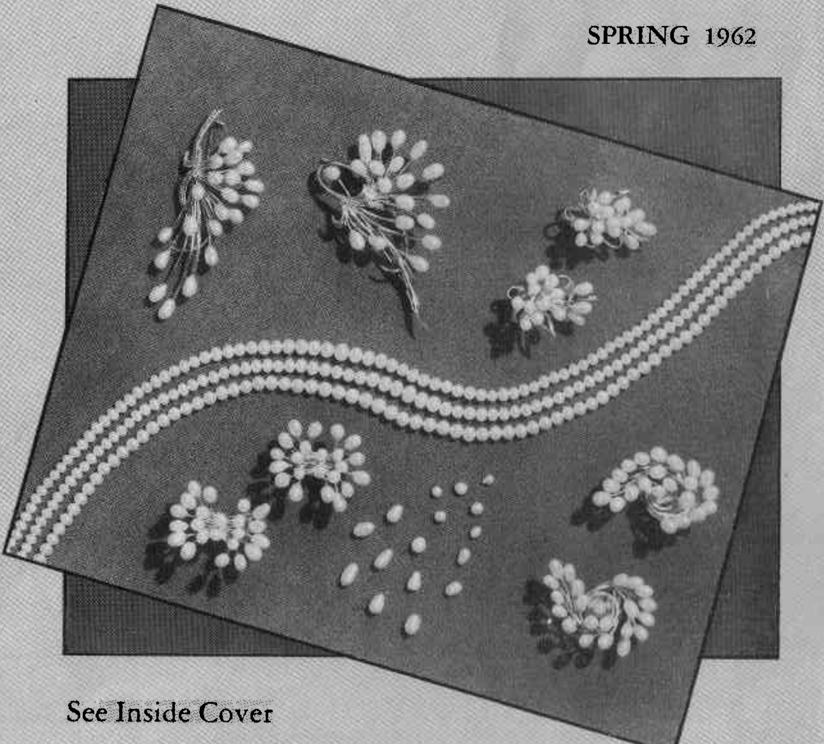
Gems and Gemology

SPRING 1962



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Gems & Gemology

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Photo Courtesy
Walter Arnstein
Jahawa Pearl Co., Ltd.

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Fresh-Water Cultured Pearls

by

Robert Crowningshield

The Laboratory examination of baroque, oval and round fresh-water cultured pearls without mother-of-pearl centers was reported in *Gems & Gemology,* Summer, 1958, at about the same time that hollow-centered Australian cultured pearls were described. Prior to this, we had seen in the New York Laboratory small, very flattened, baroque fresh-water cultured pearls and reported them in *The Loupe,* January-February, 1958. Very pleasing and marketable fresh-water cultured pearls *(Figure 1)* became available to the American market in quantity in 1961, when the Jahawa Corporation, 580 Fifth Avenue, NYC, was formed, as the exclusive United States distributor.

Since little has been published about these pearls and because new sources of information have become available, it seems a good time to note developments in the cultured-pearl industry, with a view to discussing terminology and developing an understanding of the relatively unknown process whereby pearls may be grown in fresh-water mussels or clams without the use of a bead nucleus.

Highlights of Cultured-Pearl Production

Most readers are familiar with the long history of the attempts to encourage various molluscs to produce pearls. Many of these efforts (in fact, all the early ones) were carried out with fresh-water molluscs variously called mussels or clams. The earliest work was that of the 13th century Chinese, whose method

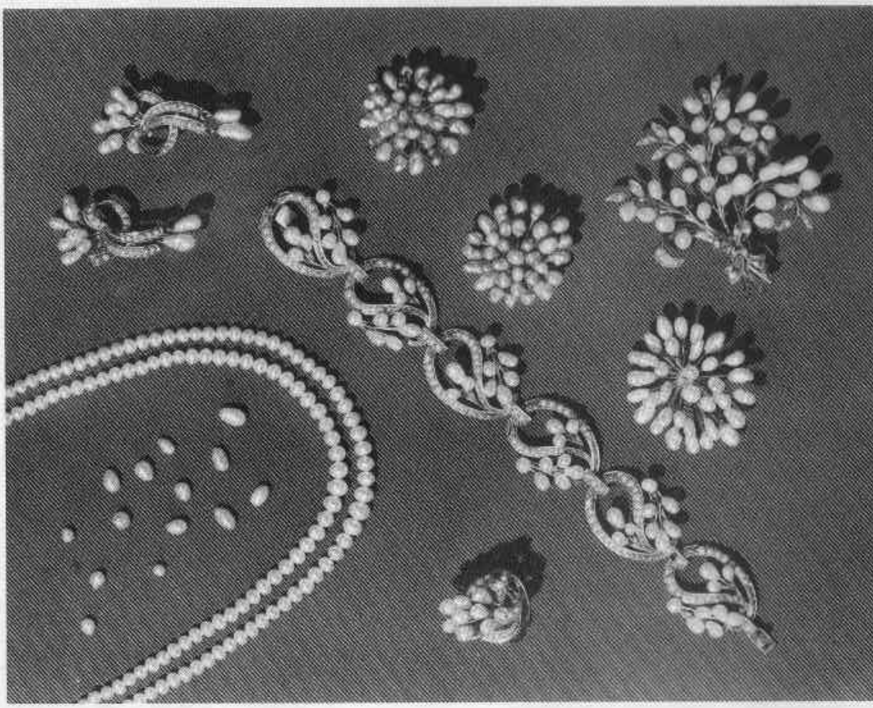


Figure 1

of placing small lead images, usually of Buddha, inside the mussel shells is well known *(Figure 2)*. A Swedish botanist did considerable work with mussels in the 1700's; though ingenious, his method never resulted in commercially grown pearls. Dr. Kunz, in his *Book of the Pearl,* states that, in 1900, there was a considerable industry in China of making "culture" pearls with mother-of-pearl or porcelain beads placed inside the shells of a common mussel indigenous to the rivers in Chekiang Province. He states that at about this time the Japanese efforts were producing better "culture" pearls than those of the Chinese, only the Japanese were using salt-water molluscs. *Figure 3* illustrates porcelain beads thinly overgrown with nacre by the Chinese molluscs. These were cut from the shell, and part of the shell was crudely worked into nearly spherical cultured pearls. Dr. Kunz mentions in his book (published in 1908) the work of Mikimoto and his cultured blister pearls (mabe pearls), but he accords T. Nishakawa, rather than Mikimoto, the honor of producing the first spherical cultured pearl. However, according to A. R. Cahn, in his very important 1948 report, *Pearl Culture in Japan,* the first spherical cultured pearl was made by Tatsuhei Mise, using mantle-tissue grafts and lead pellets in the *Pinctada Martensii.* The date given by Dr. Cahn was 1904.

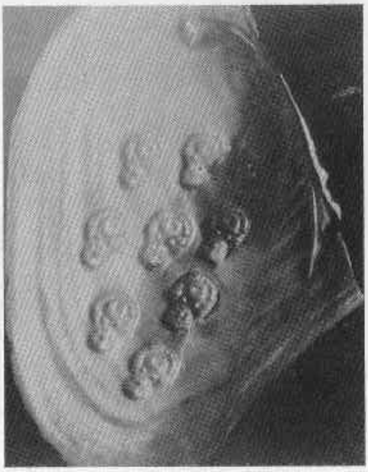


Figure 2

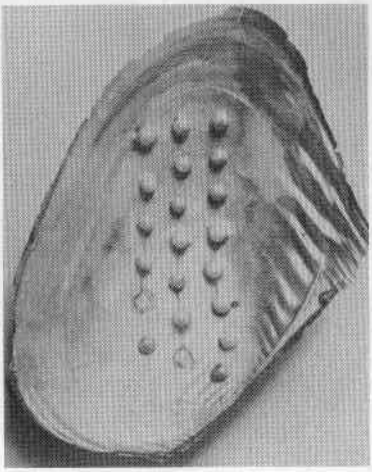


Figure 3

Mise was evidently the first to appreciate the necessity of introducing epithelial mantle tissue, along with the nucleus, into the connective tissue of the mollusc in order for a pearl sac to form. Due to difficulties in unraveling Japanese patent information, it seems that T. Nishakawa, later Mikimoto's son-in-law, was actually granted a patent for spherical cultured-pearl production before Mise, but it was granted just seven weeks after one was issued to Mikimoto. It would appear, too, that patent applications often lay dormant in the patent office in Tokyo, since Nishikawa had made an application in 1907 and the patent was not granted until 1916. In practice, it was Nishakawa's method of inserting a small bit of mantle tissue along with the nucleus, rather than Mikimoto's complicated method that was adopted and has led to the present cultured-pearl industry in Japan, Burma and Australia. Mikimoto's method required sewing up the nucleus in a tiny square of mantle tissue prior to insertion.

Attempts to cultivate pearls without mother-of-pearl nuclei were made over many years. At least one patent (to K. Mikimoto, in May, 1936) was granted for a method of making "non-nucleated pearls," using a thin "mud" made of pulverized shell or other materials mixed with epithelium from the mantle of another pearl oyster and sea water. This was claimed to be successful in initiating pearl formation when placed inside the body of the "mother-pearl oyster." It is assumed that the method was never successfully used commercially.

In Japanese waters the most successful mollusc for pearl culturing is *Pinctada Martensii,* which, unfortunately, does not produce a large shell. Mature individuals may reach four inches in diameter, but the average is about three inches. Possibly, because of this, culturists gave some attention as early as the

Figure 4

late 1920's to the large fresh-water clam, or mussel, *Hyriopsis Schlegeli (Figure 4),* called *Ike-chogai* in Japan. It may attain a length of nine inches. It is found along the eastern and southern shores of Japan's largest lake, Biwa-ko. (ko is the Japanese generic word for lake.) The lake, covering about 180 square miles, lies approximately ten miles northeast of Kyoto, in Shiga Prefecture.

Early attempts to adapt the salt-water culturing techniques, using large mother-of-pearl nuclei, met with little success, because of the involved and twisted intestine that complicates the internal anatomy of the mollusc. Operated animals that did not immediately die from the nucleus insertion usually formed discolored, poorly shaped or nonlustrous pearls. A large percentage of the growers abandoned hope of finding a larger mollusc in Japanese waters and turned their attention farther afield, both before and after World War II. They experimented with some success with the warm-water relatives of *Pinctada Martensii,* such as *Pinctada Margaritifera* and *Pinctada Maxima.* Since the War, Mergui Bay, off Burma, as well as Australia's northern shore, have been the main areas for culturing large molluscs for accepting large nuclei.

Although the large, fresh-water clam in Lake Biwa was not at first successfully used for nuclei insertion, certain experimenters did not give up hope of using the mollusc for culturing operations. Just before the War, the work was conducted solely under the direction of Mr. Seiichiro Uda, president and director of the Shinko Pearl Co., Ltd. Mr. and Mrs. Uda visited both of the Institute's offices in the fall of 1961, and staffs of the Los Angeles and New York Laboratories are indebted to him for informa-

Figure 5

tion heretofore unavailable. Today, there are more than thirty producers on Lake Biwa, not all of whom follow the procedures outlined hereafter. The producers are banded together in an organization, the Shigaken Fresh-Water Pearl Fishery Association, of which Mr. Uda is president.

Unlike the salt-water culturing operations, there is no need at the present time to propagate the clams artificially. However, the life history of the clam is being studied so that, in the future, if it becomes necessary, the growers will be prepared.

It has been reported that the clams spawn in June and July. The eggs attach themselves to fish and begin their growth, later falling to the lake bed. A combined mud-and-sand bed has been determined to be the most satisfactory for the growth of the young clam. They are considered to be of operable size when they attain a length of approximately five inches. They are gathered from October to April by local fishermen who drag a kind of bottom trawl net that has been equipped with a rake fitted across its mouth. The molluscs are about three-fourths submerged in the lake bed during the gathering months. The rake prongs are spaced so that only clams of a certain size are gathered. The gathered clams are sold to the several pearl growers who place them in retaining pens; here they stay until ready to be operated on.

Although pearls usually are grown without nuclei in the fresh-water clams, the principle of a pearl sac is used. Today, the procedure is to bring the clams from the retaining pens to a building where girls trained in the work peg the two shells open and expose the mantle *(Figure 5)*. Now, unlike the salt-water procedure, which requires an incision

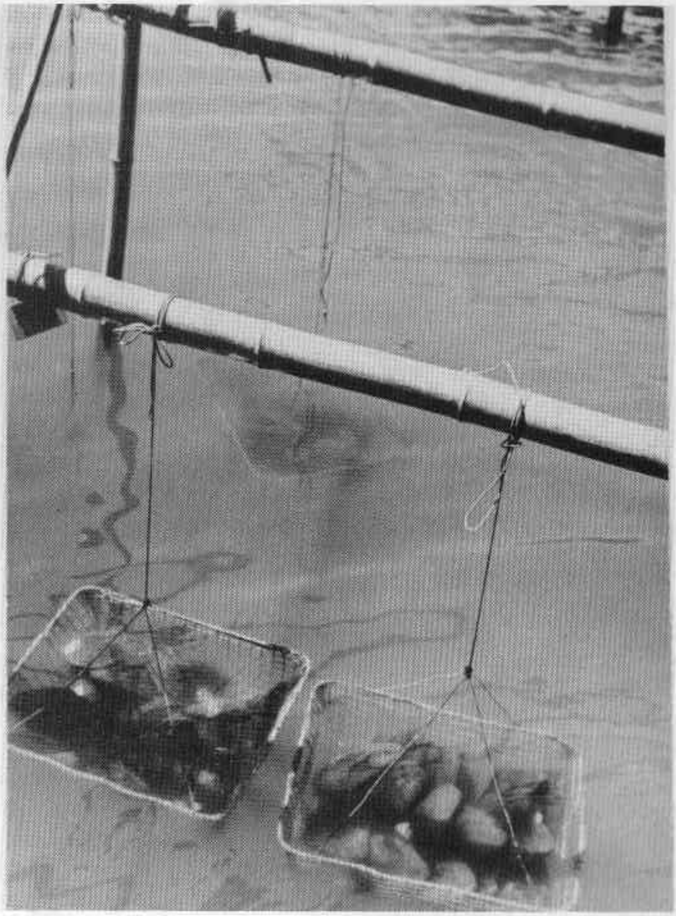


Figure 6

to be made in the fleshy gonad tissue, the girls make ten incisions in each half of the mantle. Into each small cut a piece of mantle tissue previously prepared from another clam is inserted and carefully pressed into position. It is in this incision that the mollusc forms a pearl sac in which a pearl grows. Prior to about ten years ago, before it was discovered that the main body of the animal need not be disturbed, bits of mantle from the clam being operated on were pressed into from six to ten places in the gonad with a special forceps. Only very baroque and often poorly colored objects resulted.

After the graft operation, the clams are placed in plastic baskets that are suspended about three feet below the surface of the lake *(Figures 6 & 7)*. In reality, the area is only an arm of the lake that has a more or less constant

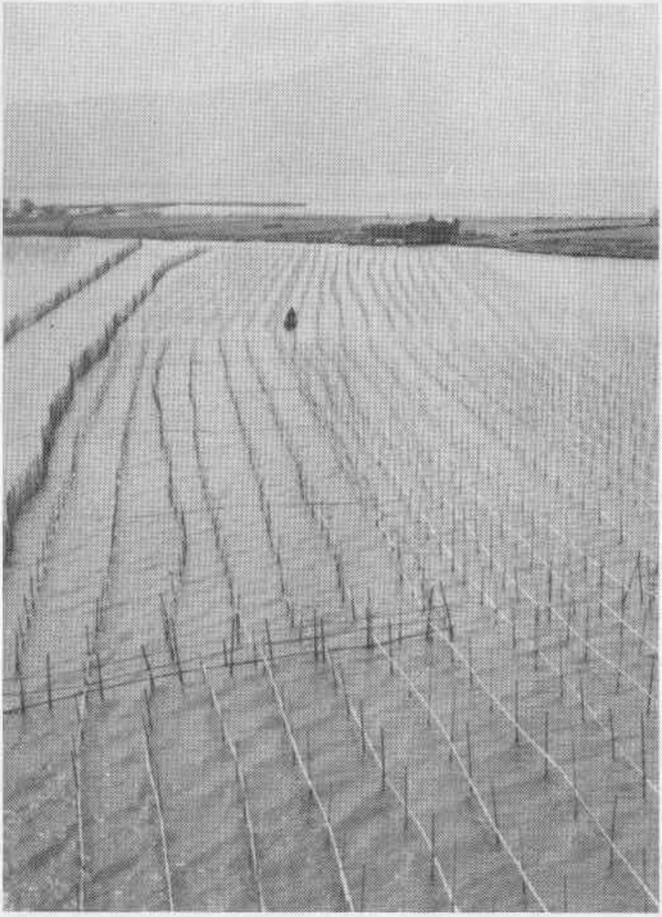


Figure 7

water level, thanks to a low dam and dikes across a narrow section of it. Periodically, the baskets are raised and inspected *(Figure 8)*, the dead clams removed, and foreign growths cleaned away. At least in fresh water, there is an absence of the scourges that plague the salt-water culture farms; i.e., star fish and the red tide. And, in addition, there is greater protection from typhoon and storm conditions. At the end of three years, the clams are returned to the plant, where the pearls are carefully removed with tweezers. Although only about 60% reach this stage, nearly 100% of these bear their full quota of twenty pearls each. The life span of *Hyriopsis Schlegeli* is about thirteen years — nearly twice that of the salt-water pearl bearer, *Pinctada Martensii;* therefore, it has been found that if the molluscs are returned to the water after

Figure 8

the removal of the first "crop," a second crop will grow! Some animals in good condition have been known to bear even a third crop. We failed to find out why the growth period is interrupted after only three years, but presume it is due to the characteristics of the pearls when left longer *(Figure 9)*.

It is claimed that fresh-water cultured pearls are saleable without need for any of the various bleaching or dyeing processes reportedly used for the nucleated pearls from salt water. The first crop produces pearls usually of very baroque or oval shape, whereas the second crop tends to be much more spherical. No data was available on the quality of the third crop.

Quality of the Production

Mr. Uda stated that the pearls are usually more lustrous and of a darker color than the inside of the shell in which they grew; this is borne out by samples we have seen. The colors of these "tissue-graft, cultured fresh-water pearls" vary from almost white with a slight rosé overtone to pastel shades of pink, orange, cream, bluish and, more rarely, greenish. To a specialist in fresh-water pearls, their color and textures are reminiscent of natural fresh-water pearls of North America and thus, to his eye, distinguishable from pearls from the Persian Gulf. At this writing, the oval pearls attain a maximum size of approximately 7½ mm. long, whereas the more nearly round pearls seldom exceed 6 mm. It is quite possible that, as the process continues to be improved, even larger and better-shaped pearls will be produced. In the five years that has elapsed since we saw our first small, flattened but lustrous baroques until to-

Figure 9

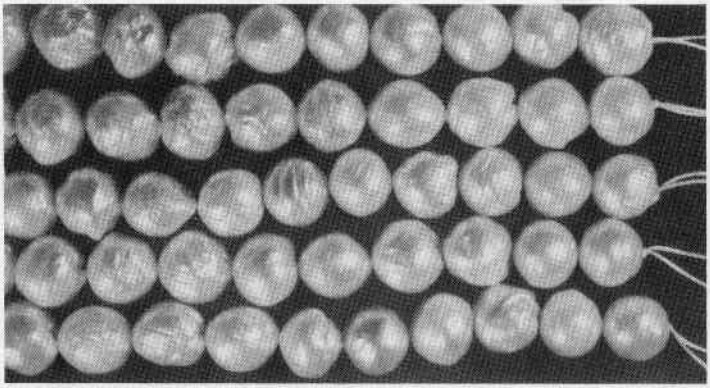


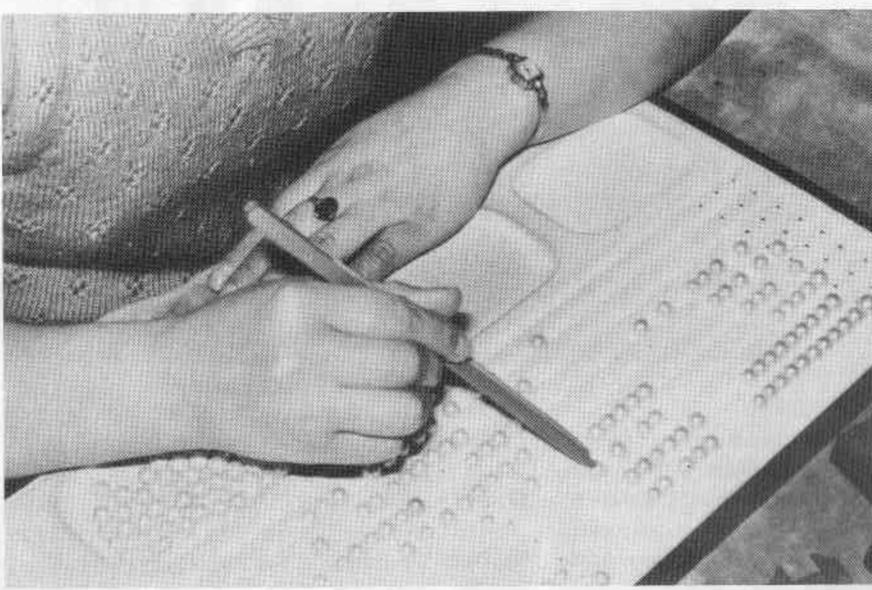
Figure 10

day, a tremendous improvement has taken place. Mr. Uda says that he has been using the "pearl-sac-in-the-mantle" technique for about ten years.

Efforts to grow large nucleated pearls in *Hyriopsis Schegeli* are, according to Mr. Uda, limited mainly to experimentation. Nevertheless, we do see necklaces and some lots of pearls up to 10 mm. in diameter *(Figure 10)*. Most

Sorting pearls for shape, color and quality. The girl on the left is working on small, round sizes; the one behind her is handing larger round sizes.

Matching large sizes for color, shape and quality for graduated strands. The holes down the center of the sorting board guide her in positioning the largest pearl in the strand.



Gauging the diameter of previously color-matched pearls, to obtain matched, equal-size strands. The perforations at the ends of the board are a length gauge for the necklace being assembled.

Mr. Seiichira Uda, president of the Shigaken Fresh-Water Pearl Fishery Association, is shown examining a $50,000 shipment of the Biwaka fresh-water, nursery-grown pearls, which are exported to Oriental and Asiatic countries as "natural pearls."

have a creamy light-orange color, good luster, but a somewhat irregular round shape. *Figure 11* illustrates a fact mentioned in *Gems & Gemology* (Fall, 1960) ; i.e., that some of these pearls have cores that were drilled prior to insertion and that the completed pearls, when drilled, show no relationship between the final drilling and the drill hole in the nucleus. Earlier, we had assumed that discarded beads were used,

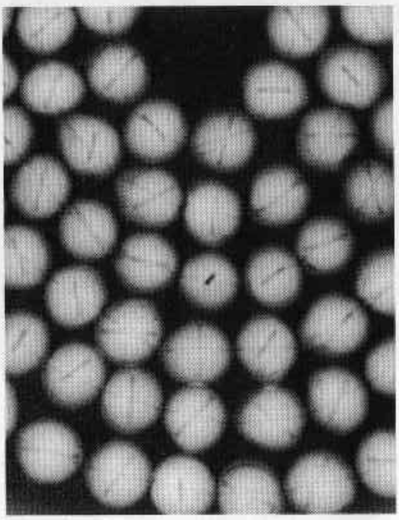


Figure 11

but Mr. Uda stated that the operators had found drilled nuclei necessary when using a special device for locating the nucleus in a nonvulnerable spot within the body tissues. Many of these nucleated pearls are of a dark and unpleasing color; therefore, it may be true that commercial possibilities for this type of growth are limited.

Identification of Fresh-Water Cultured Pearls

As mentioned before, the bulk of the pearls grown in Lake Biwa are produced by the insertion, not of a solid nucleus, but of a bit of mantle tissue that initiates the production of the necessary pearl sac within the host's mantle. Therefore, we see in the X-radiograph of all but the roundest pearls a more or less oval to vermiform shadow *(Figure 12)*, which has been found to vary from a large to a very thin hollow space when the pearls are thin sectioned. This pattern, together with the strong fluorescence under X-rays of all fresh-water pearls and the almost total lack of fluorescence under long ultraviolet irradiation, is taken as proof of fresh-water cultured pearls. In the case of the round to nearly round second-growth cultured pearls, the pattern in the X-radiograph may be indistinguishable from an ordinary natural pearl *(Figure 13)*; however, the fluorescence characteristics serve to identify these pearls. The baroque pearls frequently show a very large hollow space *(Figure 14)*. The identification of the nucleated pearls depends on the normal

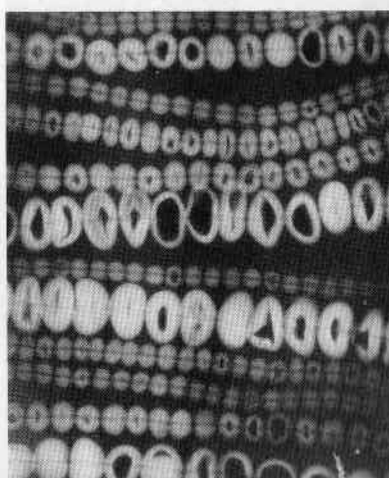


Figure 12

radiograph used for any mother-of-pearl-nucleated cultured pearl and offers no difficulty.

Fresh-Water Cultured-Pearl Terminology

Terminology for the tissue-graft cultured fresh-water pearls requires some clarification. Obviously, both the nucleated and the tissue-graft methods of initiating pearl growth are "caused or induced by man" — the criterion mentioned in the Federal Trade Commission Trade Practice Rules for the Jewelry Industry for identifying a cultured pearl. Inasmuch as the volume of the better tissue-graft cultured pearls is composed of from approximately 75% to nearly 100% nacre, whereas the mother-of-pearl nucleated salt- and fresh-water pearls are only approximately 5% to 20% nacre, there appears to be valid reason to differentiate between the two. It has been suggested that the term "fresh-water cultured pearls" be used for them. Possibly, since both nucleated and non-nucleated cultured pearls from fresh-water clams are being marketed, the term "tissue-graft cultured fresh-water pearls" describes them best but is an awkward term. Another suggestion has been that, since Lake Biwa so far is the only culturing center for these pearls, the term "Biwa cultured pearls" be used. This suggestion is not valid for the Gem Trade Laboratories, since we do not attempt to give sources of other gem materials. General agreement on terminology for this new product has not been reached.

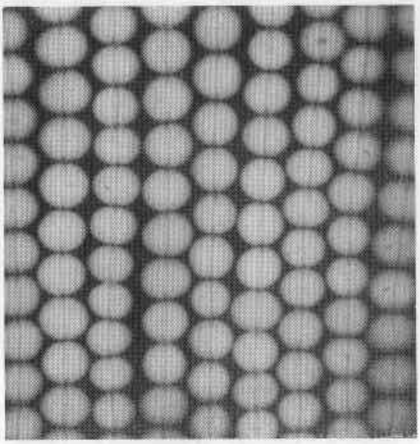
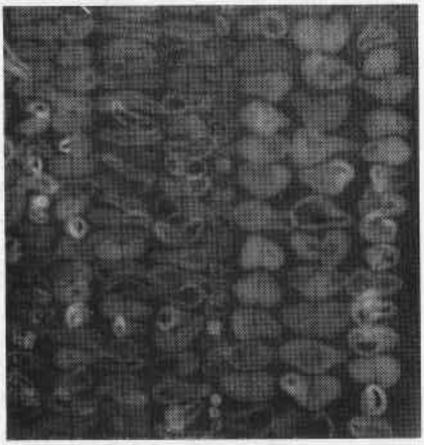


Figure 13

Figure 14



Other Problems of Pearl Terminology to be Solved

Problems of terminology are not confined to the relatively new, fresh-water cultured pearls. In fact, the very term "cultured pearl" is still questioned by those who claim it does not adequately describe what is being sold. These people would prefer some term such as "nacre veneered mother-of-pearl beads." However, since the first term has been accepted, and since more than half of the volume of some of the very large Australian and Burma cultured pearls may be composed of nacre, no single

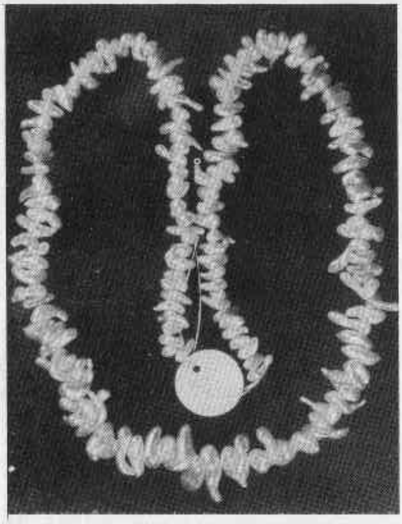


Figure 15

Figure 16

term would seem adequate to describe all nucleated pearls.

There remains the problem of pearls without nuclei recovered from salt-water cultivated-pearl oysters. After removing the pearl or pearls from the oysters, most of the operators remove the bodies from the shells, lightly macerate them, and mix the whole with sea water. From this sediment are extracted small accidental pearls, as well as accidental baroque pearls, all of which may have started from a variety of causes. In certain cases, it is known that if a nucleus is expelled shortly after the nucleus-insertion operation, the tissue that was inserted may remain, giving the necessary stimulus to form a pearl sac and a consequent "accidental tissue-graft cultured pearl." Such baroque pearls, when X-rayed, give a radiograph pattern precisely like the very baroque tissue-graft pearl pattern of fresh-water cultured pearls. Other baroque pearls taken from this residue may not show a hollow center and when the radiograph is compared with that of natural pearl, they are the same. These solid pearls could have formed as a result of some parasite or other exciting organism or physiological condition while the pearl oyster lay in its cage, or the stimulus could have resulted from loosened epithelial tissue caused by the probing and cutting necessary for the nucleus implantation. Formerly, the residue pearls were sold for "pearl medicine." Lately, some of them have been offered in the market as natural pearls or "natural rose-bud pearls." In one case, small nearly round, well-matched pearls were brought to the New York Laboratory for examination. Their color was good, but under the microscope they had a flaky appearance. It was our feeling that they had been overbleached to remove what is commonly a fault of pearls from *Pinctada Martensii:* a tendency to be greenish or yellow. Many of these small pearls showed a pattern in their radiograph that was reminiscent of fresh-water tissue-graft cultured pearls. *Figure 15* is a photograph of a strand of baroques and *Figure 16* a radiograph of this strand.

The Federal Trade Commission Rulings were drawn up before the fresh-water cultured pearls or the non-nucleated salt-water pearls were a commercial factor. Therefore, the Laboratories of the Gemological Institute have had to interpret the rulings in the best interests of the buying public, whenever the pearls submitted have been identifiable. In the case of the hollow-center salt-water pearls, their appearance and radiographs serve to indicate their source. Whether or not they were "caused or induced by man" is a moot question. In the case of solid pearls from the cultivated pearl oysters, only their association in lots or strands with the hollow-centered pearls would indicate their source. Alone, they would be identified as natural pearls, since no clues may be had from X-rays, ultraviolet fluorescence or radiographs. These solid pearls, too, beg the question as to whether or not they were "caused or induced by man." Certainly, in the broad aspect, the gathering either of spat or immature pearl oysters or clams and rearing them in prepared baskets was "caused and induced by man." In this sense, any concretions taken from such pearl oysters or clams would not be natural pearls. However, the FTC definition of a cultured pearl, "The composite product created when a nucleus (usually a sphere of calcareous mollusc shell) planted by man inside the shell or in the mantle of a mollusc is coated with nacre by the mollusc" leaves something to be desired when the matter of non-nucleated salt-water pearls from cultivated pearl oysters is considered. Possibly, the whole matter is only academic, since it is not known if any commercial tissue-graft culturing is being carried out with *Pinctada Martensii.* In view of its relatively short life span and its small size, it is doubtful if such a process could be used successfully.

The matter of fresh-water cultured-pearl terminology is not academic when we consider that in both Japan and India, export papers describe the product as "natural pearls." Since they reach America from these countries under this description, the official papers carry some weight with importers and brokers who have contested the contradition by the Laboratories. They point out that they go into India duty free as "natural pearls," whereas there is a 25% duty for cultured pearls.

We are in agreement that the product deserves a descriptive and marketable term that will serve to distinguish them from ordinary nucleated cultured pearls. But, just as the production of synthetic rubies, sapphires and emeralds is controlled by man and hence the factor of rarity, or lack of it, is controlled, one of the prime factors in the value of natural gem materials is lacking, for the production of these objects of beauty is also controlled by man.

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World's Largest Kunzite Crystal

by

John Sinkankas, C.G.

Of interest to gemologists everywhere is unusually fine gem material, which may or may not eventually be cut into gems. A trip in January, 1962, to Brazil, that fabulous country of gems far to the south of us, proved exciting in more ways than one when I was privileged to see the world's largest kunzite crystal, the prized possession of a piezoelectric-quartz dealer in Rio De Janeiro. I was invited to take this trip with Donald Parser in his twin-engine Aero Commander. Donald, with his brother Edgar, operate A. G. Parser, Inc., of New York City, dealers in rough gems and industrial diamonds. After many vexatious delays, we finally got off the ground from the Danbury, Connecticut, airport and five days later arrived at Santos Dumont Airport, located immediately next to the downtown district of Rio.

Several days after our arrival, I visited Paulo Nercessian, proprietor of Brazilia Quartzo, Ltda., at 127A Rua Alexandre Mackenzie, in Rio. The first floor of his establishment was a beehive of activity, with helpers unpacking and sorting quartz crystals destined for slicing into electronic-frequency-control wafers. A small room in the back was kept dark and used for immersing quartz in petroleum oil of nearly the same refractive index. An intense focused beam from a carbon-arc lamp passes through the side of the glass immersion tank, and is used to examine the quartz crystals for internal imperfections such as veils, cracks and inclusions that are too small to see by any other method. One part of the tank is fitted with a Polaroid screen, and the crystal is oriented in the light beam to place its "c" axis in line with the observer's vision. Interference colors disclose immediately if the specimen is twinned and, if so, if it is twinned too much to be useful for piezoelectrical applications. Rejected crystals are cobbed to remove dirt and inclusions and saved to sell to makers of fused quartz glass.

The second floor of Paulo's shop is his office, where he conducts his business affairs and stores more valuable stock. Here I saw one of his helpers skillfully wielding a tiny hammer to cob citrine *(Figure 1)*. Here also was a small electric oven, used to check

Figure 1

smoky-quartz lots for possibility of masked citrine coloration. Batches that prove to contain citrine, more or less completely disguised by smoky coloration, are naturally sold for much more than smoky quartz alone. The cobber was exceptionally clever at his task, and with a few blows of his minute hammer, chipped off cloudy or imperfect places, leaving essentially flawless facet-grade material behind.

From a safe in one corner of his office, Paulo brought out a cloth bag from which he unwrapped the kunzite crystal. I had heard about it from Martin Ehrmann, who had seen it on his latest trip to Brazil. Nevertheless, I was not prepared for its enormous size and exceedingly rich coloration. This crystal, which appears in *Figures 2 and 3* and in the accompanying drawing *(Figure 4)*, measures 311 x 157.5 x 97 millimeters, or, in inches: 12″x6⅜″x3⅞″! Its size is readily apparent from the photo

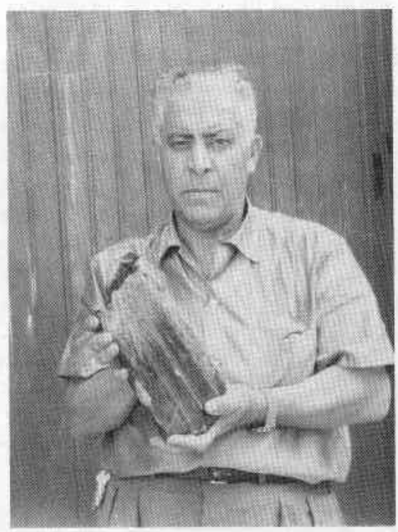


Figure 2

showing Paulo Nercessian holding the crystal. The weight is a staggering sum: 7,410 grams, or 37,050 carats! In respect to clarity, it is estimated that one-

Figure 3

half of the crystal (parallel to one of the broader faces) is virtually flawless; the other half is also largely flawless but is interrupted by a series of fine, tapering solution cavities, which are typical of etched spodumene. These hairlike cavities are often interpreted as rutile inclusions, but close examination shows them to be fairly straight or sometimes curved, tapering openings that have etched sides when examined under the microscope. As in other finds of kunzite, the present specimen, as well as others of smaller size that have been recovered from the same pegmatite pocket at an unspecified point in Minas Gerais, display tubes ranging in abundance from a few to very many. These tubes have an annoying habit of penetrating otherwise perfect faceting material. Aside from incipient cleavages, which may contain air or clay, other

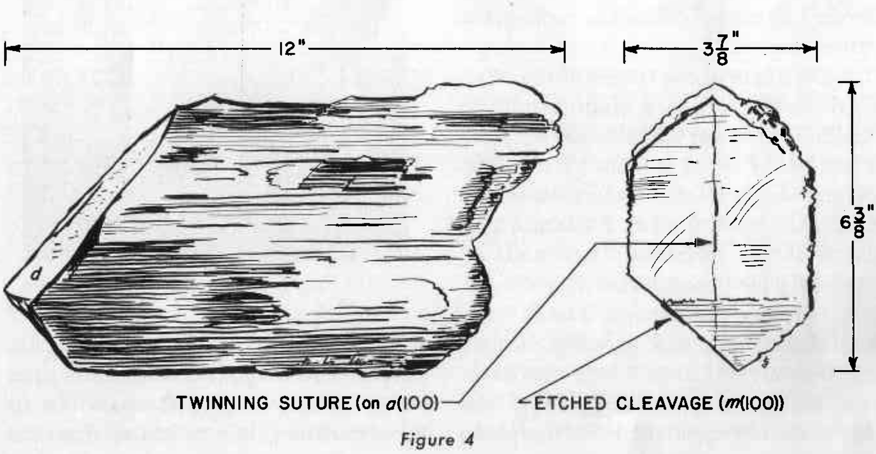


Figure 4

kinds of inclusions usually are absent from gem spodumene.

The enormous kunzite crystal was closely examined in Nercessian's shop and yielded some interesting information. It is not a single crystal but, again, as is so typical of gem spodumene, consists of a pair of twins. Close inspection of the widest periphery showed the twin suture, which became evident in places by slight offsets of one crystal face to face with the other, or by slight differences in etching modes. Internally, the composition plane is marked by a planar sprinkling of inclusions, which appear to be liquid-filled negative-crystal cavities and further appear to mark a healed junction plane that was originally much more open. The crystal is profoundly etched, particularly on the ends, which always seem to be more susceptible than prism faces to solution during late-stage pegmatite activity. However, one end is terminated by several fairly regular domal faces, as can be seen from the photograph. The other end is essentially formless. There are virtually no cleavage cracks.

In cross-section, the crystal displays the lath shape of spodumene but, it was even larger than the drawing — it was a wonder to behold! One side was cleaved off at some point in development in the pegmatite pocket and the cleavage face was etched, but not so severely as on prism faces. If this section had remained, the crystal would perhaps have been 20% larger in weight.

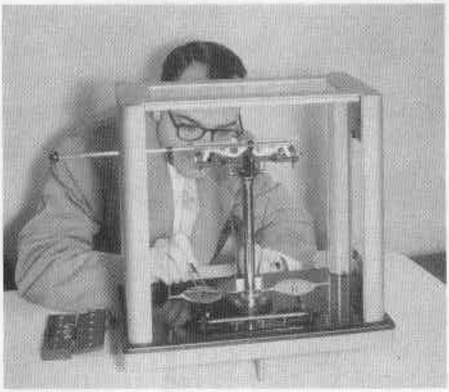
The coloration of this latest spodumene material is generally the same as other kunzite, but there are remarkable differences. The chief difference is at once apparent when examining the crystal, because all coloration is greatly emphasized by virtue of its thickness. Looking through one of the sides, there is a strong grayish-green color that appears to emanate from a direction normal to the plane of the optic axes. However, this color, as prominent and unmistakable as it is, promptly disappears when the crystal is rotated approximately 45°. Its place is taken by a deep violet, almost exactly that of rich amethyst in daylight. Through the ends of the crystal, the color is, of course, even deeper, since so much crystal is traversed by the light rays.

The color is intense pink with overtones of reddish purple, which has been likened by many to raspberry red. In respect to color, it is known that when the deposit was first discovered by tracing float to its source, fragments near the top of the ground were found to be uniformly pink in color. Because they were colored, despite an undetermined period of exposure to daylight and surface heat, many are hopeful that here at last is a kunzite that will retain color more or less permanently. However, since the exact circumstances of discovery are hearsay, and several times removed at that, readers will be justified in taking all this with a grain of salt. Only time, as it does with other kunzites exposed to light or heat, will tell. In any event, as the deposit was exploited in depth, so the story goes, the kunzite crystals became darker in hue, until finally those with a deep purplish color, with or without greenish hues, put in an appearance at the deepest levels.

The significance of color-fading did not escape the Brazilians. They soon experimented, as they are wont to do, and found that a modest degree of heat-

Continued on page 287

Developments and Highlights



at the GEM TRADE LAB in Los Angeles

by

Richard T. Liddicoat, Jr.

"Antique" Synthetic-Emerald Earrings

We recently tested a pair of "antique," carved, slightly bluish-green emerald earrings. Examination under magnification showed the heavy concentration of the wisplike inclusions that one associates with Chatham synthetic emerald. Further tests confirmed this identification. The ancient appearance of the gold mountings made it clear that it was the intent of the manufacturer for the stones to be accepted as natural.

Sintered Synthetic Corundum

A lustrous, gray, opaque tablet, one of a pair of stones to be used as cuff-links, was brought to the Laboratory. A refractive-index reading near 1.77, a specific gravity approaching 4.0, and a hardness of 9 all pointed to corundum. Studies under magnification suggested that it was a material hitherto unreported: sintered synthetic corundum, which might be likened to the sintered synthetic spinel made to resemble lapis-lazuli. The jeweler who brought it in said that it had been given to him by a customer who had received it from a man in a space-industries plant. It is probable that highly refractory alumina had been prepared in sintered form for parts subjected to high temperatures.

Enstatite-Hypersthene

One of the materials rarely used as a gemstone, but in demand by collectors, is enstatite. Like jadeite and spodumene, it is a member of the pyroxene group of minerals. The term enstatite applies to an orthorhombic pyroxene with an index range of 1.656 to 1.665 at the low end and 1.665 to 1.674 at the upper end. The specific gravity is below 3.3. When these property values are exceeded slightly, the material is more properly called hypersthene than enstatite. The range for hypersthene is 1.673 to 1.683 at the low end and 1.715 to 1.731 at the high end. The specific gravity ranges from 3.3 to 3.5. On a few occasions when stones have been sent to the Laboratory for identification, we have found property values fitting hypersthene, rather than enstatite; in each case, the absorption spectrum associated with enstatite was seen clearly in such material. The identity was listed as enstatite-hypersthene.

Unusual Three-Phase Inclusion

Recently, while examining an emerald, a three-phase inclusion was encountered in which the crystal found within the liquid- and gas-filled space was distinctly three dimensional. It appeared to belong to the monoclinic system, rather than having the square or rectangular tablet form of cubic halite. Unfortunately, it was not possible to photograph it.

Dyed Rosé Cultured Pearls

A strand of rosé cultured pearls was submitted with a comment from the retailer-purchaser that he suspected they had been dyed. That they had been subjected to a light-pink dye was clear, for it was visible around many drill holes under magnification. Cultured pearls, which usually have a greenish cast that is regarded as unpleasant by many, are often treated in this manner to mask the true color and give them a more desirable rosé tint. However, we have never seen a statement on an invoice admitting the practice.

Abalone Pearl

A baroque abalone pearl was sent in with an unusual request. The writer asked for a recommendation of a method to prevent loss of color as a result of drilling. An X-radiograph showed a large off-center spherical bead in the interior, surrounded by material that was transparent to X-rays *(Figure 1)*. It was not a void, because the bead did not move within the pearl; therefore, it was probably organic material, such as conchiolin. However, we recommended that the pearl be claw-set rather than drilled, because the inner portion could easily be comparatively weak. The fear that drilling would produce a loss of color was new to us.

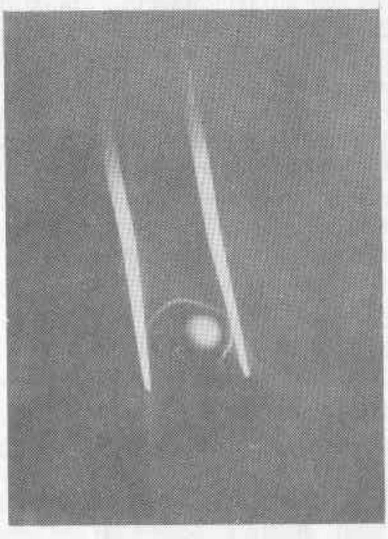


Figure 1

Wishful Thinking

The Laboratory received an 8½-carat light-yellow stone, thought by the owner to be rhodizite. Rhodizite is a rare borate mineral that is singly refractive, with a refractive index of 1.69 and a specific gravity of 3.40. The stone had the correct index and was singly refractive; however, the presence of bubbles and a specific gravity well over 4.0 left glass as the only possibility.

Black Star Sapphire

Recently, we examined a black star sapphire ring in which the stone had been loosened slightly in the setting. The owner was disturbed because one reliable jeweler had refused to tighten the setting, pointing out the cracks on the back of the stone. Actually, it was not cracked, but its back surface had a steplike group of parting surfaces with sharp edges. Evidently, the man examining the stone was unfamiliar with black stars and this typical parting-caused appearance, so he worried the owner unnecessarily.

We appreciate

We wish to thank **Robert Klippel,** of Swirsky & Ehrlich, Los Angeles, for the donation of naturally colored green and pink melee. These stones will be most useful to us for comparison purposes in the study of absorption spectra for natural versus treated colors.

We are indebted to **Dave Widess,** of Dave Widess & Sons, Los Angeles, for the donation of three carats of tiny, faceted synthetic rubies, ranging from one-thousandth of a carat to about 180 to the carat.

We are grateful to GIA student **Helen Fletcher Collins,** Denver, Col., for a recent donation of a limonite pseudomorph-after-pyrite specimen and for several topaz crystals from Thomas Mt., Utah.

From **Robert Koerber, Jr.,** Ft. Wayne, Ind., we received two small diamonds with red inclusions that will be of value for study purposes.

A vote of thanks goes to GIA student **James Davies,** El Cajon, Calif., for his donation of a compact, specially designed container for six bottles of specific-gravity liquids.

And to **E. D. Skinner,** Milwaukee, Wis., we extend our appreciation for a group of ruby crystals.

A specimen of dark-green nephrite from the Happy Camp, Cal., area was donated by **E. H. Marlow,** Yreka, Cal.

Developments and Highlights

at the

GEM TRADE LAB

in New York

by

Robert Crowningshield

Foilback Diamond

A rectangular diamond with a brilliant-cut crown was set so that the pavilion was wholly hidden. It proved to have no pavilion, but foil was shaped to simulate facets below an open space where the pavilion would be assumed to be. The thickness of the diamond plate was estimated to be approximately 1.50 mm. *(Figure 1)*. The unwary would assume from the dimensions of the crown (24 mm. x 15 mm.) that the overall depth would be approximately 9 mm.

Imitation Star Moonstone

While looking through a lot of small moonstones, we were surprised to note one with a blue star. Further investigation proved it to be not a moonstone but a milky synthetic spinel with a very thin, transparent mirror on the base *(Figure 2)*. Although such stones have been recorded, particularly in the literature assembled by the makers of the German synthetic star sapphires, they are not a commercial item.

Synthetic-Spinel Doublet

Figure 3 is a photograph of a black oval stone that is used in the manufacture of class and fraternal rings. It is a synthetic-spinel doublet, as proven by the photograph of the stone under immersion *(Figure 4)*. The two colorless sections are held together with a very dark-blue (in intense transmitted light), cobalt-bearing cement, as indicated by the absorption spectrum. Resistance to

Figure 1

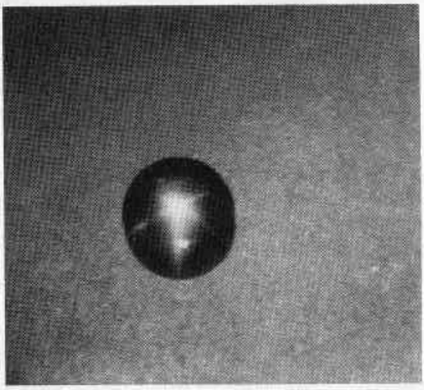


Figure 2

wear seems to be the reason for fabricating such stones.

Unusual Absorption Spectrum for Diamond

A light-yellow diamond that ap-

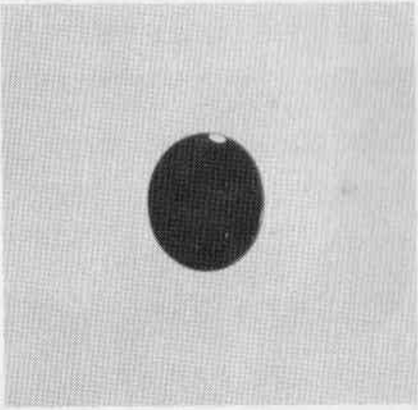


Figure 3

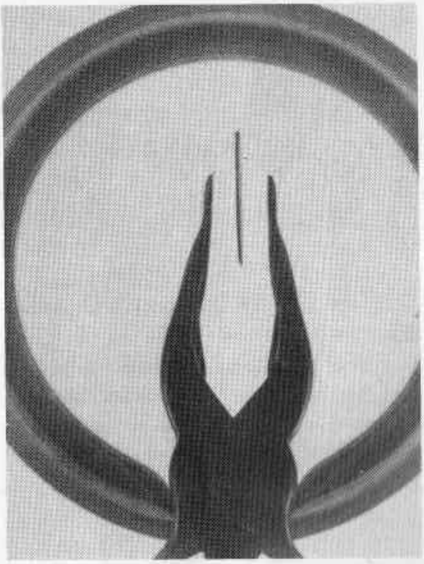


Figure 4

peared blue when a thin beam of light was passed through it gave every visual indication of being a normal "cape" diamond. However, its absorption spectrum was unlike any that we have seen for either natural or artificially colored diamonds *(Figure 5)*.

Rare Blue Jadeite

By coincidence, we have seen in the past few months two carved objects, one a snuff bottle and the other a large vase in the shape of a duck, of the extremely rare blue jadeite. Although the color is not intense, it is an unmistakable gray-blue.

Unusual Pyrope Garnet

A very unusual refractive-index reading (1.731) was obtained on an intense-red pyrope garnet. Another peculiar property of the stone was its almandite-like spectrum. The few other pyropes with this low index have been chrome-pyropes, with either no evidence or only a hint of the almandite spectrum.

Other Unusual Materials

Unusual materials seen in the Laboratory the past few months included rich, chrome-green diopside cat's-eye, amblygonite (represented as achroite), kornerupine, magnetite, celestite, sphalerite, rhodochrosite, serpentine and sodalite.

We Appreciate

We are indebted to **Melvine Strump,** of Superior Gem Co., New York, for a selection of cat's-eye tiger's-eye, blue-backed star rose quartz, and a large, unbacked rose-quartz epiaster.

We thank Mr. **J. D. Donadio,** of United Plating, for examples of their soldered synthetic stars and cat's-eyes.

Mr. **Basil W. Anderson,** director of the London Laboratory, sent a specimen of Canadian idocrase that showed a rare-earth absorption spectrum.

From Lazare **Kaplan & Sons,** diamond cutters, New York City, we received several rough specimens of colored diamonds, including an unusual lavendar piece.

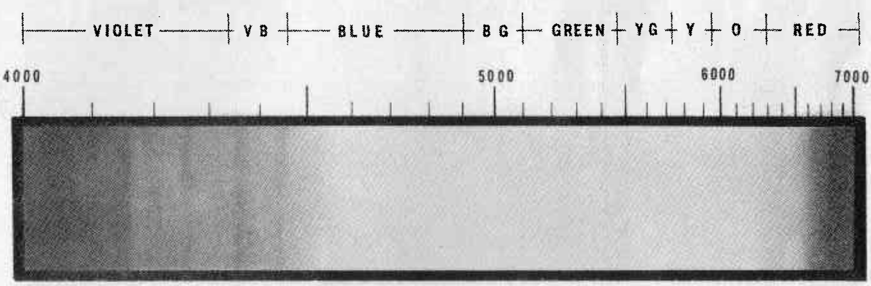


Figure 5

Tulsa Diamond Evaluation Class

Members of the Tulsa Diamond Evaluation Class that met March 5th through March 9th. Left to right: **H. C. Stuhr,** Oklahoma City; GIA instructor, **Glenn Nord; B. C. Clark,** Jr., Oklahoma City; **Fred Cordell,** Bartlesville, Okla.; **Louis F. Gose,** Oklahoma City; **Ray Bowen,** Bixby, Okla.; **Thelma Zellers,** Guymon, Okla.; **Jay Jarnagin,** Nowata, Okla.; **Paul J. Ferger,** Tulsa; **Rex Gearhart,** Henryetta, Okla.; **Lyle J. Harvat,** Bristol, Okla.; **Millard Brigham,** Tulsa; **Ben C. Gaylor,** Springfield, Mo.; **Richard V. Irons,** Tulsa; and **J. W. Reynolds,** Tulsa.

San Antonio Diamond Evaluation Class

Members of the San Antonio, Texas, Diamond Evaluation Class that met February 12th through February 16th. Left to right: GIA instructor, **Glenn Nord; J. D. Chafetz,** San Antonio; **W. H. Fizer,** Beeville, Tex.; **Homer Kelley,** Austin, Texas; **Bill Humiston,** Corpus Christie, Tex.; **Mrs. Linard Stinnett,** Pharr, Tex.; **Ernest Jahn,** San Antonio; **Hall S. Hammond,** San Antonio; **T. B. Ball,** San Antonio; **Abe Fanous,** Abilene, Tex.; **John J. Segner,** Fredericksburg, Tex.; and **Charles Leutwyler,** Austin, Tex.

Book Reviews

THE OPAL BOOK, by Frank Leechman, F.G.A. Published by Ure Smith, Sydney, Australia. 255 pages, nine full-color plates, ten black-and-white illustrations. Price $7.95.

It has been said that opal is like gold: once it gets into your blood, you can never get away from it. *The Opal Book,* like the gemstone, is fascinating, exciting and colorful. It tells about all of the places where opal has been found (Europe, the Americas, Australia), how and where to look for opal, how to mine it, how to cut and polish beautiful stones from the rough material, successful buying of opal, and how to preserve its beauty once it has been fashioned and mounted in jewelry. Information on the formation of precious opal and the scientific explanation for the cause of its beautiful play of color is also discussed. Some of the world's most beautiful and valuable opals are illustrated in attractive color plates. Comparatively small opals, as well as extremely large ones worth thousands of dollars, are also described in detail.

The author is probably the only Englishman who ever migrated to Australia with the express purpose of gaining extensive knowledge concerning the opal. He has traveled widely in Australia and has an intimate knowledge of the opal fields; in addition, he has been a lapidary for nearly thirty years. The book was written for the general reader, as well as for the gem hobbyist and the connoisseur. A vast amount of history and pertinent data on the opal has been compiled to produce an authentic and interesting book, unequalled as a reference. In his own words the author says, "The pages of the past are slipping away all too fast as the old hands turn and leave us, taking with them what they know."

In addition to the text, there are maps designating opal-bearing localities of North and Central America and the principal opal-bearing areas of Queensland, White Cliffs, Lightning Ridge, Coober Pedy and Andamooka. An appendix includes a list of opal varieties, a glossary of terms, tables, poems about opal and hints on opal polishing. An extensive bibliography completes this comprehensive work on the opal.

This book is a must for anyone who loves opals.

THE QUEEN'S NECKLACE, by Frances Mossiker. Published by Simon and Schuster, New York. 598 pages, 25 black-and-white illustrations. Price $7.50.

Many have written about the Queen's Necklace. But until now no one has attempted to collate, without prejudice, the entire mass of fascinating and conflicting evidence contained in the private and public archives of France. This Frances Mossiker has done, after five years of intensive research and seven trips to France.

For a hundred and fifty years, historians and novelists have been fascinated and mystified by the Necklace. Four years before the French Revolution, these priceless diamonds were purchased in secrecy from the court jeweler of France, presumably for Marie Antoinette and at her own instructions. The necklace, not yet paid for, was delivered into the hands of Cardinal Prince de Rohan, first prelate of the Church of France. He in turn gave it to the Countess de La Motte-Valois, who claimed to be acting for the Queen. It was then handed to a messenger, supposedly from the Queen at Versailles, and then it vanished, never to be seen again.

The scandal that resulted involved the highest personages in the realm. But in the orgy of rumor and accusation that followed, it was the Queen whose reputation was most tarnished. The people turned against her, while across Europe kings badgered their ambassadors for the latest "necklace gossip," and the bourgeoisie, from London to Moscow, followed the sensational story in their newspapers. The reputation of the French royal family suffered a mortal blow.

In the trial that followed, certain of the accused were judged guilty; however, the truth has never been established as to what happened to the diamond necklace.

Mrs. Mossiker has translated and woven into the narrative the letters, memoirs, scandal sheets, trial briefs, newspaper accounts, court records—even the doodles—written by and about these famous personages. She has presented their stories together, in their own words, for the first time. And from their extraordinary first-person revelations she has recreated an entire era.

The Queen's Necklace is an amazingly comprehensive piece of literary research. The author is to be praised for her effort. However, the book will have its widest appeal among those who enjoy lengthy historical detail and the complex interweaving of numerous characters and incidents.

GEMSTONES & MINERALS — How and Where to Find Them, by John Sinkankas. Published by D. Van Nostrand Company, Inc., Princeton, N. J. 420 pages, 133 illustrations. Price $8.95.

Sooner or later every collector of minerals and gemstones realizes he needs to know how and why mineral deposits form. If he wants to make important "finds" or learn how to look in old locations for the few places where valuable minerals and gemstones could be, he must be able to recognize the signs that say "look here"! Many persons who are eager to learn more about practical prospecting for minerals and gemstones expend considerable time and energy to find localities, only to be frustrated after getting there by not being able to search intelligently.

In this book, the author of *Gemstones of North America* and *Gem Cutting—A Lapidary's Manual* writes about the problem facing the collector when he begins working in the field. It provides the *practical* information that the average collector has been looking for and has not been able to get, except after years of field trips and hundreds of disappointments — a guide to a host of subjects, from planning trips, and tools and equipment, to actual digging and extraction methods. Also included is the vital background information on rocks and the minerals the collector can expect to find in them, descriptions of mineral deposits, outcrop signs and float, and much useful advice not available elsewhere on trimming, cleaning, preserving, storing and exhibiting specimens, and the marketing of surplus material.

Important chapters include "Prospecting and Collecting Trips," "Tools and How to Use Them," "Rock Classes and How to Recognize Them," "How Mineral Deposits Form," "Field Features of Mineral Deposits," "Collecting Practices," "Preparation of Specimens," "Storage and Exhibit," and "Marketing Mineral Specimens and Gemstones." Appendices include "Table of Mineral Solubilities," "Table of Minerals Requiring Protection from Atmospheric Influences," "Useful Addresses," "Reference Libraries," and "Suggested Reference and Reading Material."

Gemstones and Minerals — How and Where to Find Them is written in clear, straightforward language that is easy to understand by any reader, even with no special knowledge of geological terms. Because of its thoroughness, it will be of great interest to professional mineralogists and geologists, jewelers and gemologists, as well as those for whom rocks, minerals and gemstones are an absorbing hobby.

WORLD'S LARGEST KUNZITE CRYSTAL

Continued from page 277

ing drove out the disagreeable greenish color (and much of the violet) and left pink. Unlike pinkish kunzites from other sources, however, the dichroscope shows that this hue is produced through lateral directions in the crystals, as well as along the optic axes through the crystal ends. Thus, heat-treated gems are remarkably uniform in color, even when cut with the table facets parallel to prismatic directions. Flawless gems exceeding 300 carats have been cut in Brazil, and the author has cut a number of much larger ones for Martin Ehrmann, which, unfortunately, were not entirely flawless. I saw these gems after they had been heat treated by Mr. Ehrmann and was supplied the details through his courtesy. The treatment is very simple and needs no special apparatus. Mr. Ehrmann uses his kitchen electric stove. The stones are placed in the oven and the temperature allowed to rise slowly to 450°F. This temperature is maintained for one hour, and then the oven is allowed to cool. With this treatment, the green and much of the purple is driven off, but a lively pink remains.

Paulo Nercessian values his kunzite crystal highly, so highly in fact that no buyers have appeared. He wants the equivalent of $25,000 for it, which is approximately $3.40 a gram. Perhaps this price may be realized, but the attitude of prospective purchasers in the United States is that the price is unrealistic, even in terms of gem-material potential. It is interesting to note that smaller pieces were available at a number of dealers in Rio at $.25 a gram. It is hoped that this crystal will be preserved in its entirety, but it would not be surprising if the next we hear of it is that it was sold for rough and cut into small pieces.

The next largest crystal of kunzite from this find is in the Smithsonian Institution, in Washington, D.C. It may turn out, after all, to become the largest, if the gloomy forecast for the other crystal is realized.