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VOLUME XVI *NUMBER 7*

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IN THIS ISSUE

Developments and Highlights at GIA's Lab in New York

By ROBERT CROWNINGSHIELD
With Photographs By
ALAN RODITTI, G.G.

Some Sapphire Problems

Fancy yellow to orange-yellow natural colored sapphires are relatively straightforward in their identification. Ceylon stones tend to be a pure yellow, fluoresce a typical reddish-orange (apricot) and exhibit no iron line in the spectroscope. Stones from Thailand, Australia and East Africa all tend to be brownish yellow, show little or no fluorescence and exhibit strong iron lines. Typical inclusions may be present to assist in separating from synthetics. Therefore, when we encounter a natural yellow sapphire of brownish-yellow hue which does not show an iron line and no fluorescence, a short exposure to sunlight usually establishes the fact that it has been irradiated. Even X-rays may produce the necessary color center in pale Ceylon stones. Since last issue, we have had several lots of such treated stones in for testing.

During the same period, we have had two new types of sapphires presented which are mystifying and we were unable to carry out all the tests we would like since the clients did not own the stones. One was a handsome orange-brown star sapphire of a color we have never seen or heard of. It did not show an iron line, but did fluoresce very weakly. Had we been allowed to give it a fade test, perhaps we could have solved the mystery *(Fig. 1)*.

Recently, we have seen several intense red-orange natural sapphires *(Fig. 2)* in which the color appears to lie just near the surface. In fact, some facets appear to have had color polished away so that in immersion the stones resemble Lechleitner synthetic emerald overgrowth on

Figure 1.

Figure 2.

Figure 3.

Figure 4.

Figure 5.

Figure 6.

Figure 7.

Figure 8.

beryl. They do not show any absorption lines (neither iron nor chromium), while the ultra-violet fluorescence is weak at best.

Under immersion, a splotchy appearance is seen and the body color appears to be pale yellow *(Fig. 3).* Close observation of the surface shows an amazing reticulated or honeycombed "crazing" lying just under the surface and unrelated to prominent polish lines *(Fig. 4).* We were unable to see if the stones held their color in sunlight. With all the rumored treatments of sapphires, we have been surmising that perhaps in their experimenting, operators have discovered some method of introducing this most attractive color near the surface of natural yellow sapphires. Perhaps the stones we have seen were so badly worn by the treatment they had to be repolished, resulting in the splotchiness noted. The peculiar surface appearance defies solution at the moment.

Black Star Observation

The 12-rayed black star sapphire pictured in *Fig. 5* brought to mind a comment made at the 17th International Gemmological Conference in Idar-Oberstein in September by Dr. Edward Gübelin. He has been investigating the cause of asterism in this variety and other specimens and has not yet determined what foreign material is responsible — in fact, has been unable to detect foreign material. (He has determined that sillimanite is the cause of asterism in the multi-star quartz.)

A Sphene Ring

Fig. 6 shows an approximately 20-carat oval green sphene in a lady's ring with diamonds and citrine side stones. Surprisingly, the stone showed very little wear. Note that our photographer caught the strong double refraction.

Another Fake Matrix Emerald

In *Fig. 7,* we see the most flagrant imitation emerald crystal in matrix we have yet encountered. Aside from the ground-up gray rock to form the matrix, the whole specimen is plastic. The gray material is held together by plastic and the "emerald" is entirely plastic. The light "heft" of the specimen was one clue that a fake was involved. A hot point proved it.

Unusual Mexical Opal Specimen

Graduate Leon Trecker of Long Beach, California, gave the writer what we both assumed to be a specimen of natural glass, probably a light colored "Apache tear." Back in New York, the piece was examined under the microscope and just did not look right. Testing established that it was in fact an opal *(Figs. 8 and 9).*

Merchandising Diamond Inclusions

With diamonds at or near their all-time highs in price, jewelers are finding that stones to be worn in jewelry, especially engagement rings, are smaller and of lower quality in order to be afforded by today's young man, what with all the other eco-

Figure 9.

Figure 10.

Figure 11.

Figure 12.

Figure 13.

Figure 14.

Figure 15.

Figure 16.

nomic pressures coming to bear. It has occurred to us that just possibly some inclusions could be shown to a buyer in a positive manner as something unique, identifying and occasionally beautiful in themselves. With the aid of a binocular microscope, an imaginative jeweler might be able to capture a client's fancy by first showing unusual inclusions. With this idea in mind during the past few months, New York Staff Photographer, Alan Roditi, has been capturing such inclusions on slides. *Fig. 10,* however, was taken nearly 20 years ago and the stone was given the name "The Willie Mays" diamond. Clearly, the shot is of a baseball player wearing a turban. Recently, Alan took a photo so like the early one it had me searching the slide collection to see if it was the same stone. It isn't but the inclusions are amazingly alike *(Fig. 11).*

Very recently, we graded a diamond with a spherical light green inclusion resembling a baseball or tennis ball. The diamond was nonfluorescent but the "ball" fluoresced bright yellow. Whether or not to show a customer this phenomenon is debatable. He might love it *(Figs. 12 and 13).*

Another diamond had an inclusion resembling a stick figure or skinny ballet dancer *(Fig. 14).* Maybe the brown worm in *Fig. 15* would not be something to show a customer — unless he were an avid fisherman. Could the owner of the diamond shown in *Fig. 16* ever mistake his stone? The inclusions remind the writer of bracken or fern shoots or fiddle heads. We have no idea what they really were. And then in *Fig. 17,* we see some roots — actually branching hollow tubes we have seen only once before. Smokey The Bear is very realistic in *Fig. 18* even to his brown color! Other creatures of nature that we have identified lately are a sea-gull, *Fig. 19;* a dolphin, *Fig. 20;* a bird, *Fig. 21;* and a turtle, *Fig. 22.*

Melting ice cubes were caught in *Fig. 23,* and in *Fig. 24,* we see fireworks resembling sparklers.

Other Interesting Diamond Inclusions and Characteristics

The following photos were taken of peculiar inclusions perhaps not quite so meaningful to a potential customer, but in many cases, highly identifying. *Fig. 25* shows needle-like inclusions in two directions prompting someone on the staff to remark that some day we will see a cat's-eye or star diamond. (Once the cabochon process on diamond is perfected!) The yellow cubic cloud in *Fig. 26* did resemble a marshmallow. Red garnet crystal inclusions such as the one in *Fig. 27* always seem to fascinate jewelers and laymen alike. (Two gems for the price of one.) The inclusion in *Fig. 28* was determined by Vince Manson, GIA Research Director, to be chrome bearing, possibly chromite. The metallic crystal comes to the surface on the pavilion and from the crown a yellowish haze surrounds the inclusions *(Fig. 29).*

The included crystals in both *Figs. 30* and *31* were positioned in the cut

Figure 17.

Figure 18.

Figure 19.

Figure 20.

Figure 21.

Figure 22.

Figure 23.

Figure 24.

stone so that they reflect in nearly every facet. In grading for clarity of such occurrences, it is possible for a single "VS_1" inclusion to be reflected so much that the stone has to be graded SI_1 or SI_2. Such a stone is identifiable, though. The inclusion in *Fig. 32* is an octahedron with an etched surface. The tip of the octahedron forms a knot on the table of the parent diamond. A rarely seen cubic pit on the girdle of a polished diamond is shown in *Fig. 33*.

The "characteristic" illustrated in *Fig. 34* is not natural, but is the result of the uncertainty many jewelers are experiencing due to the growing number of cubic zirconia horror stories. Unfortunately, the "fake" detected by the jeweler responsible for the damage shown here is a diamond with the table parallel to the softest direction (cubic). The jeweler's fool proof tester must have been diamond oriented so that the point of the tester was a hard direction. We may be seeing more such horror stories.

Some New Imitations

We are indebted to GIA Board of Governors member Kurt Nassau for sending us two imitations, one of which must be new, and the other we do not know. The new one is an ivory imitation described as microcrystalline cellulose. With ivory declining in commerce, this may fill a need. In color, it resembles ivory and we are told it can be made in any color and size. We found the following properties: R.I. 1.54; S.G. 1.53; u.v. fluorescence (both wave lengths) medium yellow; hardness 4½; negative acid reaction; dull granular fracture (no engine turning effect); burning paper odor with the thermal reactor. The product was developed by Dr. A.O. Battista and released as "Avory Cultured Ivory" by the Research Services Corp. of Forth Worth, TX.

The other imitation is glass used to imitate a star sapphire *(Fig. 35)*. Unlike most glass imitations of star stones, the rays are clear and appear to go from the apex into the blue glass resembling the work seen in glass paper weights or old fashioned Christmas candy. Identification is no problem, of course.

Diamond Chips

About once a year we receive an item for testing in which honest to goodness diamond chips appear. Many on the staff have never seen these in jewelry and we were pleased to be able to show the ring in *Fig. 36* and *37* which contained three synthetic blue sapphires and numerous small cleavages (chips). Most laymen are under the impression that any small diamond is called a chip when in reality, they are single cuts, or more rarely, rose cuts, but of small size.

Size and Diamond Color

We have often been impressed with the scarcity of really top colored small diamonds. We have graded far more 3-carat and up such stones, than we have D colored 1-carat stones. Extraneous causes such as the

Figure 25.

Figure 26.

Figure 27.

Figure 28.

Figure 29.

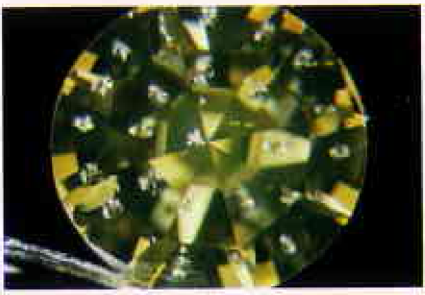


Figure 30.

Figure 31.

Figure 32.

Figure 33.

Figure 34.

Figure 35.

Figure 36.

cut, girdle effect, etc. seem to affect small stones more than larger ones. An illustration of this came about when we had the chance to grade all the stones cut from a very large crystal. The largest cut stone was more than 100 carats. All the rest of the stones weighing more than 1.00 carat could be conscientiously graded D in color. The three stones under 1 carat, with the smallest only .36 carat, were by no means D in color, though they were graded E. This brings up the fact that re-cutting a diamond may alter the effect of light on the stone with a consequent — alas, usually lowering of the color. We have seen this when a client has requested re-checking a borderline stone for a higher color, only to lose the higher color by recutting the stone.

Figure 37

The Size and Weight of Diamond And Diamond Imitations

By K. NASSAU, Ph.D.
Bernardsville, N.J.

The size-weight relationship in a faceted gemstone depends on two factors: the proportions (shape) of the cut and the specific gravity (density). The proportions are usually determined by the refractive index (and, to a lesser extent, by the dispersion) so as to maximize "life," i.e. brilliance and fire. The proportions are always subject to variations induced by the shape of the rough. Details on the history and current practices with respect to diamond proportions can be found in Bruton's book[1] and elsewhere.

In *Fig. 1* are presented curves which permit conversion between the size (diameter in millimeters) and weight (in carats) of brilliant-cut diamonds and several diamond imitations. As one example, by following the horizontal line for 2 carats to its meeting with the diamond curve, such a diamond can be seen to be a little over 8 millimeters in diameter. By now, following the 8 millimeter line upwards, it can be seen that this diamond would be matched in size by a 2¾ carat YAG (yttrium aluminum "garnet"), a 3¼ to 3¾ carat synthetic cubic zirconia, or a 4¼ carat GGG (gadolinium gallium "garnet").

Values determined by using *Fig. 1* are only approximate, since there can be considerable variation in shape; for the diamond curve the Tolkowsky proportions have been used. Even the specific gravity can vary for synthetic cubic zirconia, where both the type of stabilizer as well as the amount used can be varied[2]; as a result, synthetic cubic zirconia stones may fall on the curve given in *Fig. 1,* or may range as far as half-way towards the GGG line.

The values for several other gemstones can also be read from *Fig. 1*. Rutile, spinel, ruby and the sapphires fall about half-way between diamond and YAG, and strontium titanate falls a little above the YAG curve. Both quartz (including rock-crystal, smoky quartz, citrine, and amethyst) and the beryls (including aquamarine, golden beryl, morganite, and emerald) fall on the diamond curve; although their specific gravities are much lower than that of diamond, so are their refractive indices, thus necessitating a much deeper stone.

Finally, it should be noted that some manufacturers and retailers give the weight of their diamond imitations not as the actual weight of the stone, but as the weight of an equal size diamond. Since this practice is not always specifically mentioned, it can cause considerable confusion!

Part of this material is taken from the author's book "Gems made by Man," being published about April 1980, by the Chilton Book Co., Radnor, PA.

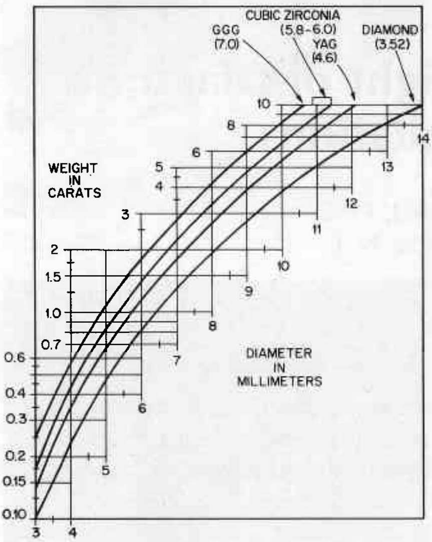


Figure 1. The weight-diameter relationship for brilliant-cut diamonds and some diamond imitations. Strontium titanate falls a little above the YAG curve; rutile, spinel, ruby and sapphires fall between the YAG and diamond curves; and quartz and beryl fall on the diamond curve.

References

1. *Diamonds,* E. Bruton, 2nd Edition, Chilton Book Co., Radnor, PA, 1978.
2. K. Nassau, "Cubic Zirconia, the latest Diamond Imitations and Skull Melting," Lapidary Journal *31,* 900 (July, 1977).

Developments and Highlights at GIA's Lab in Los Angeles

By ROBERT E. KANE

Trigons on a diamond by interference contrast. 200X

Synthetic Rubies

Quite recently the Los Angeles Laboratory has been requested to identify several fine quality synthetic rubies. In dealing with the identification of these stones careful study through the microscope is applied to determine the origin: natural versus synthetic. Inclusions have always been a necessary criterion in terms of this ruby separation. Under magnification these stones have revealed some interesting inclusions, some of which had not been encountered previously.

One such example is shown in *Figs. 1* and *2.*: The presence of uniform parallel growth planes which meet at an angle, but do not intersect as expected in a natural ruby. At first glance this may appear to resemble the hexagonal growth displayed by silk and straight zonal banding which is also seen in some natural rubies. Upon further examination through the microscope it was noted that these growth planes differ in appearance from that which is encountered in natural stones. In some of these synthetic rubies is the presence of uniform parallel growth planes which do not intersect *(Fig. 3)* and is somewhat comparable to the laminated twinning seen in some natural rubies *(Figs. 4, 5 and 6).* This laminated twinning differs from the synthetic growth planes in the fact that the laminated twinning is composed of precise parallel "layers" that continue into the stone. The growth planes in the synthetic material are not of this nature.

One feature of these synthetic stones should be noted: The growth planes are not always readily apparent and careful positioning of the stone to obtain an oblique angle of illumination might prove necessary.

This type of synthetic ruby may also contain angular inclusions of flux which appear white *(Fig. 7)* that somewhat resemble crystals found in some natural stones *(Fig. 8).* Wispy veil-like inclusions *(Fig. 9)* which may be similar to the fingerprint pattern seen in some natural stones *(Figs. 10-13)* were also noted. Angular inclusions of flux which appear dark *(Fig. 14)* and stringer-like inclusions of white flux *(Figs. 15 and 16)* were also encountered in some of these synthetic rubies. This type of synthetic ruby can contain any one or a combination of the previously mentioned inclusions.

Recently sent to the Laboratory for identification was a fairly large cushion antique mixed cut of this same type of synthetic material. The interesting feature about this particular stone was its cutting, because the majority of synthetic rubies examined in the past have usually been relatively symmetrical. However, this stone did have a poor symmetry reminiscent of some far eastern cut natural rubies.

(Note: In *Figs. 1-16* the colors of the photographs are not necessarily a true representation of the face up color of each gemstone, due to the different angle of illumination that was necessary to photograph each particular inclusion.)


Figure 1.

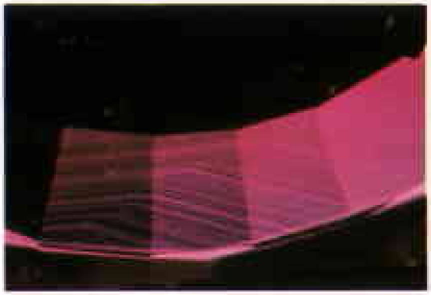


Figure 2.


Figure 3.


Figure 4.


Figure 5.


Figure 6.


Figure 7.


Figure 8.

Figure 9.

Figure 10.

Figure 11.

Figure 12.

Figure 13.

Figure 14.

Figure 15.

Figure 16.

Some Unusual Clouds in Diamonds

We have seen a thin square cloud in a diamond before, similar to the one shown in the Spring issue of Gems & Gemology, 1967, in which George Kaplan of Lazare Kaplan & Sons diamond firm commented that this type of inclusion is characteristic of diamonds from Sierra Leone. But I have never personally seen a cloud quite like the one that we encountered recently in the round brilliant diamond *(Figs. 17 and 18)*. This cloud has four symmetrical voids originating near the center and continuing outwards toward the corners of the square, creating an inclusion remarkably resembling a maltese cross. This inclusion is somewhat similar to the one in a 1.55-carat emerald cut diamond shown in the Winter issue of Gems & Gemology, 1966-67, and the Spring issue, 1967.

Fig. 19 shows a round brilliant diamond which contained an unusual cloud. This cloud was in very high relief and had an angular appearance that was almost hexagonal. The structure of this cloud was hollow with an open end and terminating in a point at the other end.

In the diamond shown in *Fig. 20* approximately one half of an octahedral cloud near the culet is seen. When viewing a round brilliant diamond from the crown, an inclusion that is positioned in this way will usually reflect. As seen in *Fig. 21*, this particular reflector forms an interesting symmetrical pattern.

Figure 17.

Figure 18.

Figure 19.

Figure 20.

Figure 21.

Figure 22.

Figure 23.

Figure 24.

Cubic Natural

In *Fig. 22* a rarely seen cubic natural is shown. This is the type of typical growth marking that may be encountered on the faces of diamond cube rough. The sides of the square or rectangular depressions are set at 45 degrees to the edges of the cube *(Figs. 23 and 24).* Cubes are rarely found in gem quality diamond rough, the most common habit being octahedral. When a diamond cube is fashioned into a gemstone, the table will often be cut parallel to the cube face. Therefore, when cut stones with these growth markings are encountered, they will probably be positioned 45 degrees to the table.

Green Graining

One unusual characteristic seen in some diamonds is that of colored graining. Green graining is sometimes associated with light green natural colored diamonds. However, the green graining shown in *Fig. 25* is not the first that we have seen in a near colorless diamond, but still is a somewhat rare occurrence.

Figure 25.

"Trapiche" Emerald

In 1964 an unusual type of emerald was encountered in Colombia. This type is known as "Trapiche," after the Spanish word for the sugar cane crushing gear which it resembles. If large enough, the green sections of these stones would be cut up into small stones; if too small they were usually discarded at the mine. With the increase of emerald prices over the past decade these small stones apparently are no longer discarded. "Trapiche" emeralds are now sold as mineral specimens and also to be cut into cabochons.

There are many types of "Trapiche" emeralds. The type that we have seen most often consists of a central hexagonal column of emerald with six arms of this same material extending outward from the central column. The interstices between these arms are a finely grained material which can be whitish to black in appearance.

Recently sent to the Laboratory was a "Trapiche" emerald of a slightly different appearance. This 13-carat oval cabochon consisted mainly of one central hexagonal column and six prisms of semi-transparent emerald separated by a fine grained opaque material. As seen in *Fig. 26*, the central column tapers dramatically as it continues toward the bottom of the cabochon.

Figure 26.

Radiation Stains

Recently sent to the Laboratory for full quality grading was a round brilliant diamond which had an interesting feature: radiation stains were found on both of the two naturals on this G colored diamond (shown in *Fig. 27).* Radiation stains on diamond naturals are usually associated with green diamonds. This is the first time we have encountered this feature on a near colorless diamond.

Figure 27.

More Diamond Inclusions

Occasionally we will see an iridescent feather in a diamond like the one shown in *Fig. 28*. Feathers of this nature usually occur in a plane that is relatively parallel to and near the surface of the faceted diamond.

An unusual inclusion in a dia-

Figure 28.

Figure 29.

mond is shown in *Fig. 29*. At the edges of the inclusion are needles radiating outward at various angles. The darker colored areas at the left of the inclusion may have been stained by an iron oxide.

Acknowledgements

I would like to thank Michael R. Havstad of Gem Media for the excellent photographs of the rough diamond cube shown in *Figs. 23* and *24*, and John I. Koivula for the excellent photograph on the cover page of this column. All other photographs are by Robert E. Kane and Shane F. McClure.

COOBER PEDY — The Opal Town

By JONATHON STONE
Australian Information Service
New York, New York

Even when you see Coober Pedy, it is hard to believe. This town fries or freezes — an incongruous clutch of buildings in the middle of a vast desert — a landscape marginally more hospitable than the moon.

What looks like meteor craters are opal diggings, for Coober Pedy is the source of 90 percent of the world's opal. Nobody knows just how much opal each year comes out of the tunnels in a 126,000,000-year-old rock-hard sea bed, some 900 km (560 miles) north-west of Adelaide.

The official census shows that 1,740 people live in the township. Actually there are more than 5,000 residents.

Opal and isolation attract people who want to get away from other people, with the thought that they might also strike a fortune.

About 20 percent of the population is aboriginal, and 60 percent is of an ethnic origin other than British or Australian.

The past history of conflicts between many of their original countries seems to have been altogether forgotten.

Accent or origin means nothing, but substance and character are everything.

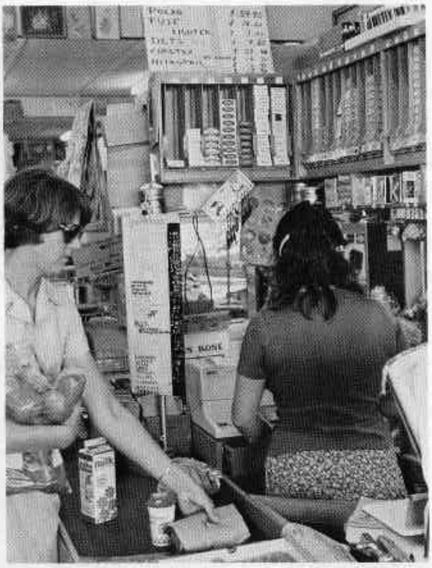
Temperatures may rise to 54°C (130°F) in the shade in summer and drop to freezing point on a winter's night.

The average rainfall for the past 25 years has been 50 mm (two inches) and it costs $A64 to have a household tank filled from the township's only water supply — brackish and scarcely drinkable after being pumped from an artesian basin.

The local area school, which caters to 525 children from pre-school to university matriculation, has an annual water bill of $A25,000.

Lawns are out of the question. However on the rare occasions when it does rain, the desert turns green overnight and carpets of wildflowers stretch to the horizon.

Five years ago there were five trees



Coober Pedy Supermarket, differing from the supermarkets most of us shop at in that this market also sells high explosives. (Note list in top center of photo.)

in Coober Pedy over five feet tall. Now there are about 100 planted at the school.

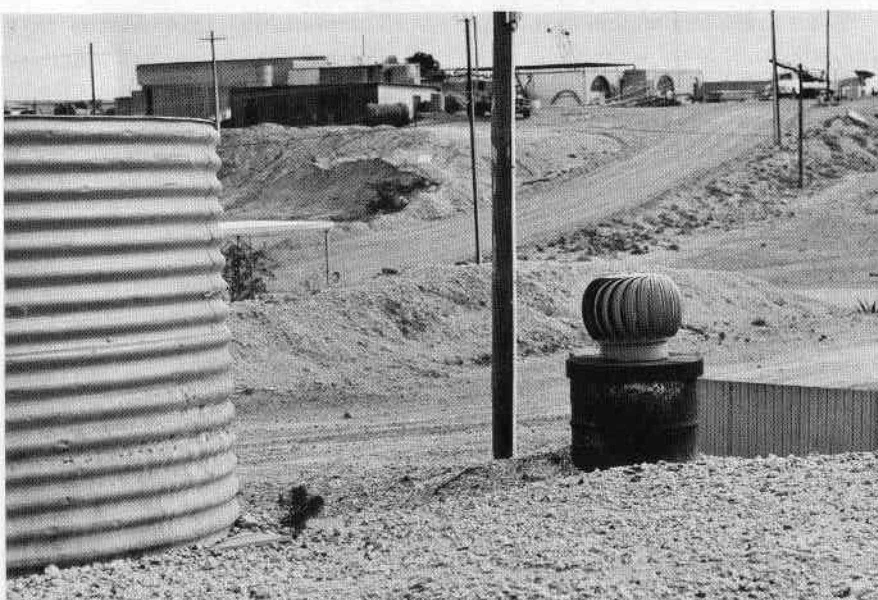
So important is the sight of trees to children that the school will use some of its precious water to maintain a drip irrigation system.

But nothing can be done about the remorseless bush flies, and dust is an ever-present irritation.

To escape the extremes of climate, many people live and conduct their business underground. A further incentive is the ever-present possibility that these diggers will strike opal.

These dugouts are also good investments because hillside sites are becoming scarce.

Dugouts don't need air conditioning. Despite the variations in outside



A ventilation shaft and a water tank mark the location of an underground house in Coober Pedy. (Australian Information Service photograph.)

temperatures, dugout temperatures generally vary no more than two or three degrees from 22° C (72° F).

At night, the dugout walls and ceilings, which look like red-veined marble, reflect artificial light, and seem to sparkle with diamonds, rubies, emeralds and sapphires.

In fact, the marble-like walls are silt of an ancient sea bed, compacted so hard that only a pneumatic drill can dig through it.

The red veins are the remains of worms which lived in the sea bed 126,000,000 years ago. The diamond-like sparkles are reflections from gypsum chips and the reds, blues and greens are reflections from opalised sea shells.

On the surface are two modern motels, one with a disco group whose lead singer and guitarist has studied music and composition in the U.S.A.

The post office, supermarket, several shops and restaurants are also above ground.

Virtually all business is done in opal or cash, and it is common to see bundles of notes totalling between $A100,000 and $A200,000 across the counter of the only bank.

The biggest surprise of Coober Pedy is that 5,000 individualists, from divergent backgrounds, have developed a cohesive community spirit.

There is no municipal government or no formal civic organisation — and the people want to keep it that way.

The township is run by a Progress Association and a Miners' Association which own the drive-in theatre, the main source of revenue for community improvements. Last year, its donations enabled the completion of a $A70,000 sports centre.

In many places in Australia's vast outback, landing strips are located on the nearest clay pan — the dry bed of a shallow lake. This one is at Andamooka, the small opal mining settlement about 320 km (200 miles) southeast of Coober Pedy. (Australian Information Service photograph.)

Other Miners' Association gifts last year included \$A6,000 to the hospital, \$A1,000 to the school library and large contributions to sporting bodies.

The school, well appointed and equipped, is the town's central meeting place for sports and other community organisations. At night it is used for adult education classes.

Most of its teacher aids, technical and electronic equipment is provided by community effort.

It seems unlikely that a government or major company would be bothered with Coober Pedy because there is no way of finding opal except by random digging, which is uneconomic on a large scale. Pockets of opal are usually small and not necessarily an indication of others in the immediate area.

Expensive machinery is neither necessary nor an advantage. More ground can be dug up with a bulldozer, but an opal level may be found perhaps just as quickly by a miner sinking a single shaft.

The sheer outlandishness of Coober Pedy, the possibilities of doing a little fossicking or buying opal cheaper on the spot, attracts many tourists during winter months.

Visitors usually come by air, and pilots of the local commuter service, called Opal Air, have opal wings pinned to their uniforms.

Notices on the window of the Coober Pedy Post Office. Note Mine Rescue Squad poster and Explosives Information Chart.

Recent Activities in GIA's Research Department

by D. VINCENT MANSON, Ph.D.
Director of Research
Gemological Institute of America

Steady progress continues to be made in achieving the major goal of GIA's research function. Specifically, this involves the establishment of a broad-ranging reference collection of gemological materials and documentation of their properties. In excess of 9,000 items are now catalogued in the reference collection and the slow but important task of collecting data on properties of all these materials is under way.

Certain specific gemological problems take priority and determine the emphasis in our data collection. Areas of special interest at the present include:

1. Origin of color in diamonds
2. Origin of color in lavender jades
3. Review of the gem garnet group
4. Color permanence in colored gemstones
5. Major and minor element composition of gem materials

Significant results obtained to date in the course of pursuing these broader goals are summarized below.

Second Crystal of Painite Discovered

In review of a box of gem spinels from Mogok, Burma, a gemmy crystal — clearly not a spinel and not readily identified with any other species — was encountered. The crystal measures about ¾ cm long and 3 mm in cross section. X-ray identification, together with other properties, identified the 1.7-carat hexagonal crystal as the second known sample of Painite. Chemical analysis showed it to be different from the composition first suggested for this mineral due to the absence of zirconium. Further library research and comparison with the type material confirmed this result.

Clarification of Composition of Maw Sit Sit

This intriguing ornamental gemstone from Mogok, Burma, was first described in the 1950's. It was recently examined under the scanning electron microscope, chemically analyzed with the energy dispersive X-ray system and X-ray diffracted to determine its internal structure, by using finely ground powder separates and studying the resulting powder patterns. Due to the intimate intergrowth of the two minerals present in the attractive dark green mottled jade-like material, it is not surprising that earlier identifications performed prior to availability of scanning electron microscopes and instrumentalized microanalysis techniques did not provide for correct identification of the components.

This study shows the dark green, almost black, phase (previously described as chrome jadeite) to be a pyroxene called ureyite, after Nobel Scientist Harold Urey. This mineral was discovered in meteorites and prior to our identification, was not known to occur terrestrially. Intimately intergrown with the ureyite is a colorless to white mineral previously identified as the feldspar albite, but which on clean separates proves unquestionably to be natrolite.

Unusual Gem Garnets from East Africa

As part of a long term project reviewing the chemical and physical properties of the gem garnets, an unusual "variety" of garnet from East Africa has been identified and the range of its properties is being investigated in greater detail.

The high grade metamorphic rocks exposed in Kenya and Tanganyika are among the oldest pre-Cambrian formations known, and have in recent years proved prolific sources of most intriguing gem materials. The area appears to have had a distinctive sequence of geological processes involved in its history which accounts for the varieties of gem minerals to be found — gem minerals not characteristic of areas with a less involved geologic history. Superimposed is the presence of a geochemical province characterized by a small but significant and widespread distribution of vanadium which occurs as a trace element in several of these gem minerals. Tanzanite is one of the better known examples of a gem mineral produced by these events in this locale. Vanadium tourmalines (frequently identified, due to traces of chrome also present, as chrome tourmaline in the trade) and vanadium grossulars or "tsavorite" are other important examples.

The East African gem province is noteworthy, among many other reasons, for the large variety and high quality of the gem garnets being produced. Along with fine rhodolites, grossulars, spessartites, and other garnets consistent in properties and composition with the traditionally recognized varieties of this species, it soon became apparent that some garnets occurred which were not conveniently encompassed by the traditional gemological separations for the varieties of this species. In particular, a garnet with a refractive index varying between 1.74 and 1.76, showing a strong manganese spectrum and most commonly with a rich golden-orange color. This garnet did not correspond with any of the recognized varieties, and became known in East Africa as Malaya ("Malia") from the Swahili word for "out of the family" (also used colloquially to describe a woman of the night).

This garnet falls in a composition range between spessartite and pyrope with a varied but small amount of the grossular molecule also present. Due to the unusual replacement within the garnet structure of atoms of significantly different size that this mixture implies, it is not surprising that mineralogists had previously considered such compositions of garnets to be of unlikely occurrence in nature. The rather special geological events, in particular the complex metamorphic history that provided for the formation of these garnets will, it is thought, provide the explanation for the unusual chemistry.

Among the "Malaya" garnets are some containing significant trace amounts of vanadium. The presence of this element provides for an exciting new character to the garnet in the form of a weak to strong alexandrite-like color change from a bluish mauve under fluorescent light to a warm magenta under incandescent lighting.

Plastic Impregnated Opal and Plastic Opal

Some time ago, an unusual opal caught our attention. Resembling a "semi-black" type of Australian opal, its unevenness in color and the presence of wispy veils of minute, discrete, opaque inclusions and a slightly low specific gravity invited further investigation. The scanning electron microscope eventually revealed that this was a plastic impregnated opal. The opaque inclusions were identified as octahedrons of the mineral bravoite, which to this time has not been found by us in any opal other than Brazilian varieties.

The plastic used initially was a carbon based polymer. We believe the process is now being done with a silica based polymer (i.e., a silane) which would have a higher specific gravity and provide for greater difficulties in identification. We continue to seek a positive separation less complicated than examination under the scanning electron microscope.

An opal simulant made entirely of plastic has been manufactured in both Japan and Australia. With unmounted goods, the very light specific gravity of this material (1.1) is a giveaway.

Australia Adds Rubies To Its Mineral Riches

By REX SCAMBARY
Australian Information Service
New York, New York

John Bruce, a veteran prospector engaged by a Melbourne company to explore a mining lease in the remote Harts Range in Australia's Northern Territory, found little for his troubles apart from some deep-red crystals.

The crystals have now proved to be Australia's first commercial discovery of ruby, one of the world's most valued gems.

Most top-grade rubies come from Burma and Thailand, with smaller quantities from Ceylon. Others have been found and are mined in Kashmir and Tanzania, but otherwise the distribution of the gemstone is limited.

Since Mr. Bruce made his discovery late in 1978, further exploration has revealed surface outcroppings of rubies over a wide area of the Harts Range lease, a region known previously only for small-scale mica mining.

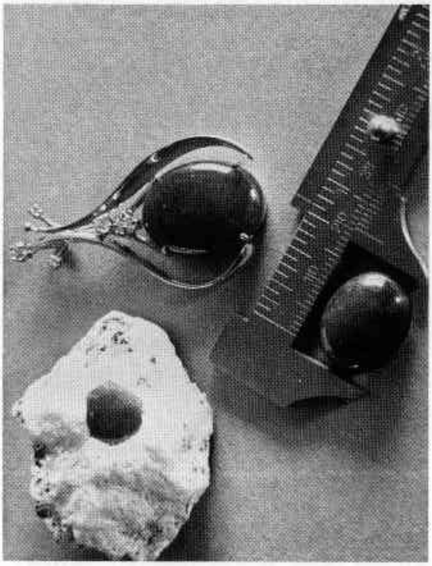
The Harts Range is north-east of Alice Springs, the main town in central Australia.

The rubies are contained in pockets of metamorphic rock, or gneiss, in a zone about 50 m (164 ft.) deep extending over some 20 km (12 miles).

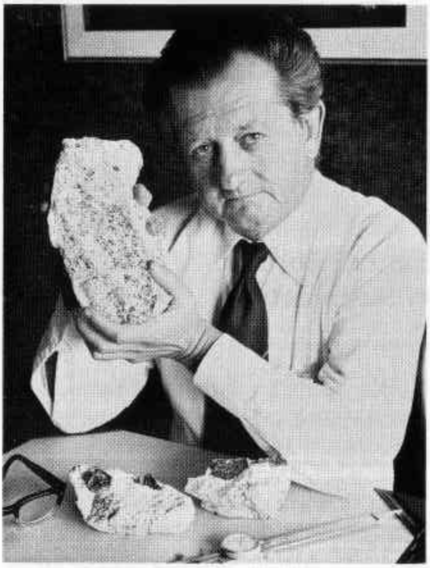
Ruby is a form of corundum, or aluminum oxide, characteristically formed in hexagonal crystals about 5 cm (2 in.) in diameter and about 1 cm (.4 in.) thick. It gets its distinctive red colour from small quantities of chromium.

Although the deposit has yet to be fully explored, geologists from the Australian Government's Bureau of Mineral Resources have assessed the rubies recovered to date to be of excellent cabochon grade and of good colour.

Only very small quantities of transparent stone have been found in



A sample of a ruby crystal from the Harts Range, set in its host rock, and specimens that have been cut and polished in the traditional cabochon shape.



Australian Information Service photograph by Norman Plant

Exploration consultant Tim Sloggett with rock samples from the Harts Range containing ruby crystals.

the Harts Range. Such stones, which are rare even in the traditional ruby producing countries, are prized because they are of faceting quality.

Hillrise Properties Proprietary Limited, the Melbourne company controlling the lease, has linked with a South Australian company, Mistral Mines NL, to develop the deposit.

As the rubies are in a shallow, subsurface deposit, a simple open-cut mining operation will be used, and grades are expected to improve as mining proceeds.

For an initial investment of about $400,000, the developers expect to mine and sell rubies worth about $2,000,000 in the first 12 months.

Australia has only limited technology for the cutting of rubies, and it is expected that the Australian stones will be processed in Bangkok, Hong Kong and the Federal Republic of Germany.

Acknowledgements for Gifts Received By The Institute

Santa Monica Headquarters

We wish to express our sincere thanks and appreciation for these gifts and courtesies:

To *Irving Apple,* Apple and Apple, Certified Public Accountants, Minneapolis, Minn., for a variety of gems including a 67.92-carat cuprite, a 45.60-carat smithsonite, and a 10.25-carat rhodochrosite. These gems will enrich our display and study collections.

To *Dr. and Mrs. John Chadwick,* Oxy Gems, Coalinga, Calif., for a selection of gems to add to the student stone sets.

To *Mr. and Mrs. Jack Chou,* Santa Ana, Calif., for an exceptional emerald carving weighing 948 carats. This distinctive gem represents a mountain, one of the important symbols of the Chinese Taoists. Visitors to the GIA will be delighted with the beauty of this work of art.

To *Mr. and Mrs. Louis Freedman,* Frankfort, Ind., for an extraordinary 63.32-carat yellow scapolite for our display collection.

To *Harold J. Greenspan,* Los Angeles, Calif., for a unique 3087.50-carat blue topaz to be enjoyed by everyone who visits our displays.

To *Richard Heckle,* Atlanta, Ga., for a medley of colored stones to add to our student study sets.

To *Stephen Howell,* for two faceted obsidian specimens to augment our research and display collections.

To *Mr. And Mrs. Thomas J. Morris,* Los Angeles, Calif., for a 15.50-carat rubellite tourmaline and a 13.25-carat indicolite tourmaline to be admired in our displays.

To *William Pinch,* Rochester, N.Y., for two intriguing specimens of diamond in matrix, four chrome diopsides, and four aquamarine crystals to enrich our display and research collections.

To *Mary Louise Johnson Ridinger,* Antigua, Guatemala, C.A., for a parcel of Guatemalan jadeite weighing 311 grams, much of which will be added to the student study stones. It is welcome also in the research collection.

To *Jim Royston,* Royston-Ward Jewelers, Inc., Dayton, Ohio, for an assortment of gems to add to our student testing series.

To *George Solibakke,* Honolulu, Hawaii, for a selection of gems including a 259.50-carat scapolite crystal, a 63.89-carat cushion cut scapolite, a 78.44-carat pink tourmaline, a 52.04-carat petalite, and a distinctive terminated spodumene crystal weighing 522 grams, all for displays and research.

New York Headquarters

We wish to express our sincere thanks and appreciation for the following gifts and courtesies:

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To *Akiva Rabinoitz,* GIA-GTL, Inc., member, for an urgently needed 1.26-carat "Z" master diamond for the new laboratory.

To *Mr. A. Ruppenthal,* Idar-Oberstein, Germany, for his gift of specimens of the new dark blue euclase, pink and prase opal, and Idar agate, all to help keep our students informed.

To *George Schuetz,* Larter and Company, for a variety of opal triplets to be used in the classrooms and displays.

Book Reviews

100 WINDOW DISPLAYS by H. Marquis, 1978, Edition Scriptar SA, Switzerland, 115 pages, text in English, French, German, and Spanish, $45.00 through GIA Bookstore.

How many customers do you lose each day because your display windows are the same? Express your store's image through crowd-stopping displays, beginning with the ideas in this text. Basic principles of window design such as the "Golden Rule" and the "Golden Number" are explained in detail, and clearly illustrated with photographs. Most of the displays are shown in color to illustrate proper use of tone, hue, and intensity. Complete instructions for making backgrounds and stands will make even a beginner's display attract customers. If each design is used for a month, there are more than eight years of creative display ideas! At that rate, the cost is a very small investment. This is also an excellent reference to supplement the GIA Creative Display course.

By Betsy Barker

THE JEWELRY IN YOUR LIFE by Morton Sarett, Nelson-Hall, Chicago, Ill., 1979. 144 pages, $27.95 through GIA Bookstore.

Mort Sarett has written a useful and much needed guide for the jewelry consumer. Easy to read and informative sections on gem materials, watches, metals and care of jewelry also give sound advice.

Birthstones and a history of rings are described in detail. The last chapter lists many of the jewelry retailer's frequent questions, and answers each question carefully. Unfortunately, the photographs are not of the same high quality as the text. The Hope Diamond is simply not impressive in black and white. The 12 pages of color photographs are interesting, but not unusual. Despite the cost and the poor photographs, this is an excellent gift for a valued customer, or a solid introduction for untrained sales staff.

By Betsy Barker

MINERAL NAMES: WHAT DO THEY MEAN? by Richard Scott Mitchell; 256 pages; 6 x 9; Van Nostrand Reinhold, 1979; $13.95 through GIA Bookstore.

"Mineral Names: What Do They Mean?" is the first modern comprehensive study on mineral names and origins. This work traces the origin of over 2,600 names bringing together an abundance of biographical, scientific, and historical data that until now was scattered throughout the mineralogical literature.

This book explains how minerals are named and investigates the origin and meaning of the various suffixes that are attached to mineral names. The names are presented in alphabetical order for quick reference. Biographical data, where possible, is given for minerals named after a person. This book should help the gemological and mineralogical communities alike in deciding which spelling to use for minerals like almandine-almandite, analcime-analcite, and haüyne-haüynite.

Gemologists, mineralogists, gem collections, geologists, and others interested in minerals and the geosciences should find this reference work a helpful and useful addition to their reference libraries.

By John Koivula

DIAMONDS, LOVE AND COMPATIBILITY by Saul A. Spero, Exposition Press, Hicksville, N.Y., 1977; $7.50 through GIA Bookstore.

Saul Spero's diamond shape game may be the best sales trick of the year. It's a fun and simple personality survey to give to couples who are buying an engagement ring. According to Mr. Spero, personality is clearly reflected in a woman's choice of a specific diamond shape such as round brilliant or marquise. After surveying thousands of engaged couples, Mr. Spero states that a groom can tell if he'll be happy with his bride by using this game. While the game is aimed at revealing the bride's interest in homemaking, the test will also reveal the groom's personality. No one has ever failed the diamond shape test!

This game could easily become part of a very effective sales presentation. Working closely with the customer to choose a favorite diamond shape also creates the trust and confidence needed to bring that customer back to buy again. Selling engagement diamonds should be fun, and with this method, these sales may be more profitable.

By Betsy Barker