*The stones Dr. Jahns holds in his hand are beautiful fakes, made from high-refractive-index glass like the chunk of "paste" shown on the table. The scattered stones are bonafide gems.*

by RICHARD H. JAHNS

# THE PURCHASE OF A GEM STONE

## —— Or What To Do Until the Appraiser Arrives

HAVE YOU EVER had an uneasy feeling about that aquamarine you picked up so inexpensively in Mexico—or the one that the beady-eyed, serape-shrouded character assured you was "just off the boat" from Brazil?

Or perhaps you were tempted into a hasty purchase, while in the antipodes as a tourist or serviceman, by the sparkle of a flawless "ruby" or "diamond" set in an impressive background of rapid-fire chatter from the vendor.

More likely, though, you recall your visit to the jewelry store to select that diamond ring, and how the happiness of the occasion was tinctured a bit with your confusion over the variety of stones (and prices) flashed before you on the showcase. You probably decided that buying a new automobile was a comparatively simple matter!

Our social customs and standards of living being what they are, most people in this country either buy or receive as a gift at least one gem stone during the course of their lives, and the national average is said to represent slightly more than two purchases per adult person. Most of these purchases are made through established jewelers, generally by individuals who are aware of their ultimate dependence upon the seller's word for the identity, quality, and intrinsic value of a given gem stone. Fortunately, most jewelers recognize and accept the responsibilities implicit in this relationship, whether or not they are personally qualified to make accurate appraisals of their merchandise. Those who are not so qualified

**What makes a gem valuable? How can you tell the real thing from a piece of glass? An expert answers some basic questions about gems.**

ordinarily rely upon the judgment of expert gemologists operating as brokers or agents at the wholesale level. The appraisal of gem stones is a tricky business, however, and the most experienced brokers have been known to muff one now and then.

Any alert person is attracted, often compellingly so, by what appears to be an unusually good bargain, even though he may be urged to commit himself before he can determine the real value of the article in question. In transactions that involve gem stones, the "good deal" usually is built around some form of cozenage or outright fraud, mild in degree only if the victim is lucky. Thus the purchaser who obtains a stone outside an established jewelry store, whether it be through a friend, from a stranger on the street, or at an auction, is strictly on his own unless he has the benefit of expert and trustworthy advice.

Even within the trade there are operators who may subordinate their scruples in favor of expanded profits on "quickie deals," and who seem to take special delight in attempting to swindle one another. Though shunned by Better Business Bureaus and all reputable dealers, they seem to make a reasonably comfortable living. Typifying their level of ethics is the story, probably apocryphal but undoubtedly containing elements of truth, of two diamond brokers in New York City. One of them approached the other saying, "If you will sell me a 5-carat diamond at a bottom price, I'll raffle it off among the dealers in town at twenty dollars a chance, and I'll cut you in for ten percent of the profit." This proposition seemed attractive enough, and the second broker acceded to the arrangement. The temptation to gull his colleague was too great to resist, however, and he slyly substituted for the diamond that had been agreed upon a white sapphire of excellent quality but vastly lesser value.

As time went by, this second broker heard rumors that interest in the raffle was high, and finally that the stone had been won by a third broker. He grew mildly apprehensive as he considered the reactions and reprisals that might follow identification of the stone, either by his associate or by the winner, and he studiously avoided contact with both of them. One day, though, he came face to face with the first broker, who greeted him with surprising warmth and commented upon the success of the raffle. After a few moments his curiosity overcame his caution, and he remarked, "Say, that really wasn't a diamond I sold you!"

"Yes, I know," was the rejoinder, "You made a neat switch."

"Then you're not sore about it?"

"No, not particularly."

"But what about the fellow who won it?"

"Oh, him," was the prompt reply. "Why should he complain? I refunded his twenty dollars!"

Although the purely negative aspects of gem purchasing are worthy of strong emphasis, more positive factors also should be considered by the buyer who wishes to obtain maximum value for his money. Several of these relate to the physical properties of the various gem materials, others to the preparation of these materials, and still others to long-established methods of merchandising that are peculiar to the gem trade. Some can be evaluated by any intelligent purchaser, others only by experts, but all of them relate to major problems about which the purchaser should at least be prepared to ask penetrating questions. These problems can best be compared with those involved in a more "normal" type of purchase, say of a new automobile.

The prospective buyer, in looking through the showroom window at the 1955 Ossel Eight, can be confident that this automobile is indeed an Ossel Eight, and not a Deep Six or some other make. He cannot have such confidence if he is shopping for a gem stone, especially if he deals with a seller of unknown or questionable reputation. Even with a perfectly honest merchant, he faces a complex terminology of well-established gem names along with trade names that range in flavor from meaningless to misleading. Some gem names, like diamond and zircon, are precise in meaning because they are identical with the names of the minerals themselves, but other popular gem names either are different from the corresponding mineral names or are applied to different varieties of given minerals. Thus peridot is the mineral olivine, ruby and sapphire are varieties of corundum, and emerald, aquamarine, and morganite are varieties of the mineral beryl. The most common gem materials and their corresponding mineral names are listed in the table on page 16.

Even more confusing are special gem names that plainly are intended to deceive the unwary purchaser. They generally resemble the names of valuable gem stones, and are applied to stones of lesser intrinsic worth. Thus red varieties of garnet, a relatively common gem mineral, have been sold as "American ruby," and green varieties of the same mineral have been sold

## THE MOST COMMON GEM MATERIALS

| Gem name | Color | Mineral Name | Index of refraction† | Chemical composition |
|---|---|---|---|---|
| Diamond* | Colorless, blue-white, yellow, brown, red, green, blue | Diamond | 2.42 | C |
| Ruby* | Red, pink | Corundum | 1.77 | $Al_2O_3$ |
| Sopphire* | Colorless, blue, pink, violet, green, yellow | | | |
| Emerald* | Green | Beryl | 1.58 ± | $Be_3Al_2Si_6O_{18}$ |
| Aquamarine* | Blue, blue-green | | | |
| Heliodor* | Yellow | | | |
| Morganite* | Pink | | | |
| Alexandrite* | Green in daylight, reddish by artificial light | Chrysoberyl | 1.76 | $BeAl_2O_4$ |
| Chrysolite* | Yellowish green | | | |
| Almandite* (carbuncle) | Deep red | Garnet | 1.70 to 1.90 | $(Ca,Mg,Fe,Mn)_3$ $(Al,Fe,Cr)_2$ $Si_3O_{12}$ |
| Demantoid* | Green | | | |
| Hessonite* | Yellow, green, brown | | | |
| Pyrope* | Red | | | |
| Rhodolite* | Rose pink to purple | | | |
| Topazolite* | Yellow | | | |
| Amethyst* | Pale violet to purple | Quartz | 1.55 | $SiO_2$ |
| Aventurine | Yellow, brown, red, green | | | |
| Cat's eye | Gray, green, brown | | | |
| Citrine* | Yellow | | | |
| Rock crystal* | Colorless | | | |
| Rose quartz* | Pink | | | |
| Smoky quartz* | Smoky gray, brown | | | |
| Tiger's eye | Red, brown, blue | | | |
| Agate | Gray, red, brown | Quartz, extremely fine grained (cryptocrystalline) | 1.55 | $SiO_2$ |
| Bloodstone | Dark green with red blotches | | | |
| Carnelian | Red | | | |
| Chalcedony | Gray, white | | | |
| Jasper | Yellow, red, brown, green, gray | | | |
| Onyx | Colored layers | | | |
| Sardonyx | Red and white layers | | | |
| Coral | Red, black, white | Calcite or aragonite, with or without impurities | 1.66 1.69 | $CaCO_3$ |
| Mexican onyx | Colored layers | | | |
| Pearl | White, pink, yellow, green, blue, brown, red, purple, black | | | |
| Alabaster | White | Gypsum | 1.53 | $CaSO_4 2H_2O$ |
| Moonstone | White | Feldspar (orthoclase or sodic plagioclase) | 1.53 | $K Al Si_3O_8$ |
| Aventurine | Green | | 1.54 | $Na Al Si_3O_8$ |
| Amazonstone | Green | Feldspar (microcline) | 1.53 | $K Al Si_3O_8$ |
| Hematite | Black | Hematite | 3.00 ± | $Fe_2O_3$ |
| Jade | White to green | Nephrite or jadeite | 1.63 1.68 | $Ca(Mg,Fe)_3Si_4O_{12}$ $Na Al Si_2O_6$ |
| Lapis lazuli | Blue | Lazurite | 1.50 ± | $Na_4S_2Si_3Al_3O_{12}$ |
| Opal | White, yellow, red, blue, green, gray, black | Opal | 1.45 ± | $SiO_2.nH_2O$ |
| Peridot* | Green | Olivine | 1.70 ± | $(Mg,Fe)_2SiO_4$ |
| Spinel* | Pink, red, yellow, purple, blue, green | Spinel | 1.75 ± | $(Mg,Fe)Al_2O_4$ |
| Topaz* | Yellow, red, blue, green, colorless | Topaz | 1.63 ± | $Al_2(F,OH)_2SiO_4$ |
| Tourmaline* | Yellow, red, blue, green, brown, pink, colorless | Tourmaline | 1.66 ± | Complex borosilicate |
| Turquoise | Green, blue | Turquoise | 1.65 | Hydrous copper aluminum phosphate |
| Zircon* | Yellow, orange, red, brown, green, blue, colorless | Zircon | 1.96 ± | $ZrSiO_4$ |

* Stones ordinarily used in transparent or nearly transparent form.

† The value of the maximum index is given for minerals that are optically anisotropic and hence have more than one index of refraction.

as "Uralian emerald." Similarly, "Balas ruby" is a name commonly applied to red spinel, a gem stone that is very attractive in its own right but scarcely commands the price of a true ruby. Modifying terms, especially those with a geographic connotation, should arouse suspicion in the mind of the purchaser, as a glance at the table on page 17 will indicate. The same caution is appropriate for coined trade names like "alexandrine," "rubicelle," and "sapphirine," which closely resemble valid gem or mineral names but are given to other, less valuable materials.

Attempts are being made in the jewelry trade to standardize the use of gem names, but much remains to be accomplished. Most unfortunate among the still-current deceptions is the widespread sale of yellow quartz for topaz, under names such as "Bohemian topaz," "Brazilian topaz," "Jewelers topaz," "Spanish topaz," or, worst of all, "topaz." Probably more than four-fifths of the "topaz" now in the hands of ultimate users of jewelry actually is quartz. This particular deception is rather serious, in part because the yellow color of much gem quartz is obtained by artificial heat treatment, and in larger part because true topaz (the "precious topaz" of the jewellers' trade) yields much more brilliant and attractive stones than does quartz.

The intelligent buyer, in comparing the Ossel Eight with other makes of automobiles, undoubtedly considers the materials of which it is made, the over-all appearance and quality of the final product, and its probable performance under the conditions of anticipated use. Similar considerations should be applied to the purchase of any properly identified gem stone. What are

its fundamental characteristics? Is it sufficiently hard and tough to be durable? Are its brilliance and color permanent? Does it contain tiny inclusions, "feathers," or other imperfections that lessen its real worth? And does its particular combination of properties have maximum appeal for the intended user? Finally, perhaps, will it constitute a good investment or is its value likely to depreciate in response to market conditions or broad changes in fashion? In these respects the wide variety of available gem stones is very much to the buyer's advantage, as he generally can find at least one type of gem that fits the specifications most desirable to him.

## MISLEADING NAMES COMMONLY APPLIED TO MATERIALS SOLD AS GEMS

| Applied name | Identity of material |
|---|---|
| African emerald | Green fluorite or tourmaline |
| African jade | Green garnet |
| Alaska diamond | Quartz |
| Alexandrine | Synthetic "alexandrite"= synthetic carundum or spinel |
| Alpine diamond | Pyrite |
| American ruby | Red garnet |
| Arabian diamond | Synthetic corundum |
| Arizona ruby | Red garnet |
| Arkansas diamond | Quartz |
| Australian ruby | Red garnet |
| Balas ruby | Red spinel |
| Black diamond | Hematite |
| Bohemian diamond | Quartz |
| Bohemian ruby | Rose quartz |
| Bohemian topaz | Yellow quartz |
| Brazilian diamond | Quartz or zircon |
| Brazilian emerald | Green tourmaline |
| Brazilian peridot | Green tourmaline |
| Brazilian ruby | Pink topaz |
| Brazilian sapphire | Blue tourmaline or topaz |
| Brazilian topaz | Yellow quartz |
| Brighton emerald | Green glass |
| California moonstone | Chalcedony |
| Ceylon opal | Feldspar (moonstone) |
| Dauphine diamond | Quartz |
| Electric emerald | Green glass |
| Evening emerald | Green olivine |
| Garnet jade | Green garnet |
| Gold topaz | Yellow quartz |
| Herkimer diamond | Quartz |
| Indian jade | Green quartz |
| Indian topaz | Yellow quartz |
| Jewelers topaz | Yellow quartz |
| King topaz | Yellow quartz or corundum |
| Madeira topaz | Yellow quartz |
| Mexican jade | Zircon |
| Matera diamond | Dyed calcite |
| Occidental diamond | Quartz |
| Oriental alabaster | Calcite |
| Oriental amethyst | Pink corundum |
| Oriental aquamarine | Blue corundum |
| Oriental emerald | Green corundum |
| Oriental peridot | Green corundum |
| Peridot of Ceylon | Green tourmaline |
| Pomegranate ruby | Pink or red spinel |
| Quartz topaz | Yellow quartz |
| Rhine diamond | Beryl |
| Rubicelle | Pink or red spinel |
| Sapphirine | Spinel, quartz, or glass |
| Scientific emerald | Green glass |
| Scientific sapphire | Blue glass |
| Siberian chrysolite | Green garnet |
| Siberian ruby | Pink or red tourmaline |
| South African jade | Green garnet |
| Spanish topaz | Yellow quartz |
| Spinel ruby | Pink or red spinel |
| Spinel sapphire | Blue spinel |
| Tasmanian diamond | Topaz |
| Uralian emerald | Green garnet |
| Uralian emerald | Blue tourmaline |
| White emerald | Beryl |

## RELATIVE HARDNESS OF SELECTED GEM MATERIALS

| Material | Relative hardness value* | Hardness rank on Mohs' scale |
|---|---|---|
| Gypsum | 32 | 2 |
| Calcite | 75-130 | 3 |
| Flint glass† | 480 | — |
| High-alumina glass† | 550 | — |
| Orthoclase | 560 | 6 |
| Quartz | 700-900 | 7 |
| Topaz | 1050-1250 | 8 |
| Spinel† | 1100-1250 | — |
| Corundum† | 1700-2200 | 9 |
| Diamond | 8000-8500 | 10 |

† Synthetic material

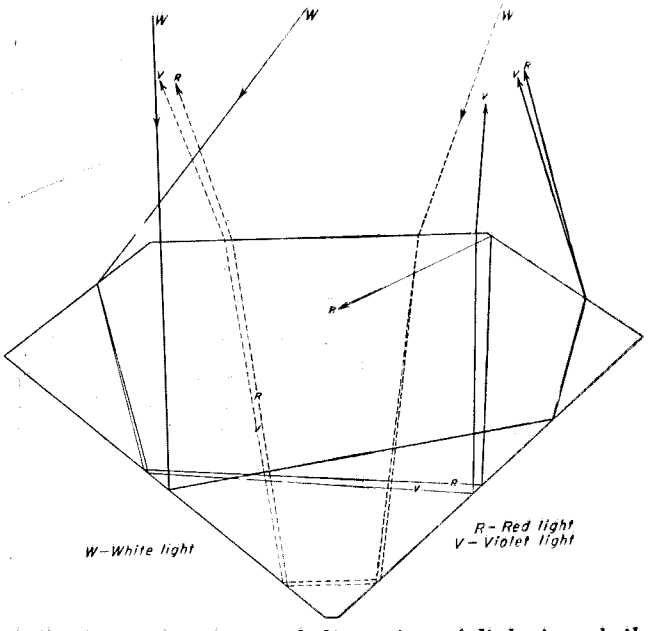
* Determined mainly through measurements, by several different investigators, of indentations made by a diamond blade. Most of the variations in hardness values for a single mineral species reflect actual differences in hardness for different crystallographic directions.

Many gem minerals differ markedly from one another in hardness, as shown for several species in the table above. The hardest minerals, like diamond, corundum, chrysoberyl, spinel, topaz, and some varieties of garnet, beryl, and zircon, can be cut into faceted stones that take an excellent and lasting polish. These gem minerals lie above quartz on the old Mohs' scale of hardness rank, and retain their polish despite daily contact with fabrics, the dust and grit in the air, and a number of additional materials that contain tiny particles of quartz or other abrasive substances.

The softer gem minerals, like jade, lazurite, olivine, opal, quartz, tourmaline, turquoise, and some garnet, beryl, and zircon, commonly become dull with daily wear unless they are handled very carefully. Relative softness also is one of the chief disadvantages of glasses that are used as gems. Loss of polish and sparkle through wear is most objectionable in facet-cut stones, whose faces become pitted and whose edges become ragged or rounded. These softer stones should not be worn continuously if they are set in rings, although they are wholly satisfactory for pendants, brooches, and necklaces.

Some gem stones are easily chipped when they are knocked sharply against another object, as a dish, table, or wash basin. This commonly is due to intrinsic brittleness of the mineral, as in some varieties of zircon and beryl, or to the presence of one or more directions of ready cleavage, as in topaz and some varieties of olivine. Brittleness also can be caused by strains set up during cutting and polishing of the gem, or, more commonly, by heat treatment that may be given the stone in order to improve its color. Many quartz, topaz, and zircon gems have been heat-treated, and should be examined very carefully under a lens for indications of potential fracturing or shattering.

Color is an important property of all gem stones, and is by far the most desirable feature of many. Almost any color can be found among the gem minerals, and several individual species occur in a wide range of colors (as in the table on p. 16). The desirability of a given color is largely a matter of individual preference, and




*Reflection, refraction, and dispersion of light in a brilliant-cut diamond.*

only for diamond, sapphire, ruby, and a few other high-priced gems are there firmly established correlations between color and value. Such gems ordinarily are graded by experts before they reach the showcases of the jewelry store.

Fortunately, the natural color of most gem stones is essentially permanent, and the purchaser need only concern himself with such features as hue, tone, intensity, and evenness of color. A few minerals, however, are known to lose a part of their color over long periods of time. Kunzite, a rare gem variety of the lithium-bearing mineral spodumene, is valued mainly for its transparency and beautiful lilac to purple color, but its color fades appreciably during years of exposure to sunlight. Gem varieties of opal, a mineral that contains considerable amounts of water, feature attractive plays of color caused by interference of light along minute cracks and other internal inhomogeneities. Some of the contained water generally is lost, with an attendant loss in "fire" of the opal, between the time when the material is mined and the time when it is sold. To forestall this partial desiccation, which often is accompanied by cracking, many dealers immerse their opal gems in water or protect them with films of oil. The purchaser must be prepared to adopt similar protective measures, especially if the stone is to be kept in a region of dry climate, or, better, he should attempt to obtain an opal that already has lost its loosely contained water and is of high quality despite this loss.

## Artificial coloring

Some gem materials, notably agate and other extremely fine-grained varieties of quartz, are colored artificially by immersion in various solutions, with or without subsequent heat treatment. Heat treatment alone is commonly used to change the color of quartz from smoky or amethyst to yellow, of topaz from yellow to pink, of beryl from green to blue, of corundum from yellow to colorless, and of tourmaline from dark blue to green. Many colorless gems, obtained by heating reddish or brownish zircon, have been sold under names that emphasize their resemblance to diamond, and all of the attractive blue zircon that has been marketed for about 35 years owes its color to heat treatment. Some gem stones, like amethyst and ruby, may be heat-treated in order to smooth out irregularities in the distribution of their original color. The purchaser should be aware of these practices, which all too commonly decrease the mechanical strength of gem stones.

Exposure to X-rays, radium emanations, or certain other types of radiation causes color changes in many gem minerals. Thus diamond may become green, and colorless quartz may become brown or smoky gray. Some of the new colors appear to be essentially permanent, but many are short-lived. Stones thus treated have not appeared on the gem market in significant numbers to date.

## Liveliness

The brilliance and sparkle, or general "liveliness," shown by facet-cut gem stones are related fundamentally to their indices of refraction. Reflection and refraction of light at an interface between substances of different optical density are such well-known phenomena that they scarcely require detailed treatment here, but it is worth noting that in faceted gems the effects of light refracted into the stones are more important than the effects of light reflected directly back from their surfaces. Maximum brilliance is obtained when the maximum percentage of the light entering a stone through its upper facets is totally reflected from its lower facets and ultimately emerges in upward directions, as shown in the drawing at the top of this page.

## Leakage of light

For all practical styles of cuts, the downward or lateral "leakage" of light from a given stone can be held to a minimum if the index of refraction of the mineral is high and the critical angle hence is low, because total reflection then takes place within the stone for light rays incident upon the lower facets over a wide range of angles as shown on page 19. Thus diamond, zircon, and other minerals with high indices of refraction are distinguished by their sparkle and brilliance, whereas minerals with low indices of refraction, like quartz and beryl, perforce derive their value more from other properties.

Many gem minerals are optically anisotropic, and hence show double refraction. This complicates the paths of light transmitted through them, but ordinarily has little effect on their brilliance. Notable effects, however, are shown by minerals that have markedly different indices of refraction for frequencies of light corresponding to different parts of the visible spectrum (as above).

These minerals, which include diamond, zircon, and some varieties of garnet, are said to have strong dispersion, and when facet-cut they show the shifting flashes of color known as fire. This feature, incidentally, is quite different in origin from the play of colors that characterizes opal.

## Cut stones

In his critical examination of the Ossel Eight, the buyer probably gives some thought to its general style. Is it fundamentally attractive? And is it well adapted to the other features of this particular automobile? The same questions might well be asked during the examination of a gem stone, even though just such questions have been anticipated in the preparation of most gems. Thus non-transparent minerals generally are cut *en cabochon*, with smoothly rounded and polished surfaces that emphasize color, play of colors, sheen, special markings, or other attractive features. Cabochon cuts also are used for star sapphire, star ruby, or other asteriated gems. Transparent gems, in contrast, are cut and polished into faceted stones, which have a pleasing form and also emphasize the clarity, color, brilliance, or other favorable characteristics of these minerals. The facets on any well-cut stone are symmetrically disposed and oriented, and corresponding facets are of corresponding shape and equal size. They are nicely polished, and the edges between facets are sharp and straight.

Gem stones are faceted in many different styles, most widespread among which is the brilliant cut (page 20). This cut has been popular since it was first introduced more than 250 years ago, largely because it is so effective in showing up brilliance and fire in transparent gems. The standard brilliant cut comprises 58 facets, including a large top facet, known as the table, and a tiny bottom facet that is termed the culet. Common modifications of this cut have 66, 74, or 82 facets, and special styles may be distinguished by more than a hundred facets. The upper part of a brilliant-cut stone is termed the bezel or crown, and the lower part the back or pavilion; these two parts meet along a sharp circumferential edge known as the girdle.

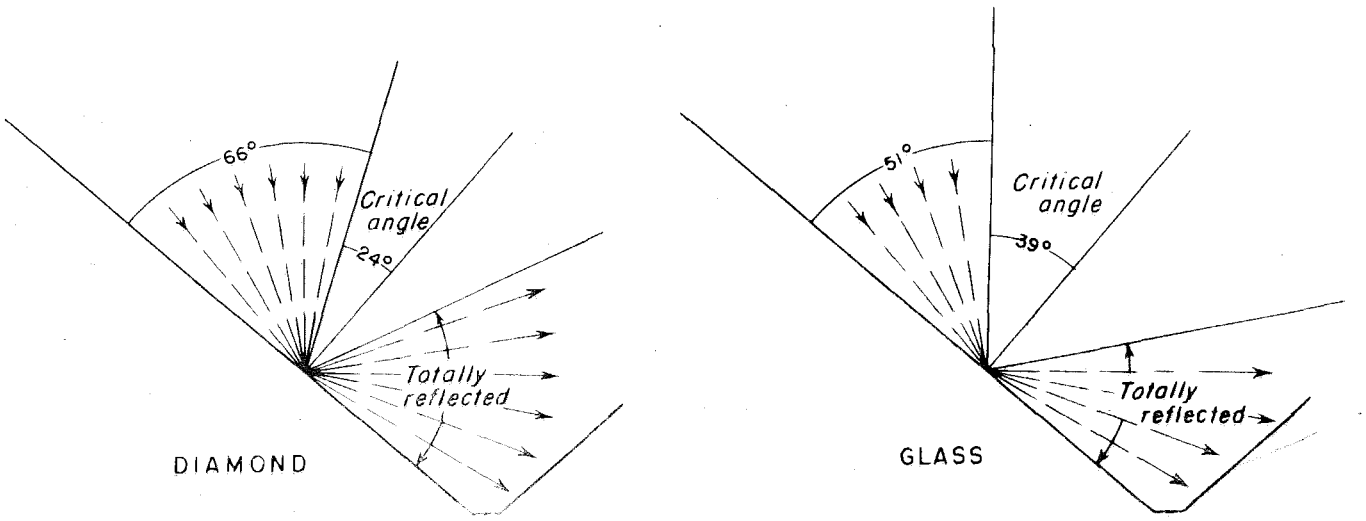
## Correct proportioning

If a given brilliant-cut stone is to show maximum sparkle and fire, its facets obviously must be oriented in such a way that the greatest possible amount of light is totally reflected upward within the pavilion. Correct proportioning of the stone is vital for gems like the diamond, much of whose value depends upon its "liveliness." Many diamonds are cut too deep or too flat in order to reduce wastage from the original pieces of rough material. Although this practice is economically sound, it does not yield gems of top quality. If either the crown or the pavilion of the stone is too thick with respect to its diameter at the girdle, light is lost by refraction through the pavilion facets and the stone appears somewhat glassy and dark.

Undesirable leakage of light also takes place if either the crown or the pavilion is too thin or shallow with respect to the girdle diameter, and such a stone is so lifeless that it is said to have a "fish-eye" or "tapioca" appearance.

Loss of brilliance also characterizes stones that have properly oriented facets, but whose crowns are too thin and whose tables are thus unduly large. Although relatively "dead", these stones generally appear to be larger than they really are, and the term "swindled" is widely and aptly applied to them. They are likely to attract the eager buyer who senses a "good bargain."

The brilliant cut is often used to show off unevenly colored gems, such as amethyst, ruby, and sapphire, to the best possible advantage. If the darkest part of the stone lies immediately above the culet, the entire stone appears to be more deeply colored than it actually is. The relatively pale upper part of such a stone is easily




*Effects of the critical angle on total reflection from a lower facet on a cut diamond (index of refraction = 2.42) and a similar facet on a cut stone of glass (index of refraction = 1.60)*

recognized if it is viewed from the side, or in a direction parallel to the table. Other types of cuts, generally square or rectangular in plan (shown below) are widely used for stones with uniformly-distributed color and relatively low indices of refraction, like aquamarine, emerald, and topaz. During recent years they also have been popular for the more brilliant stones, including diamond. Emerald, step, baguette, square, and a large number of special cuts vary considerably in their proportions, which may emphasize brilliance, lightness or darkness of color, economy of the original rough material, or other factors.

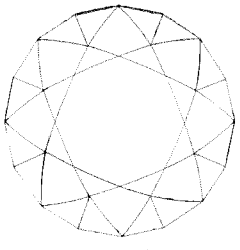
Of vital interest to the prospective purchaser are the so-called manufactured gems, which include synthetic, imitation, composite, and heat-treated or otherwise artificially colored stones. For all practical purposes, well-made synthetic gems have the same properties as the corresponding natural gems, but they have considerably lesser intrinsic values. Excellent synthetic sapphire, ruby, and spinel have been on the market for almost two decades, and during more recent years emerald, star ruby, and star sapphire have been manufactured on a commercial basis.

The latest addition to the ranks of synthetic gems is rutile, $TiO_2$, which is marketed under the name "Titania." It is extremely pale to deep yellow, has great brilliance, and is cut into very attractive stones. Synthetic corundum and spinel that appear grayish green in daylight and purplish or red in artificial light have been sold in large quantities as "synthetic alexandrite" and even as "alexandrite," especially in Asia and South America. Thousands of American servicemen purchased these stones during World War II under the mistaken impression that they were "the real thing."

Despite their close resemblance to natural stones, most synthetic gem stones can be distinguished as such by careful examination under the microscope. This is a problem best left to experts in the field. More easily recognized are imitation gems, which commonly are made of special glasses that are referred to as "paste." All glass stones are objectionably soft, and are suitable only for costume jewelry. Lead-bearing glasses have high indices of refraction and can be fashioned into sparkling stones, but they are particularly soft and hence liable to rapid wear. The lower facets of some glass stones are silvered or backed with foil, which increases their brilliance and also their price. These "gems" are sold under the general name "rhinestone."

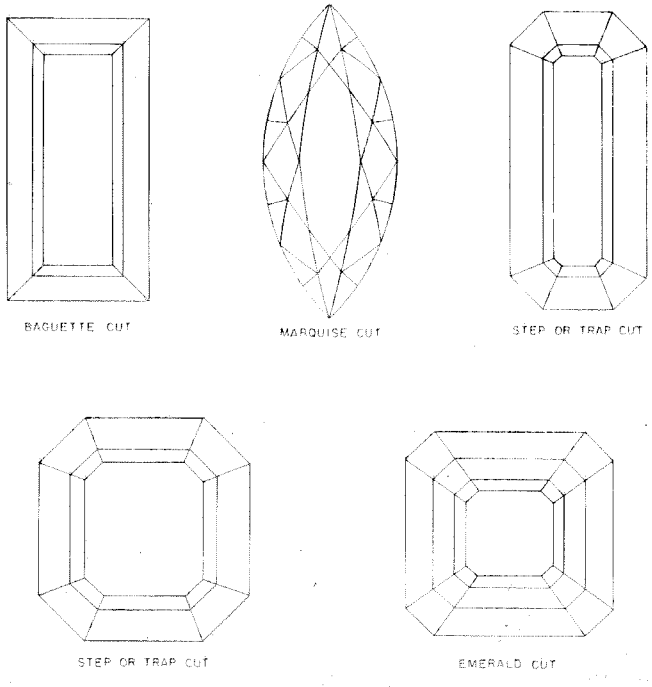
Perhaps the cheapest type of imitation gem is the molded stone, which consists of glass or a plastic that has been poured into a carefully designed mold, with or without subsequent polishing of the facets on the solidified material. Tourists in foreign countries seem to be especially susceptible to the impact of the color, clarity, and ridiculously low prices of such stones.

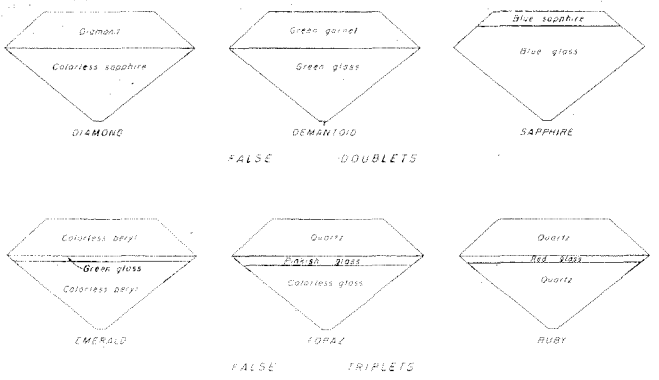
Composite or assembled stones consist of two or more parts that are cemented or fused together in order to increase their size or improve their color. Those that comprise two or three sections of genuine material are known respectively as true doublets or true triplets. False doublets, in contrast, generally comprise a crown or partial crown of genuine material, such as diamond, ruby, sapphire, or garnet, and a pavilion of colored glass or an inferior gem material. Most false triplets




*Gem stones are faceted in many different styles. Most widespread is the brilliant cut shown at the left—as it appears from the top, side, and bottom.*

*Other types of cuts, shown at the right, are widely used for stones with uniformly-distributed color and relatively low indices of refraction, like aquamarine, emerald, and topaz.*






*Some typical false doublets and triplets—composite or assembled stones consisting of two or more parts cemented or fused together to increase their size or improve their color.*

contain a slice of colored glass, pocket of liquid, or some type of colored film between two sections of harder material.

Typical examples, shown above, are the false emerald triplet, a "sandwich" of green glass between two pieces of colorless beryl, and the false topaz triplet, in which a thin plate of yellow or pinkish glass is placed between a crown of quartz and a pavilion of glass.

A composite stone, even if nicely made, can be recognized as such by immersion in a liquid whose index of refraction approximates that of the mineral the stone is supposed to represent. The cement, glass, or inferior gem material stands out distinctly when viewed in such a liquid.

Star sapphires and star rubies have been simulated by cementing appropriately colored foils or mirrors to the backs of stones that consist of milky asteriated quartz. Further, a milky stone that does not show asterism can be made to yield a star if the mirror is scribed with fine grooves or scratches arranged in a trigonal pattern. It is fortunate that mirror- or foil-backed stones are easily recognized, and any asteriated stone whose back is "protected" by a coating of lacquer should be viewed with suspicion.

## How to buy a diamond

Let us conclude this discussion by placing ourselves in the position of an intelligent person who wishes to buy a diamond of high quality, presumably for setting in a ring. He is aware of the deceptive practices noted in the foregoing paragraphs, and so has sought the advice of an established retail dealer who is reasonably proficient in the appraisal of the gems that he handles. This dealer places before him three handsome stones, and the prospective buyer cannily notes that they are free of surface dust and grease, that they are displayed against a background of dark-colored velvet, and that they twinkle and flash in the direct illumination from a powerful unfrosted light bulb. He probably senses, and correctly, that the stones are being shown under optimum conditions, and that they might not be fully as attractive when they are worn in jewelry later on. He thus qualifies as a realist.

The dealer outlines the principal features of each stone. The smallest is flawless, perfectly cut in the proper form, and of the best blue-white color. The second stone is somewhat larger, and is perfect in every respect but color. It has a yellowish cast so faint that it is barely recognizable to the buyer, even when this stone is placed alongside the other and viewed under intense illumination. The third stone, which is still larger, is blue-white in color and also is properly cut, but it has a tiny imperfection near the culet. This flaw, the dealer states, will be visible only to an expert when the stone is worn in a ring. All three stones are offered at the same price.

## The final decision

Which diamond should the buyer choose? He has been honestly provided with the significant technical data for each stone, and now he must make the final decision. Obviously this is as it should be, because only the buyer can know which combination of features has the greatest appeal for him. If he follows the dictates of his own feelings at this stage of the negotiations, he can make no serious mistake, because the three stones almost surely are of equal intrinsic worth.

After some thought, he chooses one of them, observes that it represents a considerable investment of money, and wisely requests a final appraisal by an authorized expert, so that the stone can be protected by insurance. An appraisal of this kind must be realistic, and will indicate whether the price he pays is a reasonable one. The purchaser finally leaves with the stone, knowing that he has made a sound bargain.

Are you and your wife still happy with the engagement ring you bought on that first visit to the jewelry store? Perhaps the stone looks smaller than it once did, and perhaps it frequently is filmed with dust and dishwater grime, but at least you can bet that if it is genuine it will continue to be attractive long after the Ossel Eight has seen its last used-car lot!

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