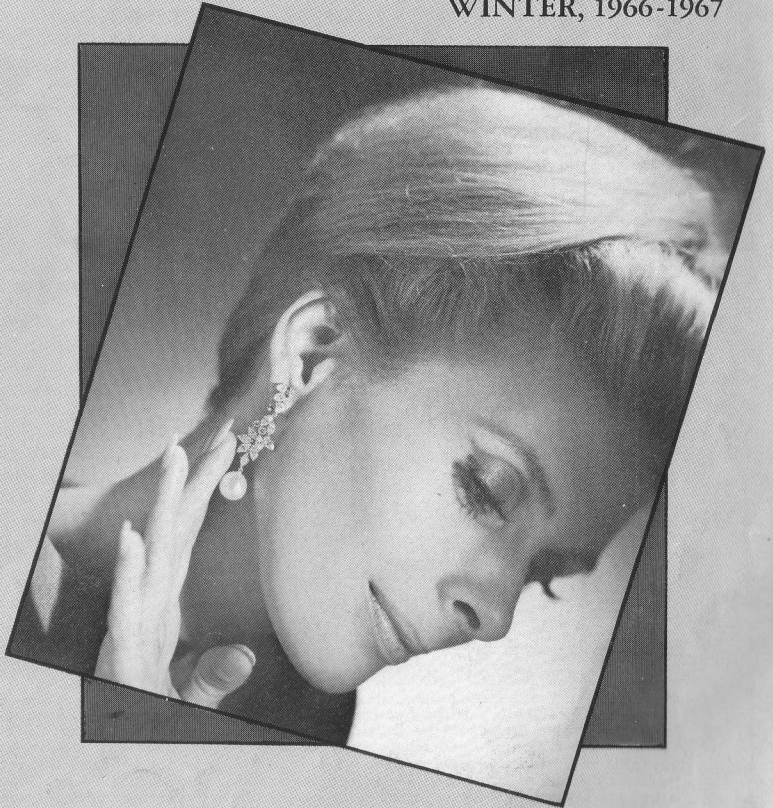


Gems and Gemology

WINTER, 1966-1967



Gems & Gemology

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On the Cover

Shown in the 1967 Diamonds-International Academy Collection are these pendant-diamond earclips of dazzling grace by Primavera & Kaufmann of Montreal, Canada. From a cluster on the lobe, marquise diamonds cascade in sparkles to a South Sea pearl drop.

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International Gemmological Conference

by

Richard T. Liddicoat, Jr.

The Eleventh International Gemmological Conference was held at the Hotel Majestic in Barcelona, Spain, from October 2 through October 6, 1966. Those in attendance represented Great Britain, Switzerland, West Germany, Belgium, France, Spain, the United States, Australia, Austria, Denmark, Norway, Sweden, Finland, the Netherlands and Italy. The hosts included the Spanish Gemological Association and their conference delegate, Manuel Masso. The Retail Jewelers' Association of Barcelona was also exceedingly hospitable. There was a dinner, a showing of jewelry made in Barcelona, and a number of other very pleasant social events.

The agenda was a full one, covering many aspects of the subject matter of major interest to the gemologists in attendance. The first speaker, Mr. Francois Duyk, President of the Belgian Gemologists, spoke on the value of

photomicrography to the expert. He stated that the time needed to photograph inclusions was perhaps better spent than would have been an equal time devoted to additional study through the microscope. He believes that he notices things on the photograph he might not have noted through the microscope. He also discussed measuring some of the crown-facet intersections as a means of positive identification of an individual diamond and the use of photography to record diamond color.

Professor Mellis, of Sweden, reported on his continuing research on garnet inclusions. Armed with proof by microprobe analysis that the needlelike inclusions he was studying were indeed titanium dioxide, he was able to show that elongation parallel to a 301 twin plane accounted for an extinction other than parallel to the needle's length — an occasionally observed condition. The

needles were oriented parallel either to cube edges or to rhombic-dodecahedral edges. Mellis believes that the needles grew with the garnet, rather than as a later exsolution process, as in corundum.

A long discussion was led into by a talk by Gordon Andrews and comments by B. W. Anderson with respect to what is and what is not an emerald. This discussion was brought about by the discovery in Brazil a few years ago of a deposit of green beryl that lacked the chromium found in emeralds from other sources. The European gemologists, by and large, feel that to be called an emerald, a green beryl must show distinct chromium lines in the hand spectroscope. There has been some difference of opinion between the GIA laboratories and European laboratories with respect to the chromium-line requirement before a green beryl merits the term emerald. Several years ago, our laboratories were asked to test quite a number of stones cut from *moralla*, which is a translucent green beryl, rich in chromium. By the use of the criterion of chromium in a green beryl, there would be no choice but to call such a material emerald. The gemologists in GIA laboratories felt that if such material were called emerald, certainly the much more attractive green beryl without chromium merited the same descriptive term. Although this difference was not clearly resolved at the meeting, GIA laboratories have agreed to take the matter of chromium as the criterion under advisement.

Dr. Eppler, of West Germany,

showed some beautiful slides of apatite crystals in garnet, discussing the fact that an early identification of quartz in garnet was faulty. Basal cleavage traces are obvious in the photomicrographs — a characteristic of apatite, not quartz. He also showed and discussed other beautiful inclusion slides he had prepared.

Oliver Chalmers, of Australia, discussed the gems and ornamental materials of that continent and showed examples of Australian materials. He emphasized sapphires and diamonds, because Australian opal deposits are so well known.

Ove Dragstad, of Denmark, discussed some materials from Greenland with gem potential: tugtupite and ussingite. The former is a pink sodium-beryllium-aluminum silicate, first thought to be a beryllium sodalite but later found to be a distinct mineral crystallizing in the tetragonal system. The latter is a violet-red sodium-aluminum silicate of 6 to 7 in hardness. Both have limited possibilities for cabochon use.

GIA's representative discussed flux-fusion and hydrothermal synthetic materials that had been encountered in the laboratories recently. It was pointed out that of four stones received at the same time, two showed obviously the characteristics of a flux-fusion type of synthesis, whereas the other two were almost entirely free of inclusions. Unless one is alert to the possibility of synthetic rubies formed by other than the Verneuil method, it would be very easy to make a mistake in identification. It is

necessary to be aware that synthetics of this type are appearing more and more frequently.

Next, Mr. Dyck discussed a form of doublet made up of two pieces of flawed beryl with an emerald-green cement. From the top, particularly when set, such stones do have a deceptively natural appearance.

Dr. J. M. Bosch discussed microhardness as applied to precious stones. Although the talk was interesting, the method does not appear to offer great possibilities.

The venerable G. Gobel, for many years head of the Paris laboratory, is planning to retire within a year or two. He is now 84 years of age. His new assistant, M. Jean-Paul Poirot, was present at the International Gemmological Conference for the first time. Mr. Gobel discussed his gemmological table to which he has added a color wheel. He has keyed the descriptions of the colors of the gemstones in the comprehensive table to the color wheel.

Other talks of importance at the Conference were a fascinating history of the spectroscope by the London Laboratory's Director, B. W. Anderson. From Newton's early experiments (1666) to the present, he covered the key developments. Of course, no one has done as much to demonstrate and contribute to the enormous value of the spectroscope to the gemologist as Basil W. Anderson.

Frederick H. Pough, Ph.D., gem consultant for the *Jewelers' Circular-Keystone*, delivered an interesting and

well-documented talk on the history of gem synthesis, bringing out not only historical data of interest, but discoursing on the latest developments in the field of flux fusion, the Czochralski and Bridgman-Stockbarger techniques and other means of synthesis of minerals, most of which are readily adaptable to gem-material manufacture.

One afternoon, half the group visited the magnificent mineral collection of Dr. Folch. This is probably as fine a private mineral collection as there is in the world. Many crystals of fine gemstones are included.

Herr Saller talked about the need for absolute clarity of terms in regard to synthetics and imitations. He was very displeased with the American Federal Trade Commission's decision to accept the "created" terminology in lieu of synthetic. He pointed out that the term does not translate into anything of comparable meaning in most European languages.

Madam Cavenago-Bignami had been prepared to discuss the synthetic rubies made by Chatham, but since this had been discussed at some length earlier, she shortened her presentation. Herr Saller discussed the hydrothermal synthetic emerald produced by Linde in America, giving the properties of the stones and showing slides of inclusions. Professor Doctor Font Altaba and Doctor Monturiol discussed the application of mineralogical techniques to gemmological investigation.

One of the highlights of the meeting was an outstanding series of reports

by three gemologists working separately but arriving at the same results in Lucerne, Leiden and Paris. While discussing their subject matter to be given later in the same morning, Dr. Pieter Zwaan, of Leiden, and M. H. J. Schubnel, of Paris, learned that their talks were almost identical, and that their work with electron-probe analyses had achieved the same results. They then learned that Dr. Gübelin, of Lucerne, had been working on the same problems, and that he too had reached the same conclusions.

The techniques were very similar, in that materials were used in which the inclusions were at the surface, a necessity for the use of electron-microprobe analysis. Dr. Zwaan also utilized the technique he described at the last Conference in Vienna; i. e., scraping a minute amount of powder from an inclusion, so that an X-ray powder analysis could be utilized. All three were able to identify a large number of inclusions in major gem minerals beyond any question. For example, one or more of them found that large inclusions long noted in sapphire from Burma were calcite. One or more of them also found in corundum apatite, spinel, pyrrhotite, corundum, phlogopite mica, tourmaline, niobite and pyrochlor. In diamond, they found chrome diopside, garnet and peridot, as might be expected. The names and reputations of Doctors Zwaan and Gübelin are well known in the gemological field. Young M. Schubnel is not as well known. He is a mineralogist working for the organ-

ization known as the French BRGM. The initials stand for the *Bureau Recherche Geologique et Minière*.

Ove Dragsted, of Copenhagen, discussed a theory of the formation of cyst pearls. In the discussion that followed, a very interesting discourse on the role of DNA and RNA in cell formation and the development of organisms was discussed rather thoroughly. The gist of the remarks in the discussion was that pearls are the result of a cancerous type of reaction in epithelial cells in pearl-bearing molluscs.

In the course of the Conference, B. W. Anderson mentioned that taaffeite has been found in place. It was mentioned in *Mineral Abstracts* in 1964 as having been found in Yunan Province in China.

Señor Masso, of Barcelona, showed some photomicrographs of pearls in thin section he had taken. They were very interesting. Dr. Gübelin discussed the use of X-ray diffraction in the testing of pearls. He likes the new X-ray Polaroid film for his testing work. Dr. Mellis presented a paper on the labradorite from Ylanaa, Finland. He had excellent photomicrographs of the material.

Herr Reiter discussed the studies of a colleague who had used a spectrophotometer as a tool in diamond color grading. He used several diamonds that had been graded on an electronic colorimeter and made an absorption curve for each of the stones on the spectrophotometer. He used a few char-

(continued on page 126)

The Stone Carvers of Kofu, Japan

by

Geoffrey W. Messchaert

Sparkling throughout the centuries, like the stones its seven guilds carve, is Kofu, Japan. Beginning with the handcarving of clear quartz crystal from local deposits, nearly a century ago, the introduction of electricity allowed the industry to expand, since it provided a more efficient method of cutting, grinding, polishing, faceting and drilling stones. However, it seems, no matter what the stone carver perfects in clear quartz crystal, the average shopper remains suspicious of quartz for its resemblance to molded glass.

But, as the carving and cutting of quartz crystal continued, local deposits of good-quality material became exhausted and new deposits had to be discovered in Japan or else the stone had to be imported. Only a small number of crystals are still being mined in the hills around Kofu. Commonly, poor crystals are seen glued to a false matrix and sold as "mineral" specimens in the curio shops of downtown Kofu. Due

to the poor job of gluing, the specimens are not attractive to those who know minerals.

Since Japan does not have many known deposits of quartz-family minerals suitable for carving (having an even color and being as free of fractures as possible), most of the natural, heat-treated and dyed stones, with some exceptions, must be imported. Once each year the master craftsmen order their foreign stones. Minas Gerais, Brazil, supplies clear quartz crystal, amethyst, rose quartz, smoky quartz, blue and green aventurine, sodalite, and natural and dyed agate. Lapis-lazuli is imported from Chile, through Santiago, from deposits high in the Andes. Tiger's-eye and jasper are brought from South Africa. Nephrite and jadeite come from Alaska, Wyoming and New Zealand.

The Japanese, however, have developed their own deposits of brecciated red-and-green jasper and a colorful

agate called "Japanese jade," an opaque, nonvitreous, milky-white agate with spinach-green splotches. Japanese carvers do not feel that their deposits of what might be called "nephrite" and "jadeite" would provide stone suitable for carving. Since Japan can easily get these materials from North America, "Japanese jade" is seldom used as a substitute. When the Kofu carvers do get exceptional jadeite they call it "jewel jade" and use it in jewelry, not for carving. "Hokkaido agate," which is a brown to gray nodular stone, is an interesting agate from the northernmost of the Japanese Islands. The center of the stone has sharp fortification banding that blends into rounded bull's-eye banding around the outer portions of the stone, which, since it is porous, is usually dyed to resemble carnelian. The carnelian-red to cinnamon-brown color is more pleasing than some of the unnatural-looking agate from Brazil.

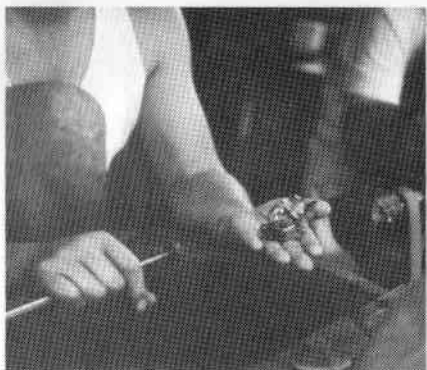
Along with the frequent problem of getting good-quality carving material from foreign sources, there is the problem of attracting young men into the stone-carving craft during this present expansion of Japan's economy. Many young Japanese do not have the desire or the patience to learn the skills of stone carving, when a more remunerative job can be had elsewhere.

Each stone carver is a skilled craftsman, a specialist concentrating on what he can do best. For example, one carver has restricted his work to the "Chinese beauty," goldfish and a few animals such as elephants and horses, but he

has carved other animals and forms on request. The master of the shop usually owns the business and hires less-skilled craftsmen and apprentices for making small carvings, while keeping the more important carving requests for himself.

The most difficult carving to master is the "Chinese beauty." Normally, ten years of experience are required before a man is allowed to carve one of these objects, so he will have developed the skills, the necessary sense of proportion and an understanding of the nature of the stone upon which he is working. Nearly fifty hours are required to complete a "beauty," measuring approximately $8\frac{1}{2} \times 2\frac{3}{4} \times 1\frac{1}{4}$ inches; it is copied from an antique Chinese nephrite carving of a robed, flower-carrying and smiling feminine figure set against a lacy backdrop. The most desirable stone for this carving is amethyst; however, since amethyst is not often found in large, evenly colored, fracture-free blocks, blue sodalite and blue aventurine are commonly substituted. This statuette is also carved from clear quartz crystal, rose quartz, lapis-lazuli, green aventurine, tiger's-eye and an iridescent, pale-yellow, heat-treated tiger's-eye called "sun stone." For other carvings, blue sodalite also substitutes for lapis-lazuli.

Several sizes of elephants and horses are carved in green aventurine, quartz crystal, rose quartz, brecciated red-and-green jasper, tiger's-eye, nephrite and jadeite, lapis-lazuli, natural and imitation carnelian ("Hokkaido agate"),



A master craftsman mechanically carving an agate goldfish.



The mechanical carving of a green aventurine "Chinese Beauty" by a master craftsman.

bloodstone and jasper. Goldfish carvings are restricted to marbled red, brown and white agates. "Laughing Buddhas" are carved predominantly in tiger's-eye, quartz crystal, rose quartz and jadeite. Additionally, small ash trays and bowls are carved in tiger's-eye, nephrite and agate.

Today's tools used in mechanical stone carving are quite simple. Power is delivered to each workbench by an electric motor, the belt of which drives a central shaft. The rotating shaft, in turn, drives a series of tapered, horizontal shafts, one for each workbench. All stone-working tools are fitted on the end of the shaft. Oval wood tubs are placed beneath the shafts, which are equipped with metal splash boards fore and aft. Drilling is done with Carborundum-tipped drills. The rough surfaces of carvings are ground with Carborundum wheels and wood wheels to which Carborundum has been ap-

plied by hand. Small cuts are made with steel wheels to which the abrasive is also hand fed. Polishing, the final step, is usually done with a four by $\frac{3}{8}$ -inch, water-logged wheel mounted on the end of the tapered shaft. As the operator polishes, he scoops up a handful of wet chromium oxide from the tub beneath the shaft and cups it about the lower portion of the wood wheel, which, in turn, rotates the clinging compound to the polishing surface. The wood wheel wears evenly during grinding, as opposed to a Carborundum wheel, which wears unevenly and "grooves out"; consequently, there is no "bumping" by the wood wheel and no damage to the stone. A worn wood wheel can be replaced cheaply. Since water is contained within the wet abrasive, none is added and the heat generated by friction is kept at a minimum by the water-logged wood wheel.

All carvings are worked according



Apprentices mechanically carving stone curios.

to a definite plan, depending on their nature (see accompanying table). The semihandcarved elephant is completed in eight steps; a large carving would measure about $6\frac{1}{2} \times 4\frac{1}{2} \times 1\frac{1}{2}$ inches. Opposed to the partially mechanized carving of the elephant is the totally mechanized carving of the agate goldfish, which, although it looks fragile, requires only sixteen hours and five steps for completion, compared to the thirty hours required for the elephant. However, sixty years ago the handcarving of a similarly palm-sized, quartz-crystal rabbit required over one hundred hours, the carver working ten hours a day for at least ten days. At the other extreme are the minor figurines, stone curios, fish, Buddhas, rings and earrings, which are generally sold in Hong Kong and carved in green aventurine and agate, commonly measuring about $1 \times 1 \times \frac{3}{8}$ inches. These small

curios, produced on a version of specialized mass production, one step at a time, by hired help, are sometimes considered the life blood of a shop. The apprentices and lesser craftsmen complete the five-step production cycle every ten days.

Once the artisan has considered what can best be carved from a particular block of stone, the six sides having been cut on a diamond saw, he inks, for example, the plan image of an elephant on all faces of a quartz-crystal block before carving. He then leaves his workbench to sit on a cushion on the floor of his shop or on a mat outside. Sitting nearly cross-legged, Indian fashion, with his knees slightly bent and the soles of his feet parallel, usually about six inches apart, he lays a heavy protective cloth over his feet. Then he places the stone block between his feet and grips it securely with the soles of

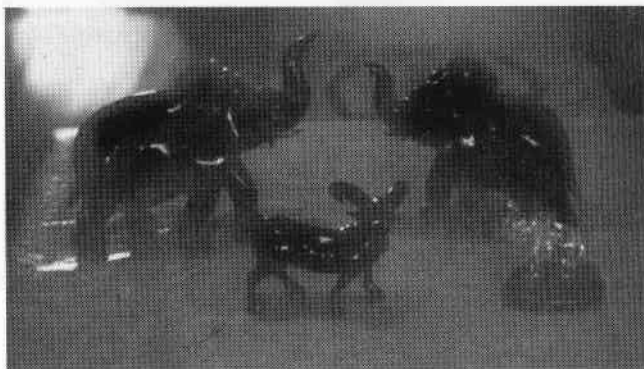


A master craftsman chiseling during the second step of handcarving a rose-quartz elephant.

his feet. In this flexible position the carver can hold the stone firmly, without damage, at any angle while chiseling. There are a variety of chisels used and each is shaped for making a particular shape of cut, kind of chip, flakes or dust, for example.

In the first three of the handcarving steps (of the eight steps followed in the carving of an elephant), a round, pointed chisel is used to chip away everything that does not resemble an elephant outside of the inked lines. Gradually, the block form of the animal is developed. Progressing to the second step, a series of defining grooves outlining the legs, trunk and head are formed with a chisel having a V-shaped cutting edge. When the carver is satisfied with the depths and angles of the grooves, he passes to the third step. This involves chipping out the rectangles and triangles formed by the inter-

secting grooves. With other chisels, as required, the extraneous material is chipped out, freeing the four legs, head and trunk, and giving curvature to the flanks and depth to the body. In the fourth step, the rough body is mechanically ground with a small Carborundum wheel, during which the tusks, ears and tail are freed and the ears hollowed. Step four ends after the legs, trunk, head and body have been ground smooth. In step five, the indented portions are carved with small steel wheels. The wrinkles of the trunk are cut and the feet are given a "manicure." In the sixth step, holes for the eyes and the tip of the trunk are drilled. The carving, in the seventh step, is given a chromium-oxide secondary polish on a wood wheel. Now the figurine looks like an elephant, although a bit "frosted." Then in the last step, the eighth, it is given the final polish with



Three quartz-family elephants. Left to right rear: green aventurine from Brazil, brecciated red-and-green jasper from Japan. Right front: clear quartz crystal from Brazil. The front left carving represents a Rocky Mountain goat in black Wyoming nephrite.

a fine abrasive. In sunlight, the miniature giant seems to come alive in the palm of your hand.

The value of a carving is based on its size, workmanship (quality), and the kind of stone used. For a "Chinese beauty," carved in amethyst, the average export price is fifty United States dollars.

After the carver has completed a figurine, he disposes of it to a dealer who stockpiles it among the finished carvings from other shops until he has enough available for an export shipment. Commonly, the largest orders are placed from the United States, Hong Kong and Europe, with the goods passing through established marketing channels.

The master craftsman of a shop is a member of the Carvers Association. There are seven associations organized for furthering each member's interest in the stone-carving and -cutting busi-

ness. Depending on the interest of the members, there are a number of functions each association performs. Such assistance includes instruction in improving workmanship, promoting friendship, sharing trade ideas, and purchasing and sale of stone-working equipment. The seven associations of Kofu are the Carvers, Dealers, Stone Cutters, Drillers, Quartz-Wafer Cutters, Necklace Makers, and the Stone-Setting Association.

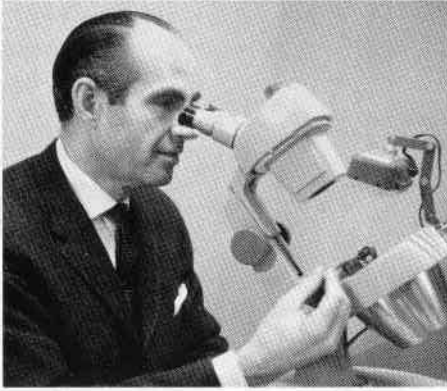
Essentially, the carvers of Kofu import stone, work it, and export the finished product. Japan's stone-carving industry thrives because of its low overhead, inexpensive labor, and skilled craftsmen who own their shops, keeping their skills within their families. Finally, there is the intermediate position of the dealer, who understands and caters to the national and regional preferences of his buyers.

TABLE

A Comparison of the General Steps Followed in the Carving of Stone Figurines

<p>The eight general steps followed in the semimechanized carving of an elephant.</p> <p>0'. Selection of the stone block.</p> <p>0'. Inking the plan image.</p> <p>1. Handcarving the block form of the elephant.</p> <p>2. Handcarving the defining grooves; outlining the legs, head and trunk.</p> <p>3. Freeing of limbs and giving curvature to the body; handcarving.</p> <p>4. Mechanical grinding of legs, trunk and body and freeing of tusks, ears and tail.</p> <p>5. Mechanical cutting of wrinkles in trunk and of toe nails with steel cutting wheels.</p> <p>6. Mechanical drilling of eyes and nose with Carborundum-tipped drills.</p> <p>7. Mechanical secondary polishing with chromium-oxide-coated wood wheel.</p> <p>8. Mechanical primary polishing with fine-abrasive-coated wood wheel.</p>	<p>The five general steps followed in the mechanized carving of an agate goldfish.</p> <p>0. Selection of the stone block.</p> <p>0'. Inking the plan image.</p> <p>1. Development of the block form with steel cutting wheels.</p> <p>2. Body, head, fins and tail formed with small Carborundum grinding wheels.</p> <p>3. Detail given to head (eyes), fins, tail and body with small Carborundum wheel and small steel wheels.</p> <p>4. Secondary polishing with chromium oxide on wood wheel.</p> <p>5. Primary polishing with fine-abrasive-coated wood wheel.</p> <p>About 16 hours of work.</p> <p>About 30 hours of work.</p>	<p>The five general steps followed in the mechanized carving of stone curios.</p> <p>0. Selection of stone slab.</p> <p>0'. Stenciling the image.</p> <p>1. Cutting out blanks with diamond saw.</p> <p>2. Development of blank form with small Carborundum grinding wheels.</p> <p>3. Relief of figure formed with small Carborundum wheels and drills.</p> <p>4. Final detail given with Carborundum-tipped drills and steel wheels.</p> <p>5. Primary polish given with chromium oxide on wood wheel.</p> <p>Mass produced. Five-step production cycle completed every ten days.</p> <p>How many hours?</p>
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Developments and Highlights



at the
GEM TRADE LAB
in New York

by

Robert Crowningshield

Chatham Synthetic Ruby

We have had the opportunity to study specimens of the first Chatham synthetic ruby rough to be offered commercially in this country. The advertisement announcing its availability was directed to the amateur lapidary trade and offered crystals of from 2 to 6 carats and called them "Cultured Rubies, Chatham Created." *Figure 1* shows a lot of four crystals, the largest weighing 4.43 carats. The color is a rich purple-red, tempered somewhat by the central core, or seed crystal. The same four stones are shown in *Figure 2*, where the seed crystals are clearly shown. *Figure 3* is a dark-field shot of one of the crystals in methylene iodide. Angular color banding in what appears

to be a very light-colored natural-corundum seed appears in one side of the seed. Surrounding the seed is an effect looking much as the corona around the sun photographed during an eclipse. The "corona" in the synthetic crystal consists of wispy inclusions and reminds one of the wisps in a synthetic emerald. *Figure 4* is an enlargement of the seed area of the same crystal. *Figure 5* illustrates a sawed crystal and the oval stone cut from the sawed section. The stone was sawed to avoid incorporating any of the seed in the finished stone, and clearly shows the relationship of the wisps to the rough crystal. *Figure 6* is a side view of the sawed crystal under immersion, showing the seed as a light center. The four crystals shown in

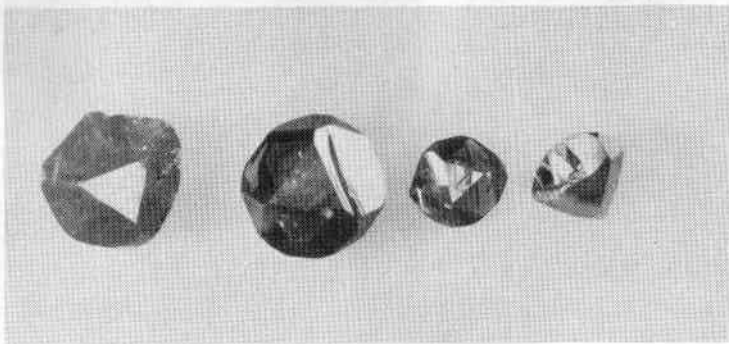


Figure 1

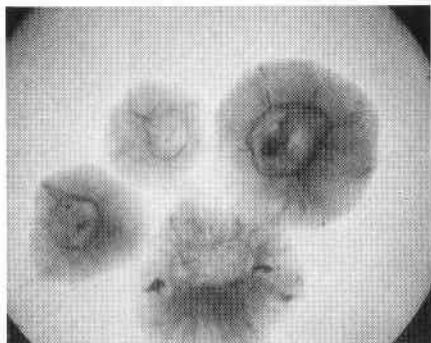


Figure 2

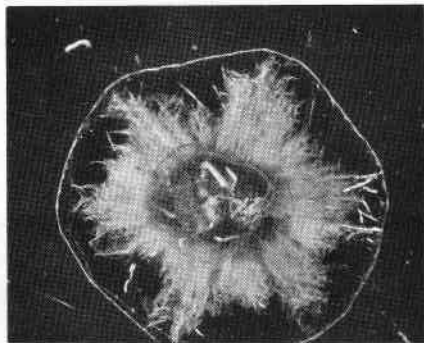


Figure 3

Figure 1 are shown in Figure 7, which is a short-wave ultraviolet transparency test with three natural faceted rubies that appear light and three larger synthetic rubies of Verneuil type that appear dark. The four flux synthetic ruby crystals in the center appear light in the center because of the natural corundum core. To date, as mentioned in previous lab columns, the greater strength of fluorescence of the



Figure 4

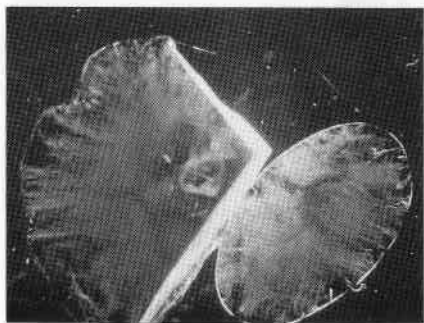


Figure 5

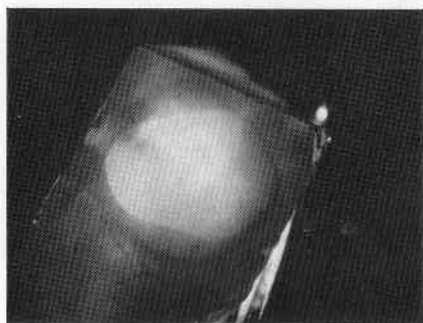


Figure 6

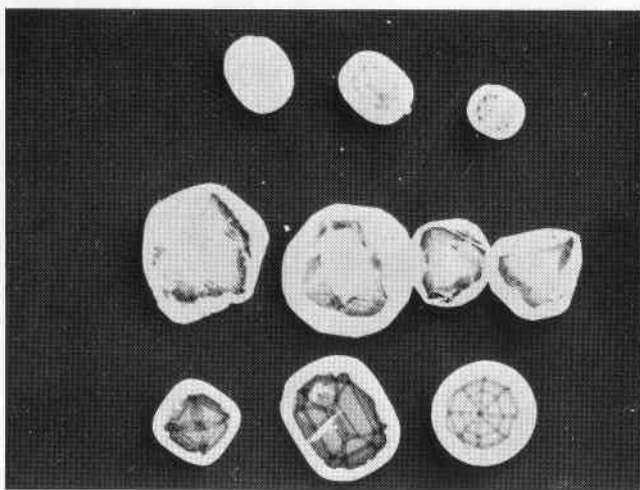


Figure 7

flux-grown synthetics, as well as their greater transparency to short-wave ultraviolet, compared with natural rubies of similar color, are important diagnostic characteristics.

Unusual Inclusion in Diamond

A most unusual inclusion in a 1.55-carat emerald-cut diamond is shown in *Figure 8*. It appears to be an iron cross

with a border around it. We are indebted to Irwin Komorow of Harry Winston, Inc., for making the stone available to us to photograph.

The Steinbach Diamond Cut

In the Winter issue of *Gems & Gemology*, 1965-66, we illustrated a modified round brilliant-cut diamond cut by New York diamond cutter, Harry

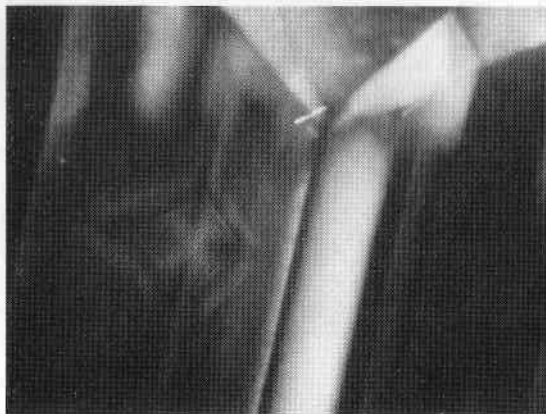


Figure 8

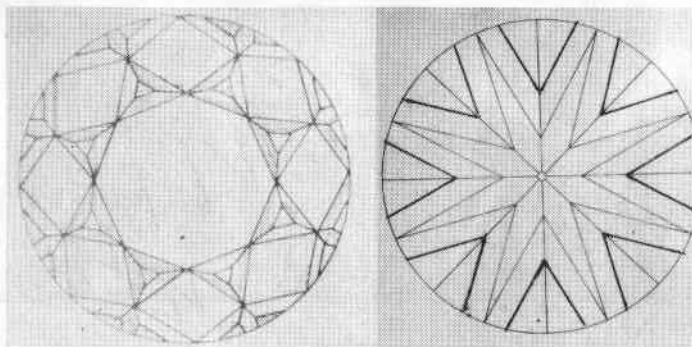


Figure 9

Steinbach. This writer must apologize for choosing the wrong illustration and counting wrong to boot! Mr. Steinbach and others called or wrote to ask for an explanation and I was happy to be able to talk with Mr. Steinbach again and question him about the cut. He told me that he had cut several designs but since they could not be proved to be measurably more brilliant, he did not continue to cut such stones. However, some collectors were intrigued with the workmanship and he has had occasion

to cut on order. We examined another stone just over a carat in weight and counted 212 facets. *Figure 9* illustrates the placement of 81 facets on the crown and 41 facets on the pavilion, and we were able to count 90 facets on the girdle. Details of the faceting are seen in *Figures 10 and 11*.

Uvarovite Garnet

We are indebted to Mr. B. L. Mecke of Sloan-Kettering Institute for Cancer Research for the privilege of examining our largest cut uvarovite garnet and a



Figure 10



Figure 11

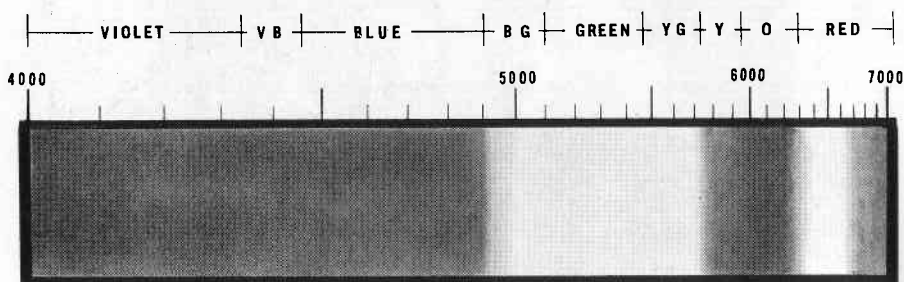


Figure 12

1.01-carat twinned crystal. The cut stone weighed 0.17 carat and is of an intense emerald-green color. The material is from Orford in Quebec, Canada. Dana gives 1.87 as the refractive index for uvarovite, but the stones we examined had an index near 1.74 with specific gravity at 3.60, being less than the data given for the Russian material — 3.77. The absorption spectrum is disappointing, considering the fact that chromium is an integral part of the composition. It is illustrated by *Figure 12*. Under the color filter the stones are

a bright red. This is true of the jadelike green grossularite from Africa but unlike demantoid. *Figure 13* shows the twinned crystal.

Black Opal

One of the most brilliant opals we have ever examined was suspected of being treated by prospective purchasers because of an unusual black outlining of the mosaic structure. This is shown in *Figure 14*. We proved to our satisfaction that the black is an extension of the black matrix, or rather common opal, that forms the back of the stone.

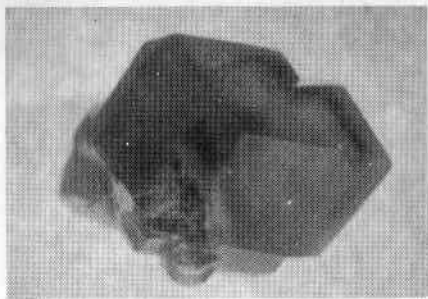


Figure 13

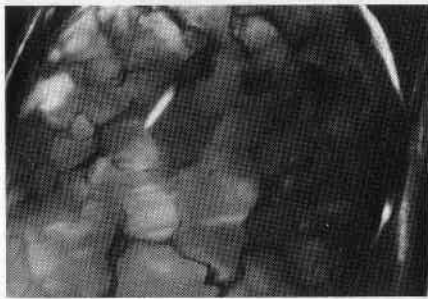


Figure 14

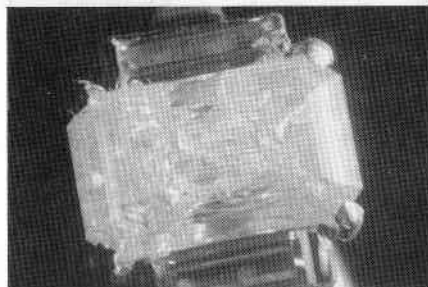


Figure 15

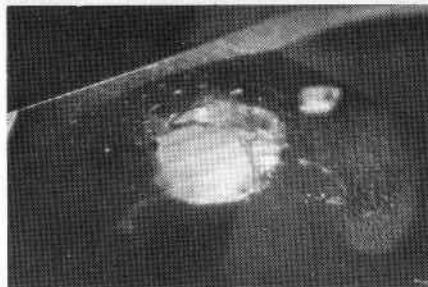


Figure 16

Perhaps the unusual placement of the black material contributed to the exquisite flashes of color.

A Mystery

A mystery surrounds the stone shown in *Figure 15*. Presumably, it had been worn by the owner for 20 years and the shank of the ring indicates it. While replacing the shank the jeweler, to his consternation, saw the stone shatter. An alert adjuster decided to have the stone tested and it proved to be strontium titanate. However, aside from the internal fracturing the stone showed virtually no abrasions or scratches, but the mounting does show tool marks and

distortion indicating that the strontium titanate was not the stone the mounting was made for. When was the switch made?

Pink Sapphire

Figure 16 shows an included crystal with repeated twinning in a fine pink sapphire.

Pearl Wear

Figure 17 shows the wear on a pearl caused by dirt caked between the pearl and the central diamond in a two-pearl-and-diamond ring. It would appear that over the years the dirt held acid-producing foreign material that, in turn, affected the pearl.

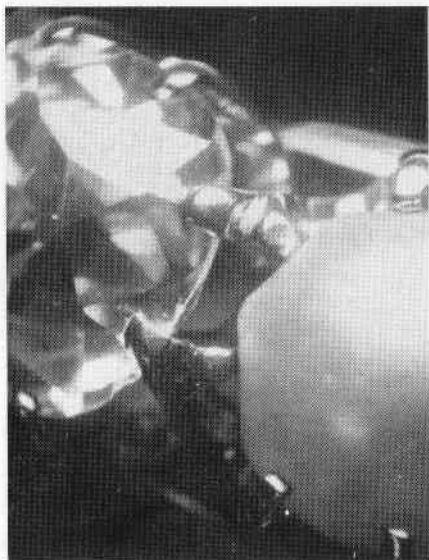


Figure 17

Treated Topaz

We have examined several very dark red-brown topazes in recent months and suspected them to be treated. We secured some brown Mexican topaz ovals and had one treated in the atomic pile at Brookhaven. Following the final treatment, the stone became a very dark red-brown with trichroism of red, yellow and orange. We have not carried out controlled fade tests yet, but suspect that in strong light there may be a change. The present color is unlike any known natural stone we have encountered.

Blue Diamonds

Recently, we examined three diamonds varying from approximately five carats to 26 carats in weight that were

all flawless and above the GIA color scale, being exceedingly transparent and very light blue. All three stones were conductive, though only in certain areas, indicating that they were in part Type IIb.

Plastic-Coated Cultured Pearls

We examined some very thinly cultured pearls recently that had been given a temporary luster with a coating of clear plastic. A sensitive person would note the peculiar "feel" of the pearls, compared with ordinary cultured pearls.

Unusual 5-Carat Emerald

A most unusual five-carat emerald in a lady's cluster ring was suspected of being an imitation because it had no flaws. The jeweler was right about one thing — it was flawless under 10x, but all tests and magnification of 60x proved it to be natural emerald.

Flawless Sapphire

Another paragon of flawlessness we examined was a very fine sapphire of 140 carats. Only when it was immersed, in order to determine if the color was homogeneous, did we see faint, straight color bands. The stone was unusual for another, but unfortunate, reason: it had been cut with the optic axis through the girdle.

Sherry-Colored Glass

A 93-carat reddish-yellow-brown square-antique stone, looking for all the world like a fine "sherry" topaz, had a refractive index of 1.63, but was glass.

Acknowledgements

We wish to thank our student **Herbert Savitt** of New Haven, Conn.,

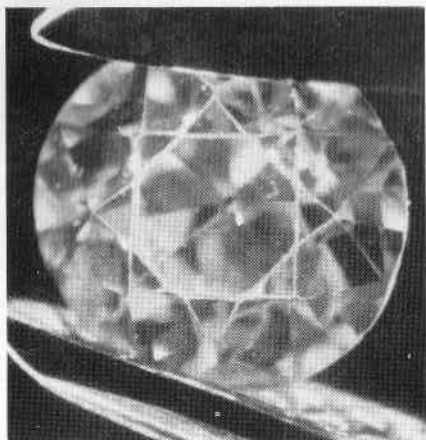


Figure 18

for the gift of a small old-European-cut diamond that had puzzled several dealers because of the worn facet junctions (Figure 18).

Figure 19 illustrates a *tour de force* in faceting. The stone is a natural emerald set in a lady's double-cluster ring.

We wish to thank our student A. Del Noce of New York City for several Australian sapphires that he heated in an attempt to lighten the color. Unfortunately, the color lightened only slightly, but changed so that the stones became more greenish and perhaps less desirable.

We thank New York Mineral and Lapidary Club officer Sidney Steriss for a gift of very light-brown to nearly colorless transparent grossularite garnet from Asbestos, Ontario. The stones fluoresced a bright red under long-wave ultraviolet and are

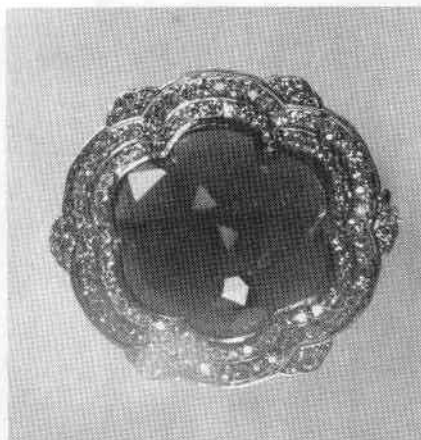


Figure 19

thus the first garnets we have ever heard of that fluoresce.

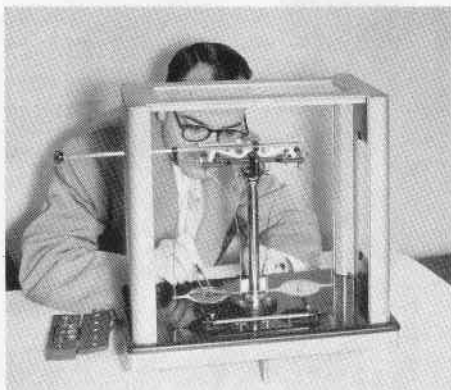
We are indebted to student Bob Dunnigan for a copy of the Department of Fine Arts of Oberlin College Bulletin of the Melvin Gutman collection of Ancient and Medieval Gold. Bob is a travelling man we admire for his efforts to further his jewelry education wherever he finds himself.

We thank student Jack Kimpel of Columbiana, Ohio, for several faceted Mexican brown topazes.

We acknowledge with thanks the gift of rough chrysoprase and Mexican opal in matrix from student Steve Rocklin of New York City.

We are grateful to student Murray Darvick, New York City, for several large cabochons for our gem cabinet. Among them are star moonstone, malachite, chrysocolla and opal.

Developments and Highlights



at the

GEM TRADE LAB in Los Angeles

by

Richard T. Liddicoat, Jr.

Prolific Gem Deposit

We recently received a letter from a man who said he had found a gem deposit containing a wide variety of gemstone species. The letter gave the optimistic impression often offered by those who have located nothing of gem quality. Although much of the material submitted to us was too small to have much value, the parcel contained some attractive blue and pink sapphires, as well as green and brown peridot, zircon, almandite and demantoid garnet, chrome diopside, amethyst, enstatite, spinel and even the tiny diamond crystal shown in *Figure 1*. The owner of the property claims to have a pipe that cuts through limestone and that there is a quartz-feldspar dike intrusive into the pipe. This combination would ac-

count for the variety of minerals we have identified from this location. We are looking forward to seeing more of the material and perhaps having an opportunity to visit the property.

Mossifying Chalcedony

In the January, 1965, issue of the *Journal of Gemmology*, P. C. Zwaan discussed the experimental coloration of chalcedony by the use of silver nitrate to form a dendritic pattern similar to that of moss agate. Recently, we encountered this fascinating artistic effort in a stone from Bombay, India. The pattern occupied the center of a large piece of chalcedony, approximately $1\frac{1}{4}$ inches square (*Figure 2*). Although this is not exceptionally rare, the fact that we were able to get a rather detailed picture of it was unusual.

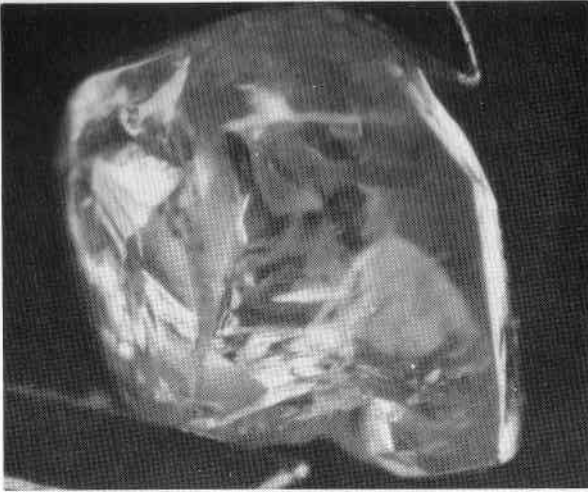


Figure 1



Figure 2

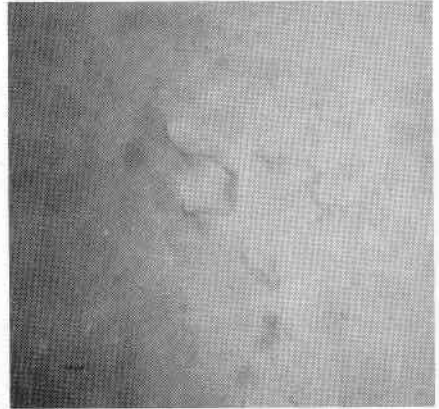


Figure 3

Turquoise Imitation

Quite frequently in the last few years we have seen turquoise imitations made of an unidentified white material coated with a blue plastic substance about a quarter to a half millimeter in thickness, having an attractive color reminiscent of turquoise. The accom-

panying photographs illustrate the characteristics that make the coating readily detectable. In *Figure 3*, a little thread of dark blue can be seen, which is quite characteristic of this kind of imitation. *Figure 4* shows cracks in the coating, which are less commonly seen. Too, near the left-hand prong are two semi-

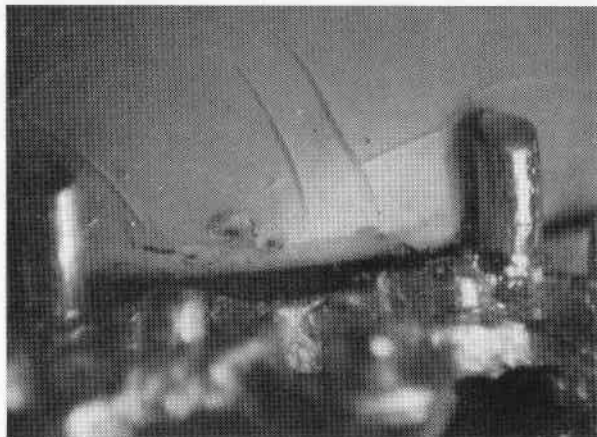


Figure 4

circular areas with dark spots in the center. A hot point was touched to these areas, melting the plastic and scorching some of the white material below.

Polishing-Wheel Marks

Polishing-wheel marks are very commonly encountered on diamonds that have been polished too rapidly and not too carefully. However, the table of a diamond is seldom so poorly polished that the condition is very obvious through the pavilion, as in *Figure 5*.

Rare Cat's Eye

Figures 6 and 7 illustrate a kornerupine cat's-eye we identified recently.

Odd Inclusions

A natural emerald we were asked to identify contained some rather interesting inclusions that, if accompanied by different properties, might have led us to suspect a flux-fusion or hydrothermal product; i.e., a synthetic. The inclusions, shown by the arrow in *Figure 8*, run at right angles to the

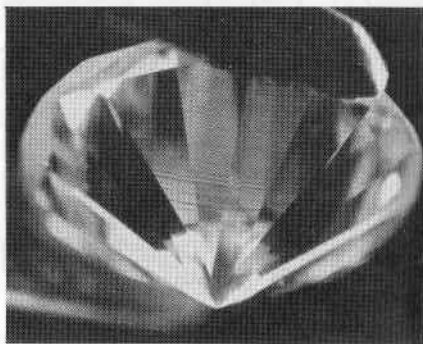


Figure 5

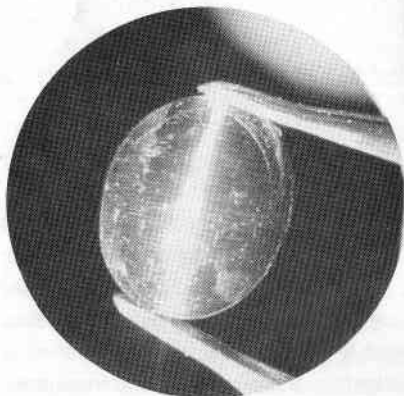


Figure 6

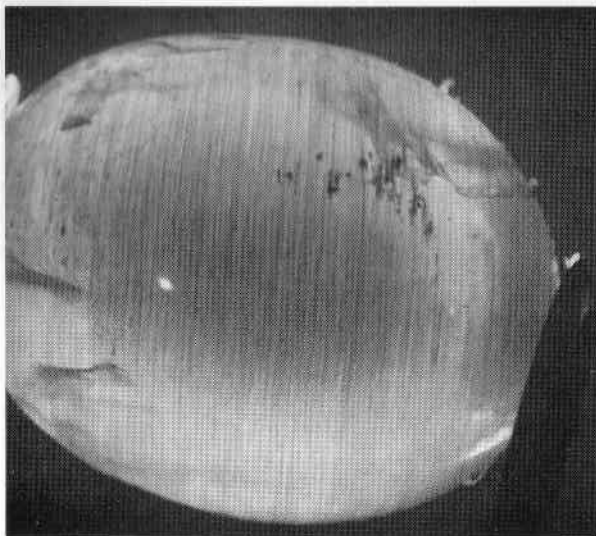


Figure 7



Figure 8

strong banding that crossed the length of the stone.

Flux-Grown Rubies

A short time ago we received for identification four rubies, two of which

had numerous inclusions and two of which were almost flawless. The flawed stones had all the characteristics of synthetic material made by the flux-fusion process. The inclusions were a combina-

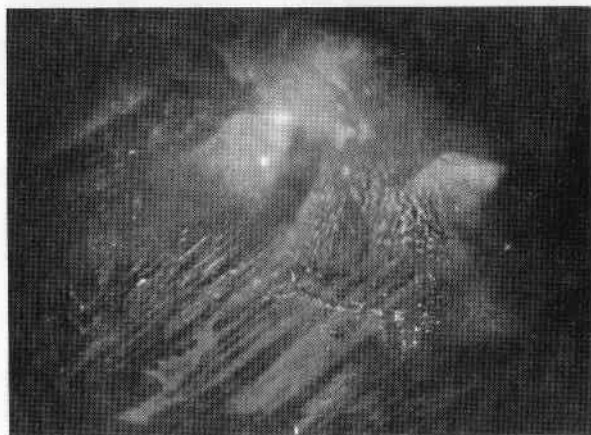


Figure 9

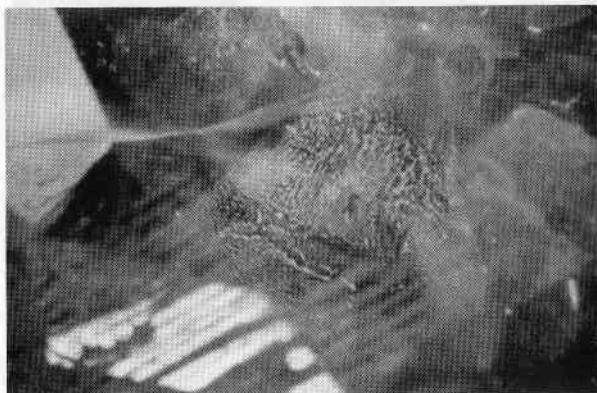


Figure 10

tion of wisplike or veillike inclusions often seen in Chatham synthetic emeralds (Figure 9) and those, resembling a fingerprint pattern, that appeared to be two phase but actually were solid inclusions composed of the flux material (Figure 10). The almost-flawless stones would have posed a much more difficult identification problem had they been

sent in by themselves. They were tested by the various means used to detect flux-grown rubies and clearly were synthetic.

Interesting Inclusion

Jim Small, former GIA instructor, and now a diamond-wholesale representative with the J. C. Keppie Company, Pittsburgh, Pennsylvania, sent us a 9-point diamond with an interesting

inclusion. Octahedral clouds, of course, are very common in diamond, but this was a square cloud with very little depth. It is shown in *Figure 11*.

We had occasion to examine a large number of 3-point full-cut diamonds and discovered some remarkable cutting. The facet arrangement on the crown of the stone in *Figure 12* is unlike anything in a cutter's manual.

Uvarovite Crystal

It is interesting that in the same month that our New York Laboratory encountered a large uvarovite for the first time, we did too. Charles Fryer, of our laboratory staff, brought in a crystal weighing over a carat that was identified as uvarovite by X-ray diffraction. The source was the same — Orford, Quebec.

We Appreciate

We appreciate Edward Swoboda's gift of rough apatite, epidote, purple fluorite, topaz, chrome idocrase, ruby, amethyst, zircon, benitoite, and a number of imitation stones.

Our thanks to C. D. Parsons, of Burbank, California, for a lovely faceted blue apatite.

We were delighted to receive from Petronio Miglio, Tiofilo Otoni-Minas, Brazil, five faceted amblygonites and a sphene crystal.

Student Joe Rothstein has kindly donated excellent specimens of zircon, quartz and stilbite crystals.

We are indebted to Gary Green, Sheldon's Jewelers, Oceanside, California, for a number of cut stones that include morganite, tourmaline,

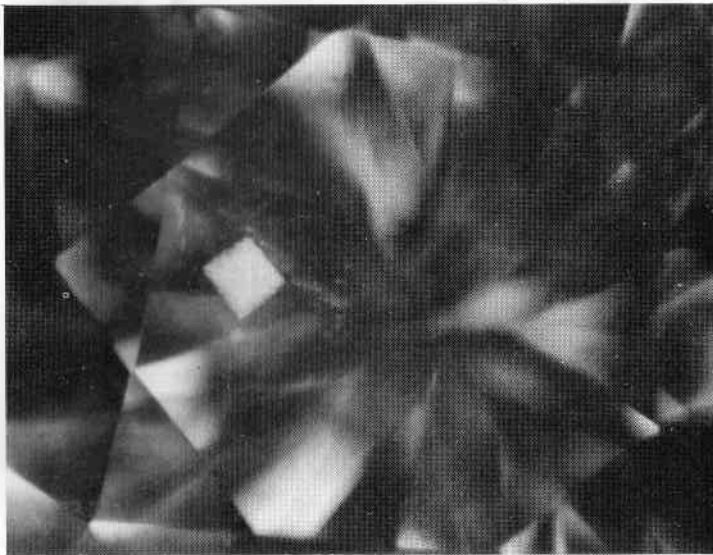


Figure 11

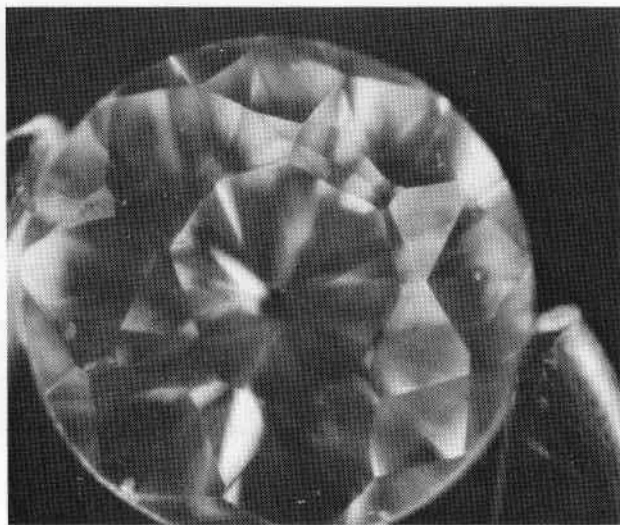


Figure 12

ruby, sapphire, aquamarine, synthetic corundum, amethyst, sard and aventurine, as well as rough amethyst, agate, a fluorite crystal and an abalone pearl.

We wish to thank **Ernest Beisinger**, of Pittsburgh, Pennsylvania, for sending us blue glass and synthetic blue sapphire for use in our Gem-Identification separation sets.

We are grateful to student **Lyle R. Bigelow**, Iron Mountain, Michigan, for a number of rough gemstones and

two single-cut diamonds for test sets.

Our appreciation to student **Larry Ward**, Fallbrook, California, for rough axinite specimens.

And to student **John H. Earle**, thanks for a Wyoming nephrite jade cabochon for our Gem-Identification test sets.

Jeanne Martin has donated to the Institute many of her very fine crystal specimens for our collection and many cut stones for our course material. Thank you, Jeanne.



G e m o l o g i c a l D i g e s t s

Diamond Sales

Sales of rough diamonds in 1966 climbed to an all-time high of \$497,968,307, according to figures released by the Central Selling Organization in London. (In 1965, sales tallied \$415,287,434.) The totals included sale of both gem and industrial rough.

Sales amounting to \$262,058,517 for the last six months of 1966 represent a record for any half-year period. For the past four years sales have climbed sharply, as can be seen in the following chart:

Total for Year	
1966	\$497,968,307
1965	\$415,287,434
1964	\$373,920,937
1963	\$324,739,634

Czechoslovakia

According to reports, from the Foreign Service Dispatch, Prague, artificial diamond has been produced in Czechoslovakia (from graphite) under normal factory conditions at the Pramet plant at Sumperk in northern Moravia, in cooperation with the Research Institute of Powder Metallurgy and the Czechoslovak Academy of Sciences' Institute for Solid State Physics.

The results are interpreted to mean that Czechoslovakia will now be able to produce synthetic diamond at competitive prices and without benefit of foreign licenses.

Ireland

As a result of cooperative research conducted by Ultra-High Pressure Units of Shannon and the Diamond Research Laboratory in Johannesburg, synthetic diamond of far greater strength and better color than previously attainable is now being produced. The development arose from the observation that the deposition of nitrogen atoms and the manner in which they are occluded governs both the color and shape of natural diamond.

Scientists used an electron accelerator to move carbon atoms within the atomic structure of diamond and discovered that a nitrogen atom can attach itself to a crystal at any place where a carbon atom would normally be found. However, since nitrogen atoms have five free electrons, compared with carbon's four, there is a surplus unattached electron that absorbs light. It is these surplus electrons that are responsible for the color of certain stones and, in particular, the rare "yellow fancies."

Further research disclosed that when the nitrogen-carbon ratio exceeds one part in a million, the nitrogen atoms will separate into large aggregates of "platelets." In this form, the nitrogen atoms are unable to absorb visible light because they have no free electrons. They can only absorb ultraviolet light, which has no effect on color. At lower

concentrations the platelets do not occur, and an intermediate staff of aggregation takes place to give a fairly common brown color. Less nitrogen still gives the yellow fancies.

From these discoveries, it was a fairly simple step to introduce nitrogen into the synthetic production cycle in the precise quantities that will ensure yellow fancies. The new "doped" diamonds have exactly the same or better color characteristics than their natural counterparts, and more important have a stronger and much chunkier shape, that makes it ideal for metal bonding applications where they are to be used

for such jobs as machining glass, stone, ceramics, or tungsten-carbide tools.

South Africa Diamond Cutting

The new diamond-cutting industry in South Africa may earn R60 million (1 South African rand equals US\$1.40) annually in foreign exchange when it is fully developed, according to reports. Transvaal Diamond Cutting Works (pty.) Ltd., processing stones of less than a carat, reported export earnings of R480,000 during 1965 and plans to increase earnings to R1.4 million in 1966. The US, reportedly, is receiving 60 percent of the firm's output.

GEMMOLOGICAL CONFERENCE

(continued from page 102)

acteristics of the curves to decide the order in which the colors should fall visually. However, apparently no effort had been made to choose diamonds that were nonfluorescent, without a brownish tinge or of comparable proportions. Thus, the fact that the results on the spectrophotometer did not agree exactly with those on the colorimeter is not surprising. Some of the assumptions made in the comparisons between curves could have been faulty.

The diamond crystals given to the

Gemological Institute by DeBeers were shown in normal light and some in dark-field illumination; others between crossed Polaroids and still others under ultraviolet illumination. An attempt was made to identify the probable source of each of the crystals on the basis of habit and other characteristics. The strain-birefringence pattern in diamonds was related to their durability during the cutting process.

It was an interesting and worthwhile conference.





Jeanne Martin Retires

Twelve years ago, Jeanne Martin was offered a position on the staff of the Gemological Institute of America, because her work as a resident-class student had been so outstanding. Despite the fact that she had had no experience in publications, she became Associate Editor of *Gems & Gemology* and put together many books, including the *Jewelers' Manual*, *Diamonds . . . Famous, Notable and Unique*, *The Diamond Dictionary*, and several editions of the *Handbook of Gem Identification*.

All during her stay with GIA she worked closely with resident students

as an instructor of gem identification, making hundreds of friends because of her exceptional patience and understanding of beginners' problems. During her years at GIA she became as accomplished a gem photographer as any we know.

Jeanne is going to move to a high, dry climate — to Monument Valley, Utah — where she will become an assistant in the operation of Goulding's Trading Post and Lodge.

Students and staff alike will certainly miss her and remember her with great fondness.