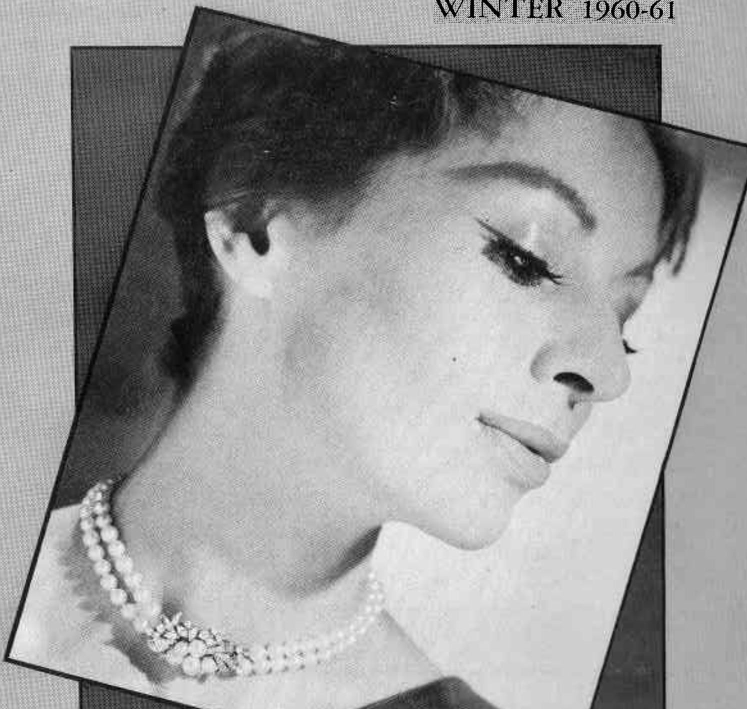
Gems and Gemology

WINTER 1960-61



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Gems & Gemology

VOLUME X | WINTER 1960-61 | NUMBER 4

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On the Cover

A nosegay of diamonds with five cultured pearls serves both as a necklace clasp and a cluster brooch on this award-winning design by Primavesi and Kaufmann of Montreal, Canada. A bouquet of marquise and round diamonds balances the sideward sweep of the tapered baguette strands.

Photo Courtesy N. W. Ayer & Son, Inc.
New York City

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Planning and Using Your New Diamond Room

by

Lester B. Benson, Jr.

Director of Research and Laboratories

An increasingly popular approach to diamond merchandising is opening new avenues for increased diamond sales for many jewelers. This approach removes from diamonds the age-old label of a blind purchase, and gives meaning to the factors that establish value.

Today's jewelry store must present an atmosphere that combines a feeling of warmth with one of competence. Working in tandem, these two impressions strengthen a customer's confidence in his ability to buy wisely and make his own choice, rather than create a fear that something will be forced on him. When potential diamond customers are classified into three categories on the basis of their readiness to buy, the need for a different approach becomes obvious. The first is the person who is presold before entering the store. He knows approximately what he wants and how much he intends to spend. This man expects to walk to the diamond counter, inspect a few rings, make a selection and leave. The second type is presold on the idea of purchasing a diamond, but he is concerned with his lack of knowledge of both diamonds and jewelers and instinctively wants proof that his decisions are correct. The third type is the potential diamond customer who has not yet given consideration to the acquisition of diamond jewelry. Most jewelry stores are equipped to accommodate the first type only.

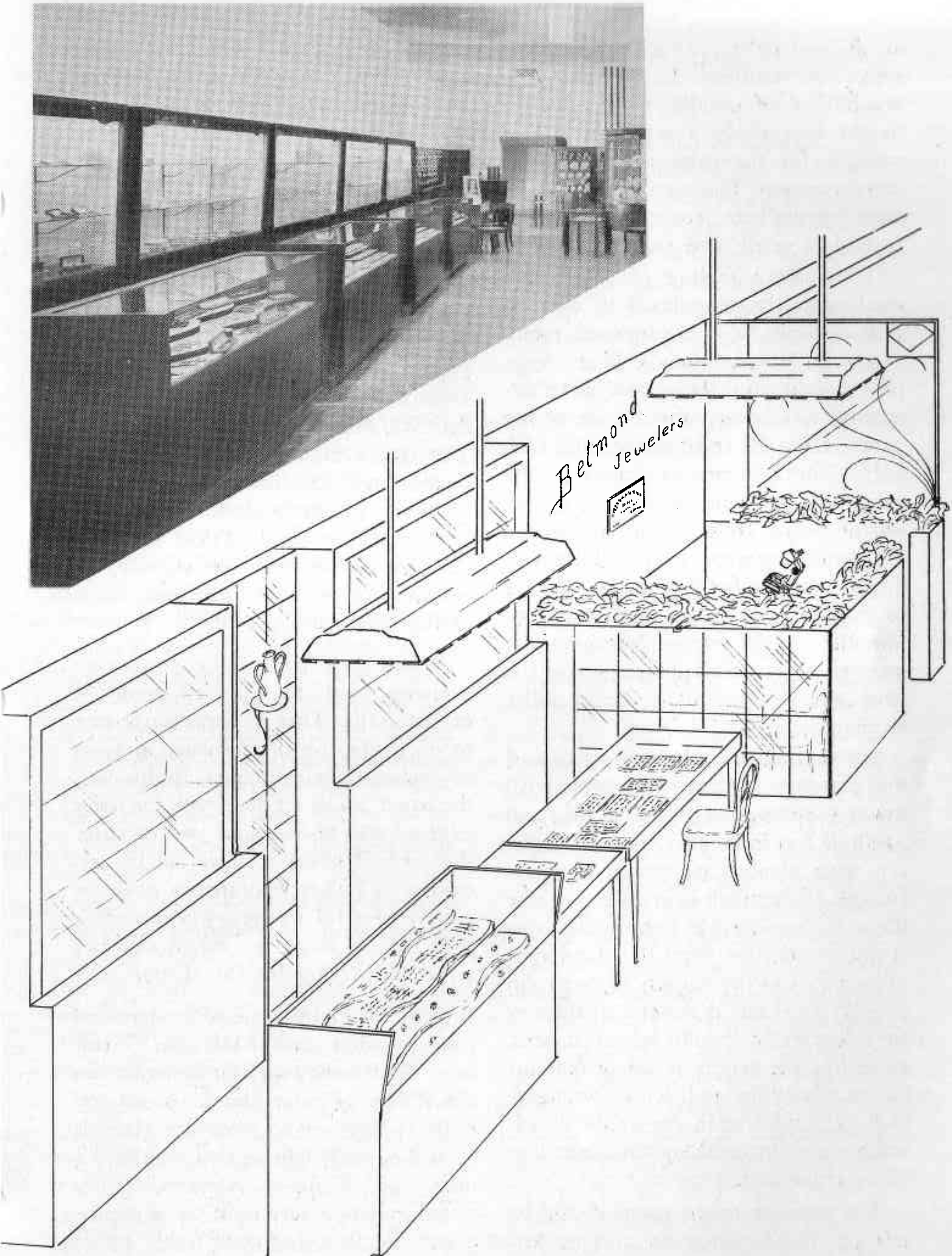
Customers in the second and third categories *can* be sold diamonds, but the sales will not be made merely by providing a counter and a selection of diamonds. Similarly, good salesmanship alone is not sufficient. These sales are concluded most easily when proper facilities and sales aids are utilized to demonstrate diamond quality and enable the customer to make a positive decision based on his own knowledge and new interest.

What is meant by proper facilities is an area referred to as a *diamond room*. It may be either a complete or partial enclosure, depending on the layout of the store. There are many methods of construction, ranging from extensive alterations of existing facilities to inexpensive installations made from panels and other decorative but functional accessories constructed outside the premises and assembled in the desired area. Although many jewelers feel that their stores are already too small and overcrowded to permit the addition of such a sales area, this is rarely true. When the potential is so great, converting space used for the display of less important merchandise should be considered when it is the only alternative. With a little planning and rearranging, an effective and attractive diamond room can be incorporated into nearly any store, and the adjacent areas can be rearranged to complement it.

The initial planning for a diamond room must take into consideration such factors as present ceiling height, the number and location of electrical outlets, and the position of the proposed room in relation to the store entrance and other sales areas. Conditions can be encountered that may at first discourage the installation; for example, if the proposed room is to be located in a typical narrow store with continuous, parallel showcases on each side of the aisle and in an area with no overhead electrical outlets. Instead of ruling out the possibility, it should be remembered that usually the more difficulty encountered in planning a room, the more it is needed to compensate for what is probably standard commercial space that conveys little or no feeling of uniqueness, professional know-how and warmth. These qualities are prerequisites for volume sales of fine jewelry.

This example presents a difficult problem that is typical of many jewelry stores. The narrow layout of the store is a distinct disadvantage, but especially so if a diamond room is not added. It is not difficult to visualize the hurdle facing a timid potential customer who enters a long, narrow store for the first time and is forced to walk down a long aisle under the eye of sales personnel he assumes to be critical. The initial impression gained in such impersonal, stereotyped surroundings does nothing to create confidence or a feeling of welcome. A jewelry store attempting to interest the public in diamonds must not offer obstacles to the timid but must establish a feeling of warmth and friendliness. It must be inviting. This is *not* being done in the atmosphere that exists in the average store today. To sell diamonds effectively, this desired atmosphere must be created, even if it means sacrificing a few square feet of selling space. Furthermore, the long, straight lines must be broken. A store designed in this manner serves one purpose only: *to provide rapid counter service*. This is ideal for selling certain types of merchandise, but *not* for closing difficult diamond sales.

A completely enclosed diamond room offers no more advantages than


Belmond
Jewelers

an area partially enclosed by three or four low partitions. In fact, five and one-half feet usually is a sufficient height to provide a semiprivate area suitable for the sales discussion and demonstration. The room need only be large enough to accommodate comfortably a small table and three chairs.

To create a feeling of space in a small store, be generous with mirrors. For example, if the proposed room, even with low partitions, is likely to appear dominating, there may be an advantage in covering the outside of the panel facing the front of the store with a full-length mirror or square mirror panels. In general, flush-fitting square mirror panels are more decorative and also lend themselves to the addition of display shelves for ornamental objects or other unusual items that would be unnoticed in a showcase. Moreover, the mirrors increase the apparent size of the store and the quantity of merchandise on display.

An alternative in the construction of the panels is to make the walls still lower (approximately four to four and one-half feet in height), rimmed at the top with planters containing artificial foliage. If the room is in an area where there is considerable floor traffic, this is not as effective from the standpoint of acoustics as the slightly higher solid panels; however, it is very satisfactory for a low-traffic area. In some instances, extending the height of one or more of the panels by the addition of wrought-iron or similar open decoration is advantageous for breaking the long lines of a narrow store.

The entrance to the room should be left open and facing an area of low traffic. If the entrance must face the center aisle, the room should be located toward the rear of the store, and adjoining sales areas should be devoted to those items that draw the least traffic.

The table for the room does not have to be large. A satisfactory size is approximately twenty to twenty-four inches wide, forty-five to sixty inches long, and twenty-eight to twenty-nine inches high. This is large enough to accommodate three persons and a gemological microscope (a *GEMOLITE* or *DIAMONDSCOPE*) and a *DIAMONDLITE,* two essential sales tools. The chairs should be about eighteen inches high and have relatively firm cushions; the backs should be slightly contoured but rigid. These specifications, of course, may vary slightly, depending on the style and construction of the units chosen.

When possible, some concealed shelving should be provided along one of the walls. This is particularly easy to do if the top of the panel consists of a relatively wide planter. In this case, the panel can be set flush with the outer edge of the planter and two or three shelves built below it. These can be covered with pull-type draperies made of good material or heavy upholstery cloth; if the latter is used, it also can serve as covering for the chairs.

A comfortable, efficient diamond room requires careful selection of colors. With today's illumination, the actual hue or color chosen is not too critical; however, to minimize glare, it should be very light in tone and have a matt, or dull, finish. A warm, lightly tinted gray or a very light tan is appropriate. Be sure that comparable colors are available in carpeting and in drapery and upholstery materials, the use of which is recommended. The top of the table can be covered with white or very light gray unpatterned Formica with a nonglare surface. One or two large fabric-covered pads should be on the table for displaying jewelry; they also can be used for tweezers and other small articles that are not being used. The color of the pads should be relatively neutral; i.e., black, light gray or white.

With the exception of prominently displayed gemological diplomas or certificates, pictures and other decorative items should not be used, since they are distracting and often lead to unnecessary, time-consuming conversation. The diplomas establish the knowledge and competence of the jeweler. Illustrative material needed for informative sales discussions should be kept in separate folders or containers in a drawer or on the concealed shelves and removed only when required. The objective in the over-all planning should be to provide a comfortable, semiprivate area where the customer can concentrate on merchandise shown to him.

The illumination for a diamond room is critical. In the past, incandescent lights had to be used, but the color content made it impossible to observe the colors of stones accurately. The same is true of standard fluorescent fixtures, which, in addition, produce a highly diffused light that does not display diamond jewelry to best advantage.

The recent development of the *GIA DIAMONDLUX* has simplified greatly the problem of diamond illumination. This lamp is a fluorescent fixture, but it contains a series of specially constructed tubes of different colors. No single fluorescent tube has been developed that will produce an effective, neutral illumination; however, by combining tubes of individual colors, the necessary balance can be achieved. The light from the tubes is combined by a special diffuser, below which is a series of baffles that provide the equivalent of a series of small point sources of light of moderate intensity. The resultant lamp is therefore cool operating, light weight in construction, and remarkably effective for displaying diamond's inherent brilliancy, scintillation and dispersion, in conjunction with accurate color perception.

The *DIAMONDLUX* can be mounted from the ceiling on stems or chains, or supported on a cross bracket made as part of the diamond room. If there are no overhead electrical outlets from which the lamp can be suspended, the expense of such an installation can be avoided by extending decorative supports from the wall panels of the room itself, with the electrical connection made to a wall outlet. (Note: The *DIAMONDLUX* without baffles is available for general store illumination.)

When a diamond room is properly developed, equipped and utilized, the customer realizes immediately that he has access to an exceptional fund of diamond knowledge. This feeling of confidence and security can have only one effect: to offset the widespread distrust felt toward jewelers, resulting from the many variations in quality standards, nomenclature, markups and ability. When a microscope such as the *GEMOLITE* or *DIAMONDSCOPE* is used in conjunction with a *DIAMONDLITE*, a diamond's quality factors can be demonstrated and explained easily; therefore, these instruments are an integral part of a diamond room. Equipped with overhead light sources, these special microscopes also are ideal for clarifying watch- and jewelry-repair recommendations, because the defects and malfunctioning parts are so easily seen by the customer.

The diamond room soon becomes an effective medium for creating new customer contacts. Introducing store visitors to the new facilities is a very simple matter. For example, it is regarded as a friendly and helpful service to offer to inspect rings and other articles for insecure stones or possible damage. Discussing remounting and special-order work can follow easily, as well as appraising and other services. However, the customer should be made to feel that the purpose is not to make a sale, but that you have started a friendly conversation based on a genuine interest in him and his jewelry. In short, this approach should serve primarily to inform him that the store is now ready to provide the services and jewelry he will need in the future, and that he will be assured the satisfaction that only a combination of modern equipment, knowledge, integrity and a sincere interest in his needs can guarantee.

Prospective customers who have not visited the store may be contacted by direct mail and invited to come in and have their jewelry checked by an expert and to be permitted to see its condition under magnification. These inspection times should be scheduled during slack periods. A continuous program of periodic mailings to portions of the list of present and potential customers should maintain a fairly steady flow of calls.

Successful salesmen, regardless of their field of endeavor, can sell only a certain percentage of the clients contacted; and if they want to increase their income, it is necessary to increase their contacts. This is difficult for a jeweler to do, if his store is not equipped to offer services of special interest to anyone who owns jewelry—and if these services are not offered in an atmosphere that bespeaks warmth, friendliness and professional competence. A diamond room furnished with the essential demonstration tools and ideal lighting creates that atmosphere.

The accompanying illustrations show graphically how the addition of a relatively inexpensive diamond room can improve the appearance and efficiency of a typical narrow store with a parallel counter arrangement, represented in the photograph. The opposite wall, not included in the picture, was arranged in the same way.

As shown in the sketch, the second and third counters and the third wall case were removed, and the area was enclosed with foliage-topped panels to a total height of approximately five and one-half feet. Nothing was used on the back wall except the jeweler's name and his gemological diploma and certificate. To assist in isolating the diamond area and breaking the long lines of the store, a wrought-iron frame supporting four ornamental spirals was placed on the panel facing the rear. Because of the monotonous repetition of fixtures, the diamond-room panel facing the front was faced with mirrors. Mirror paneling also was used on a narrow strip of wall that was made available by separating the two wall cases. To main-

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More Light on Beryls and Rubies with Synthetic Overgrowth

by

Dr. E. J. Gubelin, C.G.

In the course of the last fifteen months, two new forms of counterfeit stones have appeared on the gem market. Although only a few samples of these new substitutes have been submitted for examination, they have provided ample proof for establishing distinctive characteristics and facilitating identification.

Hydrothermal Ruby

The same hydrothermal process that was used for making synthetic quartz has now been exploited successfully to produce synthetic ruby. This new method was pioneered by two American scientists, Drs. R. A. Laudise and A. A. Ballman, of the Bell Telephone Laboratories, and it became common knowledge in the autumn of 1958. At first, this achievement was considered to be of mere scientific or technical interest, until Carroll Chatham announced success with his process in his San Francisco laboratory and declared that he would soon develop the experimental stage into commercial production. He also claimed that the new production would provide stones that were more reminiscent of natural rubies.

The apparatus developed by Laudise and Ballman corresponds with that used by the Bell Telephone Laboratories for the synthesis of quartz, which has its ancestry in the method invented by Prof. R. Nacken. However, the task is much more complex, because the aluminum-oxide nutrient complicates the problem on account of the various modifications [gibbsite $Al(OH)_3$, boehmite ($Al\ OOH$), diaspore ($Al\ OOH$) and corundum (Al_2O_3)] in which it occurs. Many experiments were necessary in order to ascertain optimum conditions of the techniques. Solvent, nutrient, temperature, pressure and foreign agents are only a few of the variable factors that may render the hydrothermal synthesis a hazardous gamble.

The autoclave consists of a welded steel cylinder closed with a threaded cap that can support pressures in excess of 30,000 pounds per square inch. In the cavity of this vessel a cylindrical tube is placed, within which the reaction takes place. The nutrient, consisting of poorly crystallized gibbsite [$Al(OH)_3$] or corundum [Al_2O_3] is concentrated at the bottom of the silver tube and the tube is filled with sodium carbonate. The seed crystals, which might be either natural or synthetic ruby, of desired orientation are suspended from a silver frame in the upper part of the apparatus. This assembly is heated to 400° C. from below by means of an electric heating plate. The top region remains cooler, thus leading to temperature conditions that cause circulating currents in the interior of the saturated alkaline solution. This is very similar to a central water-heating system; i.e., raising the warmer solution from the area of the nutrient to the top of the bomb while the cooler solution sinks to the bottom, where it is heated and made to ascend again. The precipitation of the reagent (that is, the crystallization of the alumina, or corundum) takes place on these seed crystals that grow analogous to any natural or synthetic crystals, forming in a solution in accordance with their typical crystal habit and developing all the faces characteristic of their particular species. Thus the nutrient, which first is an aluminum-hydroxide, transforms into alumina crystals during this process. A single run may take one or two months. It is interesting to note that rod-shaped Verneuil synthetic rubies made by Linde Air Products may be used as seed crystals, if slabs are cut whose main face is oriented at right angles to the main crystal axis.

The crystals grow extremely slow: under favorable conditions the growth rate may vary from .002 to .01 inch per day. The fastest growing face is the basal plane, so flat plates seem to be the prevalent forms on which the prism faces are strongly reduced. Occasionally, rhombohedral forms also are developed. The sizes of these hydrothermal rubies vary from ¾ to 1¼ inches. The color depends on the percentage content of chromium oxide, of course. The best hue is obtained by adding one percent of chromium; i.e., $\frac{1}{10}$ gram of sodium chromate to one-fourth gallon of solvent. The color also proves to be affected by the material of the interior wall of the autoclave, which makes the corundum crystals green if it is made of iron. Silver gives the best results.

I recently enjoyed the opportunity of examining a few hydrothermal ruby crystals that were claimed to have been produced by Chatham, and since I believe that my observations can be of some help in making reliable identifications, I shall describe them. Determining the physical data offered no diagnostic distinction, since all specimens tested revealed physical properties identical to those of natural rubies. The refractive indices were within the normal limits of 1.76-1.77, and the birefringence was constant at .008. In some instances, these constants were difficult to measure because the filmlike artificial coating caused the shadow edges to be rather indistinct. The dichroism showed the well-known twin colors of purple-red and yellowish red, and the absorption spectrum displayed its

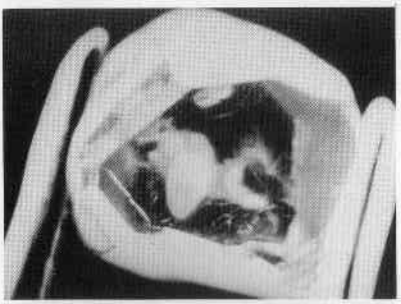

Figure 1. Truncated "hydrothermal ruby," constituting a large seed nucleus overgrown by a thin synthetic ruby film. *(Diamondscope. 7x)*

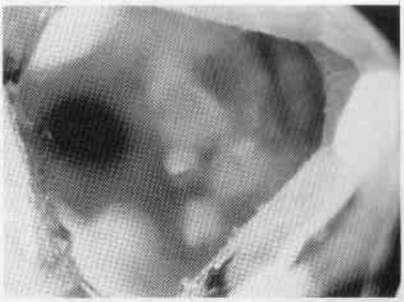

Figure 2. Base and rhombohedron faces of a ruby with hydrothermal overgrowth. *(Diamondscope. 20x)*

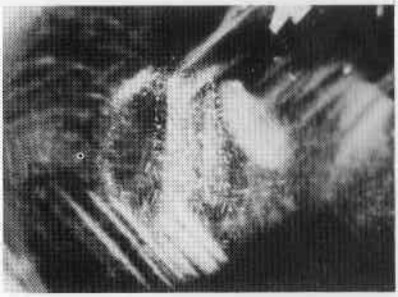

Figure 3. Zonal structure accentuated by "silk" (rutile needles) in the ruby seed. *(Diamondscope. 40x)*

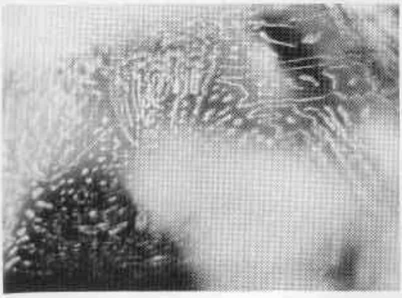

Figure 4. Liquid feather (healing fissure) in the natural ruby core. *(Diamondscope. 60x)*

Figure 5. Clouds of minute gas bubbles in the hydrothermal ruby mantle and growth marks of incipient crystal faces. *(Diamondscope. 80x)*

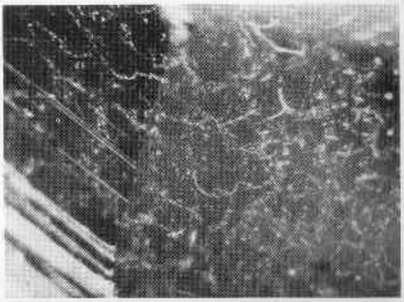

Figure 6. Curiously curved, dotted lines formed by tiny gas bubbles in synthetic ruby layer. *(Diamondscope. 80x)*

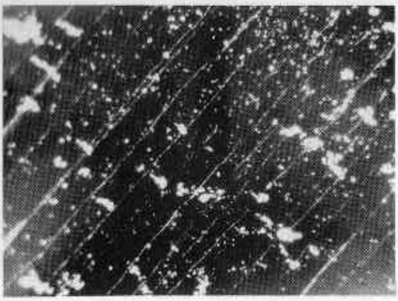

Figure 7. Straight lines running parallel to principal growth direction, and minute foreign dustlike particles in hydrothermal emerald mantle. *(Diamondscope. 40x)*

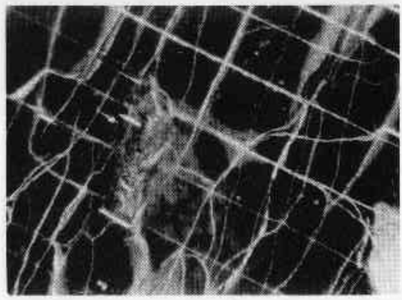

Figure 8. Reticulate pattern drawn into the artificial emerald film by two systems of tension fractures. *(Diamondscope. 80x)*

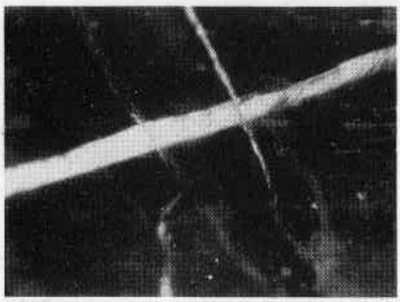

Figure 9. In slightly tilted position, the breadth of the subcutaneous fractures appears to correspond with the depth of the hydrothermal overgrowth. *(Diamondscope. 120x)*

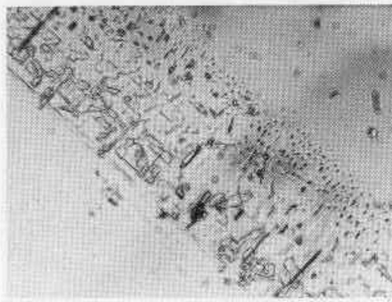

Figure 10. Residual liquid drops clearly mark a partly healed fracture in the man-made emerald coating. *(Polarizing microscope. Phase contrast. 250x)*

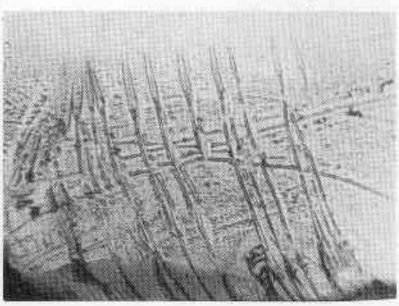

Figure 11. Unusual arrangement of "undigested" liquid drops in a healing fissure of the hydrothermal emerald layer. *(Polarizing microscope. Phase contrast. 250x)*

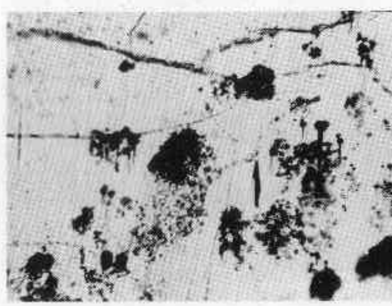

Figure 12. Irregular agglomerations of foreign microlites on the previous surface of the beryl nucleus. *(Polarizing microscope. Phase contrast. 100x)*

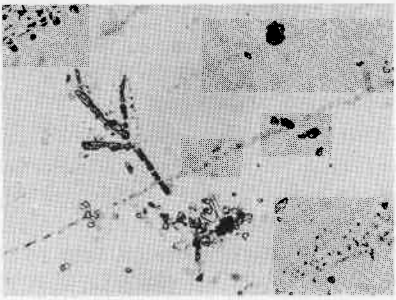

Figure 13. Slender prismatic microlites of the alien crystal phase darting out from a common center on the former surface of the beryl seed.
(Polarizing microscope. 250x)

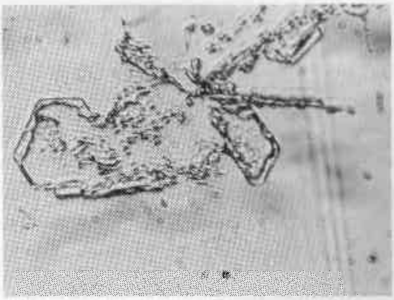

Figure 14. Group of typical crystal skeletons with hexagonal outlines interrupted in their growth as the man-made emerald film started to grow.
(Polarizing microscope. 500x)

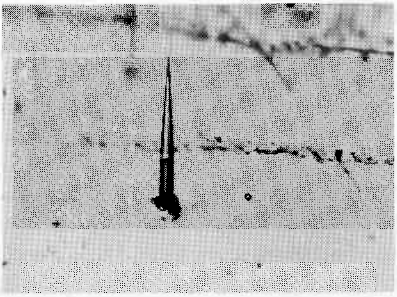

Figure 15. Cuneiform growth funnel standing on a cluster of foreign microlites and piercing through a straight healing fracture.
(Polarizing microscope. 250x)

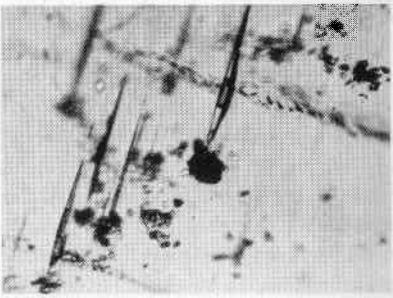

Figure 16. Group of "growth funnels" filled with liquid and a "libella," aligned parallel to the direction of principal growth. *(Polarizing microscope. 250x)*

Figure 17. If the specimen is tilted into an appropriate position, an interesting mirror effect of natural inclusions in the beryl nucleus is brought about by the artificial emerald layer.
(Diamondscope. 40x)

Figure 18. If the stone is slightly inclined, impurities in the man-made emerald layer are reflected from junction plane.
(Diamondscope. 40x)

characteristic sequence of four lines in the red region (6942, 6928, 6680 and 6595 Å) and three in the blue (4765, 4750 and 4685 Å), with a broad band between 6100 and 5500 Å. Short-wave radiation excited strong-red fluorescence, the tone of which was slightly different depending on the light source. The specific gravity varied between 3.9840 and 3.9882 only. Phosphorescence under X-rays was not distinct enough to serve as a criterion, but it might have been evident had the seed consisted of synthetic ruby.

Under the microscope the crystals were dangerously deceptive, owing to the natural inclusions in the core. The latter formed the integral and main part of the stones' volume, for the former seed crystals of natural origin had been covered with a relatively thin synthetic coating.* If the stones had been cut, most or all of the coating would have been removed. In distinct discrimination from the hydrothermal rubies produced by Bell Telephone Laboratories, Chatham's samples were not flat, tabular crystals, but exhibited the typical truncated hexagonal prisms, ending with rather small basal planes *(Figure 1)*. The man-made surface layer of each stone simulated the habit, shape, crystal faces, growth marks and external irregularities of the seed crystals *(Figure 2)*. All specimens were strongly marked by typical growth features, such as incipient development of the prism and the rhombohedral faces.

Within the genuine core, various types of natural inclusions could be observed; for instance, rutile needles forming planelike "silk" *(Figure 3)*, or whitish clouds or zones and solid mineral inclusions of the kind typical of Burma rubies, as well as liquid feathers and other natural inhomogeneities *(Figure 4)*. The synthetic coating, however, could be discerned under very intense scrutinization because it teemed with minute gas bubbles. These were either distributed singly or, more often, accumulated into lines, planes, clouds or other odd shapes *(Figures 5 and 6)*. It was possible to notice that the formations were abruptly terminated along the junction planes between seed crystal and unnatural layer. In one sample, a natural feather of liquid inclusions ran across the core and was sharply cut off by the previous natural crystal face. This face, however, was overlaid and transversed by a loose cloud of gas bubbles in the artificial overgrowth.

I must admit that these features are extremely delicate and that it takes a sharp eye and a keen microscopist to discover them, but they offer sufficient proof to pronounce a decisive verdict. Unfortunately, I did not have these specimens in my possession long enough to carry out a more detailed investigation, though for the present the results are sufficient to reveal diagnostic characteristics by which rubies with a synthetic overgrowth can be recognized. These features, within the internal structure of the man-made mantle, however, do not seem to indicate a hydrothermal ori-

*Editor's note: Chatham synthetic rubies furnished to the GIA for a very short period of study in 1959 differed from the synthetic rubies Dr. Gubelin was able to study in that no natural seed was discernible. This makes it clear that large seeds are not to be regarded as essential or necessarily usual features of Chatham synthetic rubies. It seems possible that the product Dr. Gubelin describes were made by another producer or process than those examined by the GIA.

gin, but rather seem to be produced by a flux-fusion process.

Emerald-Coated Beryl

The latest innovation in the field of gem fakes is a new synthetic product that consists of a large genuine nucleus of colorless or slightly colored beryl overgrown by a relatively thin, hydrothermally-produced emerald layer. This counterfeit was investigated exhaustively and described thoroughly by R. J. Holmes and R. Crowningshield in the Spring, 1960, issue of this journal (Lit. 5).

In the course of last year, I was submitted an appreciable quantity of these so-called "Emerita" stones for scrutiny. Since I believe I have observed some additional and new diagnostic peculiarities, I feel justified in complementing this recently published information with the results of my own examination, so that fellow gemologists will become familiar with the decisive characteristics of this material.

In order to gain more exact knowledge on the color influence of the beryl nucleus upon the general appearance of these new fakes, I requested J. Lechleitner to coat a blue aquamarine and a well-colored yellow heliodor with a hydrothermal emerald mantle. But to my astonishment, not the slightest difference in hue was evident, which allows the conclusion that if a sufficiently thick overgrowth is built up, a fairly good emerald color will result that resembles very closely the pleasing appearance of good emeralds from the recently opened Colombian Gachala mines.

As far as the physical and optical properties are concerned, I found but slight deviations from the previously published data. The refractive indices varied from 1.578 to 1.590 for ω and from 1.571 to 1.583 for ε, with a constant value of .007 for the birefringence. The inquiry into the cause responsible for these astoundingly high figures represents an intriguing problem that Lechleitner may someday disclose. The specific gravity also displayed a clear tendency toward increased values, which were lying between the limits of 2.676 and 2.713. One beryl seed from which the synthetic emerald overgrowth had been polished off showed an R.I. of merely 1.564-1.570 and a specific gravity of 2.672. Dichroism, absorption of visible light and luminescence appeared to vary only within the normal limits.

In their above-mentioned study, the co-authors competently emphasized their microscopic observations, which revealed a number of typical irregularities, and very rightly they claimed streak-like internal fracture lines to be a characteristic feature of the hydrothermal emerald mantle. Although Lechleitner can cause the emerald coating to develop as a homogenous layer devoid of any inhomogeneities, the majority of specimens that I tested contained such parallel lines. In most cases, these lines followed the direction of principal growth *(Figure 7)*, but in some stones this set of parallel lines was traversed at right angles by another system of streaks that ran more or less parallel to the basal plane (001), thus giving the stone a crackled appearance *(Figure 8)*. These basal, secondary lines are usually not as straight as the primary ones, but rather undulant.

If the stone is rotated and tilted into an appropriate position, the lines and streaks appear to be fractures in the hydrothermal overgrowth, the depth of which is usually distinctly marked by the breadth of these cracks *(Figure 9)*. Some of these fractures are of a uniform appearance and are "dry," but the majority show a spotted effect under low magnification. Under a high-power microscope, they prove to be partly healed fissures that are clearly defined by residual liquid drops and that are responsible for the spotted appearance of the cracks *(Figures 10 and 11)*. Actually, the fracture lines are "healing fissures" that formed during the hydrothermal process while the specimen was still suspended in the hydrothermal solution of the autoclave as tension was released. The fractures were immediately infiltrated by the saturated solvent, which formed the mother liquor, and were thus given a chance to heal eventually. The watery liquid drops, deprived of the healing ingredients, remained enclosed in the partly healed fissures.

If, at the beginning of the process, the favorable conditions (i.e., adequate temperature, temperature gradient, chemical component) for the formation of the emerald mantle are not instantly reached, a foreign crystal phase may be stimulated to develop on the surface of the seed. The junction plane between beryl core and synthetic emerald coating then seems to be covered by innumerable tiny dust particles *(Figure 7)*. Actually, these minute specks are tiny agglomerations, single crystals or crystal skeletons of euclase (Be (Al, OH) SiO_4), phenakite (Be_2SiO_4) or other related minerals, that adhere to the previously polished surface of the nucleus. Although the aggregates form irregular or ball-like dense clusters *(Figure 12)*, the single crystals are transparent, slender, prismatic rods that often branch out from a black, mutual center *(Figure 13)*, and the crystal skeletons display a distinctly hexagonal orientation of some of the edges that were capable of development *(Figure 14)*.

The most intriguing feature of the internal structure of the overgrowth is a wedge-shaped two-phase inclusion that normally occurs only in contact with a lump aggregate of the alien crystal phase; e.g., euclase, phenakite or related mineral *(Figure 15)*. This fact, and the observation that these wedgelike cavities are always oriented strictly parallel to the principal growth direction, makes it possible to explain their formation as follows: the aggregates of alien microlites acted as obstacles in the growth flow of the nutritious solvent, in whose "wake," in concurrence with the inherent tendency of emerald to develop lattice vacancies, tapering cavities were formed in which a minute portion of the watery hydrothermal solution was trapped. Therefore, these "growth funnels" always indicate the direction of principal growth *(Figure 16)*, and they are oriented parallel to the straight fracture "lines" that run along the c axis *(Figure 8)*.

The above-mentioned inclusions in the synthetic overgrowth are absolutely characteristic of this new emerald fake; they have never been found in any genuine emerald. Any careful microscopist should be able to observe them, and he ought not to be confused by natural inclusions that might be present in the beryl seed. Expanded systems of natural inclusions in the core that happen to extend as far as the former surface of the seed beryl come to an abrupt linear cut-off slightly beneath the rough or polished surface of the synthetic emerald layer. Natural inclusions in the core lying near the contact plane of the nucleus and overgrowth may be mirrored easily in the artificial mantle, if the specimen is properly tilted so that the inclusions and the junction plane, functioning as a mirror plane, are viewed from the opposite side through the stone *(Figure 17)*. Likewise, the inhomogeneities in the hydrothermal emerald layer may be seen to be reflected from the contact surface *(Figure 18)*.

The close resemblance between the growth features of Professor R. Nacken's synthetic emeralds and those of Lechleitner appears to confirm the statement that the Lechleitner process is purely hydrothermal. In analogy with Nacken's procedure, the synthesis of the emerald overgrowth is brought about in an autoclave in which the pressure may be approximately 1000 atmospheres and the temperature between 300 and 400°C. Similarly, as in the above-mentioned process of the hydrothermal ruby coating, a weak alkaline aqueous solution may, under these conditions, suffice to dissolve the nutrient, which is composed of silica (SiO_2), alumina (Al_2O_3) and beryllium oxide (BeO) and that will crystallize around the suspended nuclei in the favorable zone of formation. If chromium oxide (Cr_2O_3), is added to the charge, the beryl seed will continue to grow as synthetic emerald. This process is entirely different from that developed by Chatham, whose mode of operation is based on the same principle of a diffusion melt as was used by the I. G. Farben Co., at Bitterfeld, Germany.

With regard to the large nucleus overgrown by a relatively thin synthetic film of emerald, Lechleitner likes to compare his produce with the cultured pearl, although he resolutely accentuates that it is a synthetic in the true sense of the word. As mentioned before, Lechleitner can easily alter the conditions of the process and thus deliberately govern the various growth features described above. He may cause a flawless emerald coating to enclose the nucleus, just as he has succeeded in making minute gold octahedra form as enclosures in the hydrothermal overgrowth. My observations may comprise only a few of the possible peculiarities whereas others may appear in the future. But one of the safest tests of these substitutes may be the lateral examination when the stones, after being immersed in benzylbenzoate ($n_D - 1.57$), will betray themselves by a dark-green relief *(Figure 8. Lit 5)*. It is, however, Lechleitner's sincere intention not to commit any fraud, but to "brand" his products by some kind of "earmark" by which they can be identified readily.

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Developments and Highlights

at the

GEM TRADE LAB

in New York

by

Robert Crowningshield

Director of Eastern Headquarters

Rosé Pearls

Because of the demand for so-called rosé pearls, the Japanese often dye cultured pearls a pale-pink color. This practice has been in use for a number of years. Occasionally, we are called upon to determine whether or not the pink color is natural or artificial. When a consumer hears the term rosé he probably thinks of a pearl with a pink body color, when, in fact, rosé more properly describes a pink overtone on a white to cream body color. Dyeing pearls with what is believed to be an eosine dye produces a pink body color, rather than a true rosé effect. We have found that the dye sometimes can be seen under magnification as a pale violet to pink line of demarcation between the mother-of-pearl bead and the nacre. In a few very obvious cases, the coloring has rubbed off on the string. The dye is also fluorescent under long-wave ultraviolet radiation; if it is quite heavily concentrated, it may be seen as a pale-pink line.

Pink Synthetic Sapphires

Twice during the past month we have examined pink synthetic sapphires that, under casual observation, could have passed as natural stones. The reason for the possible error was the presence of what seemed to be the typical needle-like inclusions of natural sapphires. Complete examination revealed typical gas bubbles, which identified the stones unquestionably as synthetic. A careful study of the inclusions indicated that they were fine parallel separations, or voids, along planes of repeated twinning; they could be seen as part of the twinning plane only when the stone was properly oriented. Twinning in synthetic corundum is not too uncommon, but this anomaly could easily result in a misidentification by a person who is not aware that any stone may exhibit properties or inclusions never before reported. Although something new always constitutes a potentially serious problem, it is one of the fascinating aspects of the study of gemstones. While this column was being prepared, one of the above-mentioned stones was resubmitted to still another dealer for identification. We expect to see it several more times — unless, of course, it is sold!

Looks Can Be Deceiving

We identified a fine-blue aquamarine mounted in a well-made platinum ring. The side stones did not "look right," so we performed the necessary tests and found that they were synthetic spinels. A good example of how that old maxim "Never judge a book by its cover" can apply to gemtesting.

Artificially Colored Beryl

The artificial coloring of beryl apparently constitutes a fascinating challenge to some people. The result of another attempt was recently observed in some round beryl beads that had been altered to green by putting green plastic in the drill holes. Although, superficially, the effect was passable, under careful examination the concentration of color in the drill hole was very obvious, and a needle was sufficient to identify the coloring agent quickly.

Green-Glass Hololith

Hololiths (rings or bracelets fashioned from a single piece of stone) are interesting examples of the lapidary's art. Jade and chalcedony are the most commonly used materials for this type of cutting, because of their unusual toughness and their color. For the first time, a green-glass hololith was submitted to the Laboratory. It was a particularly good imitation of jade from the standpoint of color, but heavy concentrations of gas bubbles made its origin easy to determine.

Fresh-Water Pearl Necklace

It is quite uncommon for a necklace of fresh-water pearls to be submitted for identification. Since the number of fresh-water pearls recovered is very small and they vary so much in color and overtones, a truly matched necklace would take many, many patient years to assemble. Thus we most frequently see them in rings, earrings and pins. However, we did test an unusually beautiful necklace recently. The pearls were large and exceptionally round for the fresh-water type, ranging from approximately eight to fifteen millimeters, and they exhibited all of the characteristic nuances of white, pink and pale-brown colors.

Fresh-Water Cultured Pearls

While on the subject of fresh-water pearls, it should be noted that more and more Japanese fresh-water cultured pearls are appearing on the market, frequently being represented as natural. Whether this misrepresentation is on

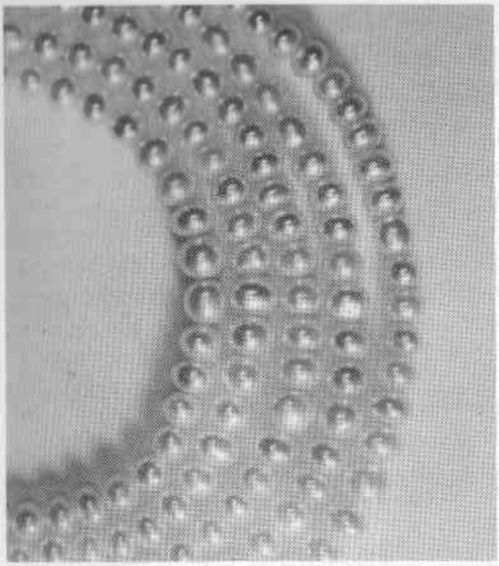


Figure 1

the part of the producers, the importers or the dealers we cannot determine. *Figure 1* shows a portion of five strands of these pearls. Although this type is usually kidney or oval shaped, we noted a greater frequency of nearly round specimens in these strands. Since they do not contain a mother-of-pearl bead, we are often asked why we designate them cultured pearls without any distinction from the salt-water product. It is the opinion of the Laboratory that the culture technique used is not as important as the fact that the pearls are the result of man's planned interference (no matter how noteworthy) in the normal growth of a mollusc and thus are correctly designated as cultured pearls.

French-Cut Stones

We examined a pair of guard rings, one containing French-cut diamonds and the other French-cut sapphires (an uncommon cut today). We have never seen such badly worn sapphires or diamonds. The diamonds had the usual appearance of badly abraded sapphires, and the sapphires were so worn that only occasional traces of the facets could be seen. We surmise that the rings had been subjected to prolonged abrasion by being worn against an adjacent diamond.

A Variation of the Old Shell Game

An eye-opening account of the practice of one lapidary was brought to our attention when a client submitted a number of transparent, colorless brilliant-cut stones for identification. He told us that he had been gem and mineral collecting in a well-known locality and had found a number of rolled, translucent colorless pebbles. He took his "find" to a lapidary in the area who apparently specializes in cutting for gem hunters. When our client picked up his cut stones, he felt that some of them appeared larger than the rough he had left with the lapidary. We tested both

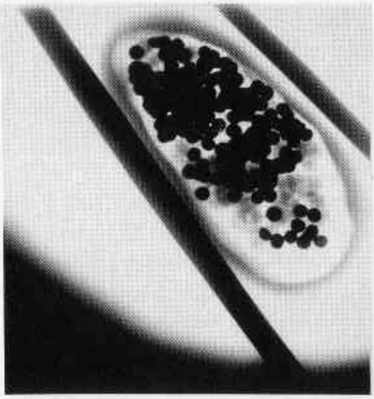


Figure 2

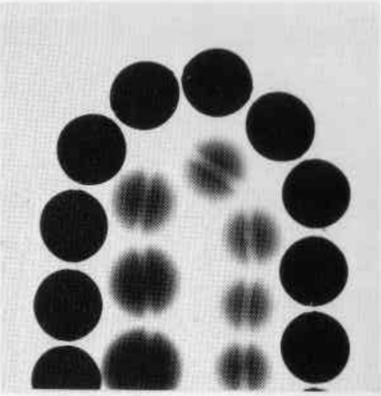


Figure 3

the rough and cut stones. The pebbles were natural colorless sapphires and the cut stones were synthetic spinels; for the latter, the lapidary had charged a cutting fee of $10 per carat. Fortunately, this is a rare practice in the lapidary field.

Alexandrites

To the best of our knowledge few, if any, newly mined alexandrites are coming on the market. The supply of this beautiful gem is very limited. It was unusual, therefore, to have three very good ring-size specimens submitted to us within the period of a month. It was obvious that the stones had not been cut recently, since they (and also the settings) showed evidence of long wear.

Unusual Blister Pearl

We identified a large, fascinating blister pearl, the radiograph of which is shown in *Figure 2*. Although it was exceptionally large, it was unique primarily because the hollow center had been filled with small pearls and metallic buckshot, as a means of adding weight. The metallic shot rattled as the pearl was shaken.

A 15-Strand Pearl Necklace

An unusual and striking pearl necklace, consisting of fifteen strands and more than 1500 pearls, was submitted for identification. The pearls were in three sections and were separated by platinum dividers and profusely set with diamonds. It was the largest single pearl piece we have tested. Because of its extraordinary size, it was necessary to take a number of radiographs before all of the pearls were covered — all proved to be natural.

A Necklace of Natural, Cultured and Imitation Pearls

It is not unusual for strands of pearls consisting of both natural and cultured specimens to be submitted for identification. Rarely, however, do we encounter imitation pearls in a necklace of this kind. We recently tested a very attractive necklace of large and apparently well-matched pearls and found approximately 20% to be imitation,

Figure 4

20% cultured and the remainder natural. Although this may seem to make our separation job more difficult, the imitations are usually obvious on a radiograph, since they are completely opaque to X-rays. *Figure 3* shows a radiograph of typical imitation pearls, as compared to mother-of-pearl beads.

Burned Diamonds

Two diamonds were submitted by insurance companies for the purpose of estimating fire damage and the approximate weight loss after recutting. One stone appeared to have been burned but actually was undamaged. Most diamonds accumulate a coating of oils, soaps or cosmetics, particularly on the pavilion surfaces. When they come in contact with high heat, these surface materials char, usually leaving a residue that is difficult to remove by ordinary cleaning methods. The "damage" can be removed in an acid bath. The other diamond had been thrown inadvertently into an incinerator, and the surface suffered some erosion as a result of oxidation. It, too, seemed to be damaged more severely than it actually was because of the charred material adhering to the surface. It was our finding that this diamond could be repaired by repolishing, and that the weight loss would be less than 4%.

Shortly after these stones were examined, a cutter called to tell us of a diamond that had been submitted to him for recutting. He stated that it was so badly burned that none of the crown facets remained. He stated further that in forty years of specializing in diamond recutting he had never seen a stone so badly burned; in fact, he attempted to place a facet on the stone before he was convinced that it was actually a diamond.

Emeralds

During the examination of a group of Colombian emeralds, we noted that one stone had a peculiar iridescence on its table surface. Although this characteristic has been mentioned in this column before, it was always associated with a worn stone, rather than recently cut material, as in this case. We have not been able to determine whether the effect is a reaction of the polishing agent or whether it is a residue of an agent in which the emerald was soaked to minimize the appearance of its fractures.

Carved, Purple-Glass Cameo

Submitted for identification was a black-enamelled, yellow-gold brooch set with a "stone" cameo of a lovely purple color. The combination was unusual and attractive, and to all appearances the cameo was an amethyst; however, magnification revealed gas bubbles typical of glass. The cameo was finely detailed, a quality of workmanship associated usually with natural materials *(Figure 4)*.

Conch-Shell Ensemble

An ensemble of necklace, earrings and bracelet represented as coral proved to be conch shell, carved and dyed in Italy. The material was fairly easy to identify because of the characteristic flame-shaped reflections in conch shell as it is moved, in addition to the obvious concentrations of color, giving it a more blotchy or banded coloring than is common to coral. A great deal of this material has entered the U.S. recently. The reason for representing it as coral is because the import duty on coral is only

Figure 5

5%, whereas a shell designation brings the duty to 55%.

Carved Emerald

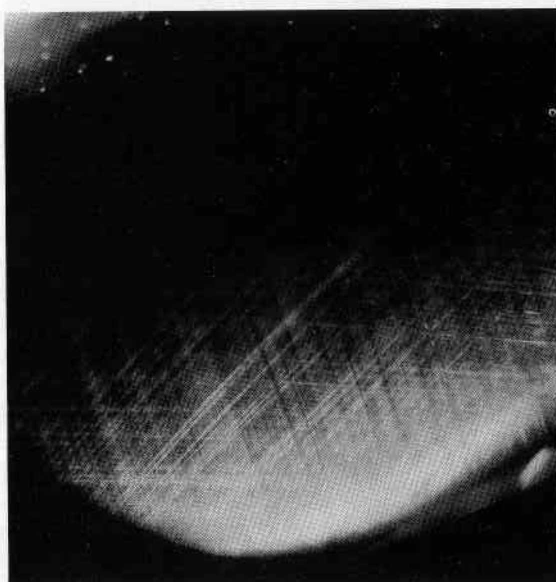
An emerald carved in the form of a calf's head has been submitted several times by various dealers. It is so unusual to encounter an emerald fashioned in this manner that apparently the stone is making the rounds in the trade.

Synthetic "Star of Destiny"

The new synthetic *Star of Destiny*, distributed by William V. Schmidt, Inc., is the latest attempt to reproduce the appearance of star ruby and sapphire *(Figure 5)*. It is an assembled product consisting of a ceramic back, a synthetic corundum or synthetic spinel top, and a thin metallic film between the two *(Figure 6)*. The top section is transparent and without asterism. The star is caused by reflection from three sets of lines engraved in the base of the top section *(Figure 7)*. The appearance of the stone is somewhat similar to that of star quartz, although it has the ob-

Figure 6

Figure 7



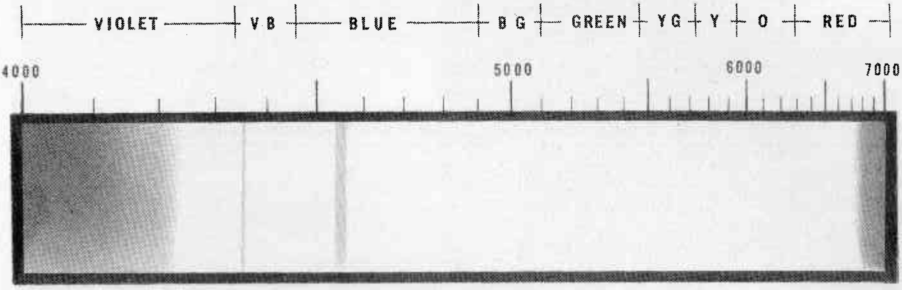


Figure 8

vious advantage of being much harder than quartz. The color of the stone depends on the color of the top section, which may be any color in which synthetic corundum or spinel is produced. It is planned to have a *Star of Destiny* for almost every birthstone color.

Andalusite

We had the pleasure of seeing and testing a gem andalusite that weighed more than 32 carats, the largest example of this rare stone known to us. Prior to this, the largest andalusite we were aware of was the 20-carat flawless specimen in the Peabody Museum, Harvard University. Since absorption spectra of the rare and unusual gem materials are understandably limited, we are attempting to record the spectra of as many as possible. The spectrum of the andalusite described above is shown in *Figure 8.*

Idocrase Cameo

We also identified a large translucent green cameo as idocrase. It is unusual to find what is considered a rare stone in the form of a cameo. This specimen was particularly beautiful and made an excellent jade substitute. Its absorption spectrum is shown in *Figure 9*. A photo of it is shown in *Figure 10.*

Translucent Variscite

We tested a rare example of a translucent green variscite and were able to record its absorption spectrum *(Figure 11)*. We are not aware that it has been recorded before.

Crocoite

Another absorption spectrum that we

Figure 9

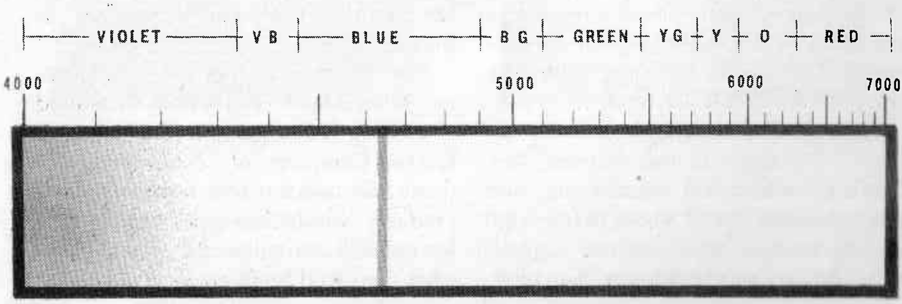


Figure 10

believe is being recorded for the first time is that of the very rare gem-collectors' mineral, crocoite. Not only is its occurrence rare but, because of its brittle nature, it is rarely cut. Its spectrum is shown in *Figure 12.*

In addition to the above materials we have tested beryllonite, scheelite, euclase and amblygonite in recent months.

Acknowledgements

Our thanks again to Mr. Theodore Moed, this time for a brownish-pink irradiated diamond. This color is not available commercially and is considered an accidental occurrence when a group of diamonds are treated. Apparently, only a certain type or color of diamond changes in this manner; but detailed studies and records are not made of melee lots of stones before and after treatment, so we cannot suggest why certain stones change to pink rather than the more common colors. It is interesting to note, however, that we have seen this color only in very small melee-size stones.

We are indebted to Dr. J. F. H. Custers, of the Diamond Research Laboratory, Johannesburg, South Africa, for a treated blue and a natural blue diamond. They can be used advantageously as master stones when checking blue diamonds for electrical conductivity.

Thanks to dealer Eric Engel for examples of rough Brazilian emeralds in matrix and some very attractive sodalite from a reportedly new find in Brazil.

We appreciate the very generous gift from Mr. J. T. Elovich, Diamond Marketing Manager of the General Electric Company, of 10 carats of synthetic diamonds. The company now produces two distinct types; one is used for resinoid and vitrified bonds and the other for metal-bond applications. Each

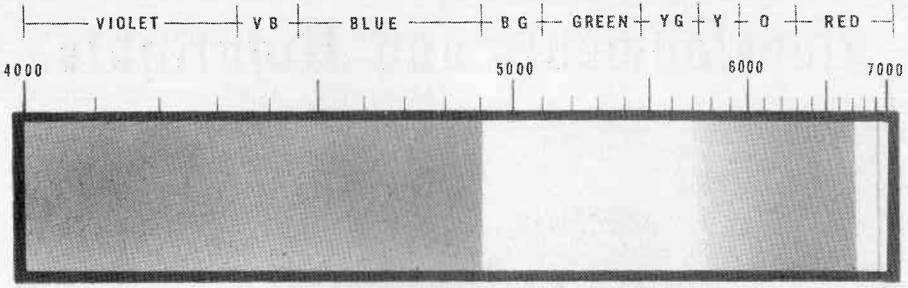


Figure 11

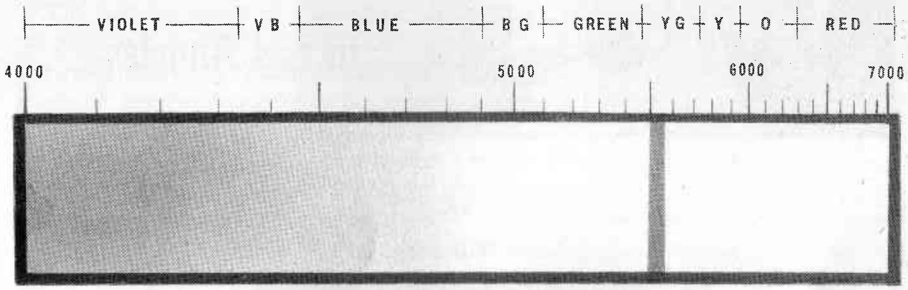


Figure 12

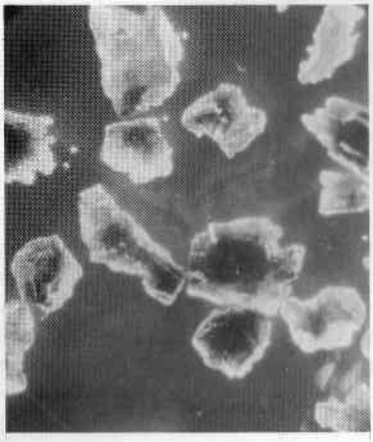


Figure 13

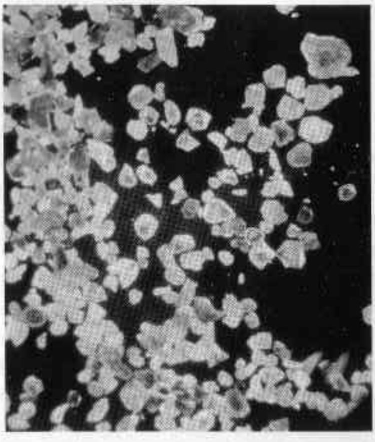


Figure 14

varies in shape and grain size. The type used for metal-bonded wheels is considerably tougher and more blocky in shape than that used for vitrified and resinoid bonding. The former is illustrated in *Figure 13* and the latter in *Figure 14*. Both photos were taken under 60X magnification.

Developments and Highlights

at the GEM TRADE LAB in Los Angeles

by

Lester B. Benson, Jr.

Director of Research and Laboratories

Fire-Damaged Jewelry

A major project undertaken recently was the examination of several hundred jewelry items to determine the extent and nature of fire damage and the possibility of restoration. In addition to a considerable quantity of diamond jewelry, the inventory included a number of pearl-set items and other pieces containing jade, turquois, opal, amber, etc.

Examination established the presence of a number of treated stones among the jade, pearl and turquois jewelry, which, for the most part, displayed fire damage. The dyed jade had been altered in color. Many of the black-treated cultured pearls displayed a streaky discoloration, but it was confined to the surface-treated specimens. Some of the turquois had been paraffin treated and displayed a spotty discoloration.

Of special interest was the smoke stain within inherent cracks in some of the remaining stones. It was noticeably concentrated in many of the separations, attesting to the exceptional penetrating ability of smoke fumes. Actually, the damage inflicted by the smoke and heat to the overall inventory was minor in relation to that caused by handling after the fire.

New GIA X-Ray Unit

The Los Angeles Laboratory is pleased to announce the installation of a new X-ray unit for pearl testing. It is considerably larger than the previous one and, with the exception of a slightly different exterior design, is the same as the new unit also recently installed in the New York Laboratory. Both instruments feature automatic timing controls, advanced safety devices, and other features that simplify radiography and fluorescence testing of pearls.

Treated Turquois

The announcement of a new treated turquois was received recently with the statement that it had been treated with a special plastic that emitted no odor when heated. If true, this could have caused considerable difficulty in the identification of mounted plastic-impregnated material. However, tests with an electric heat needle revealed that the claim was incorrect, for the odor was similar to that produced by Bakelite. It is possible that a slightly higher heat may be required for detection than for the earlier treated material, and thus may not have been noticeable during polishing. This could explain the claim that the material does not emit a typical plastic odor, since most lapidaries use a polishing wheel for detecting this type of treatment.

An Unusual Benitoite

A very unusual benitoite, weighing 2.78 carats, was sent to the Laboratory for identification. The stone was attractive in color and flawless. It possessed such strong dichroism that, when observed under magnification through the table, the extraordinary ray was almost completely absorbed. The resultant absence of doubling when viewed in this position made it appear to be singly refractive. In the polariscope or through the dichroscope, the dichroic colors were colorless and almost black.

Paraffin-Treated Turquois

A rather expensive turquois necklace submitted for checking proved to be average-quality paraffin-treated material. When it was returned to the jeweler who had offered it for sale, he was quite concerned and contacted his supplier. The supplier apparently was very disturbed and claimed that it was natural for paraffin to be present, since turquois "is polished with paraffin." Anyone who has had experience with turquois is fully aware of the disastrous results of impregnating it with paraffin, since the end result is an eventual color change. Furthermore, compact, fine-quality material does not need aids of this kind to produce a high polish.

New Ecuadorian Gem Lab

A prominent jeweler, Augusto M. Castro, from Quito, Ecuador, visited Los Angeles recently to purchase diamonds and other jewelry merchandise for resale in his own country. While discussing diamonds with a wholesaler, he was given the opportunity to examine a number of stones through the new GEMOLITE (the GIA's gemological binocular microscope) and was highly gratified with the results. He was not aware that such equipment existed, and subsequently was referred to the Institute. The fact that a complete selection of specialized grading and merchandising instruments was available, in addition to comprehensive gemological training, impressed Mr. Castro greatly, since these modern jewelers' aids are virtually unknown in Ecuador. He immediately changed his plans and made arrangements for a program of concentrated private tutoring in diamond grading and appraising and general identification procedures. All discussions were handled through a translator. Mr. Castro was unusually adept at grasping the full significance of the various phases of his training program, and quickly became proficient in the use of the instruments. He left with complete equipment to set up the first basic gemological laboratory in Ecuador.

New Film For Jewelers' Camera

For those who are using the new GIA JEWELERS' CAMERA, attention is called to the recently introduced Polaroid film: Type 47. It offers all of the advantage of the old film, in addition to a 3000 speed rating and ten-second developing. The faster speed but wider latitude actually reduces the range of exposure times formerly required to accommodate various combination of lighting and enlargements, thus assuring superior photographs on the first exposure of a new setup. The ten-second developing time permits duplicating prints as fast as the film can be removed and coated.

Denver Diamond Class

Members of the Denver, Colorado, Diamond Evaluation Class that met September, 1960. First row, left to right: **Wade Munden,** Salt Lake City, Utah; **Alexander Dietz,** Denver; **J. A. May,** Farmington, New Mexico; **Arthur O. Bush,** Denver; and **Rex Gard,** Alva, Oklahoma. Second row, left to right: **Mrs. Clifford W. Odell, Jr.,** La Habra, California; **Clifford W. Odell, Jr.,** La Habra, California; **Fred Crum,** St. Francis, Kansas; **R. C. Neuenschwander,** Scott City, Kansas; and **Charles McElwain,** Fort Morgan, Colorado. Third row, left to right: **Eugene E. Rose,** Denver, **Ernest E. Hess,** Lakewood, Colorado; **Forrest J. Lutz,** Yuma, Colorado; and **Harry Blalack,** Denver. Standing, GIA Instructor, **Gale M. Johnson.**

Planning and Using Your New Diamond Room

Continued from page 104

tain design balance and the feeling of a complete unit, the use of any highly contrasting medium of this kind requires some duplication elsewhere. The other counter that was removed was replaced by sit-down counters.

Depending on the location of the jewelry stock to be shown in the diamond room, it may be advantageous to alter the design in this example by opening the aisle behind the counters into the room. In this case, the table could be placed parallel to the aisle and extended from wall to wall, to take maximum advantage of a small area. These details are optional, and several possible layouts should be considered before making a final decision.

The location of the lamps over all parts of the diamond area is critical; they should be centered over the customer, not over the counters. This will prevent disturbing reflections from counter tops and will not impair the efficiency of the lamps.

Instead of a completely tiled floor, carpeting should be used in the diamond room; if desired, it also may be used in the general diamond area, extending into the aisle only far enough to accommodate the chairs and standing areas in front of the counters. Whether or not carpeting is advantageous throughout the entire store depends on the nature of the establishment and the clientele to which it caters. For most stores, one or two small carpeted areas are sufficient to impart the desired atmosphere, and it is comparatively inexpensive to add. If tile is used, it should be neutral in color and without a pronounced pattern.