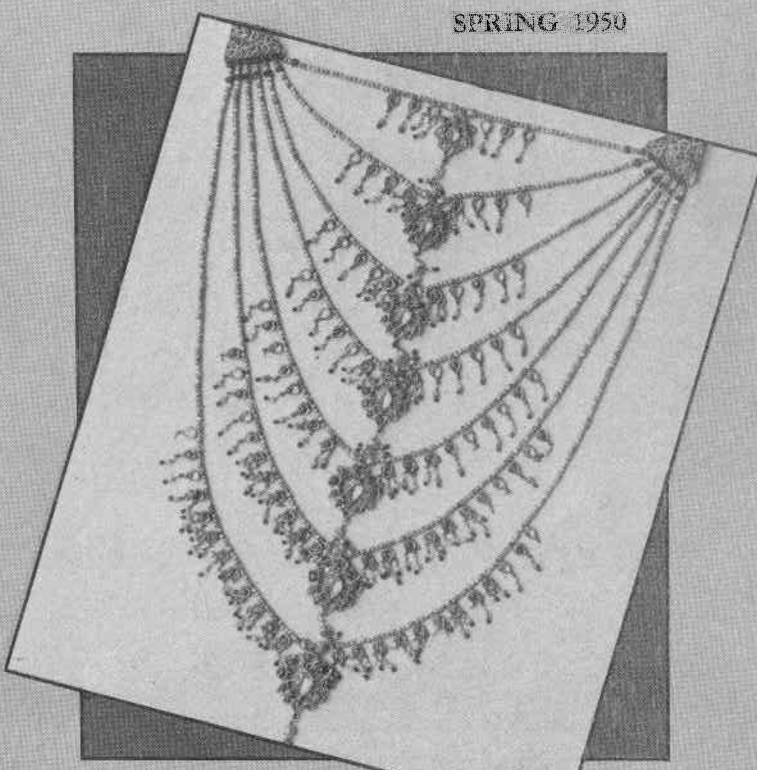
Gems and Gemology

SPRING 1950



Early Diamond Jewelry

See Inside Cover

GEMS & GEMOLOGY

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An Indian necklace of diamonds, rubies, and emeralds from the 17th to 19th centuries.

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GEMSTONES AND THE SPECTROSCOPE

The Absorption Spectra of Emerald and Alexandrite

by
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PRESSURE OF WORK towards the end of the war compelled me to discontinue this series of articles, the first of which appeared in the Fall, 1944, issue of this Journal. Unfortunately, the break has now extended to a period of five years, so that it is difficult for both writer and reader to pick up the threads.

A beginning was made with absorption spectra due to chromium, and so far only the spectra of ruby, red spinel, and pyrope have been described, which may have given rise to the erroneous impression that only in these few minerals are distinctive effects observed. Other important gemstones showing chromium bands are emeralds and alexandrite, which will be dealt with in the present article. Next to be considered will be stones which owe their absorption bands to ferrous iron, including almandine, peridot, and blue spinel; and those in which ferric iron is the important factor — green sapphire, andradite, and chrysoberyl. Manganese (spessartite, rhodochrosite, willemite) copper (turquoise) and cobalt (synthetic blue spinel, and blue glass) are others of the "transition" elements which give rise to distinctive absorption bands. "Rare Earth" bands are found in many of the calcium minerals, but are so similar that without careful measurement the particular host mineral can hardly be determined by this means alone; apatite and scheelite show the didymium bands most strongly; in sphene and danburite they are usually faintly visible.

Zircon, which, with almandine, shares the distinction of being the first gemstone in which absorption bands were noted (by Sir Arthur Church, in 1866), owes its unique spectrum to traces of uranous uranium. Finally, there are several useful absorption spectra to be considered in which the factor causing the bands is still unknown or only guessed at. Diamond, tourmaline, spodumene, jadeite, and enstatite are among those included in this category. It will be seen from the above brief and incomplete survey that there is quite a deal of ground to cover.

Before proceeding to describe the absorption spectrum of emerald, which is next on our list, let me briefly recapitulate the recommended techniques and instruments for using this too little known method of gem recognition. Doubtless special instruments, such as the spectroscope with wavelength scale and built-in light source recently designed by Dr. Gubelin, will eventually make the beginner's task much more easy in this field, but with patience and practice perfectly good work can be done with quite inexpensive and simple instruments commercially available. The instrument chiefly used in the writer's laboratory, and by his students, is a direct-vision prism spectroscope with adjustable slit (R. & J. Beck's No. 2458) having a dispersion of about 10°. This balances quite easily on top of a microscope when the eyepiece, or better still perhaps, both eyepiece and draw tube have been removed. For safety's sake, the spectroscope is lightly held in the hand while an observation is being made.

The specimen to be examined—it may be cut or uncut, mounted or unmounted, so long as light can be transmitted through it—is usually placed on a glass plate in the center of the microscope stage; a powerful beam of light from a 500 watt projection lamp is concentrated on the microscope mirror and reflected thence through a wide aperture substage condenser on to, and through, the stone. Using a low-power objective (1″ or 1½″), the light transmitted through the stone passes up the body tube (when the mirror is correctly adjusted) and is examined through the spectroscope, held lightly in the hand and resting on the body tube in place of the eyepiece. If the light, and focus of the objective have been correctly managed, a strong spectrum, free from streaks, should be observable by this means.

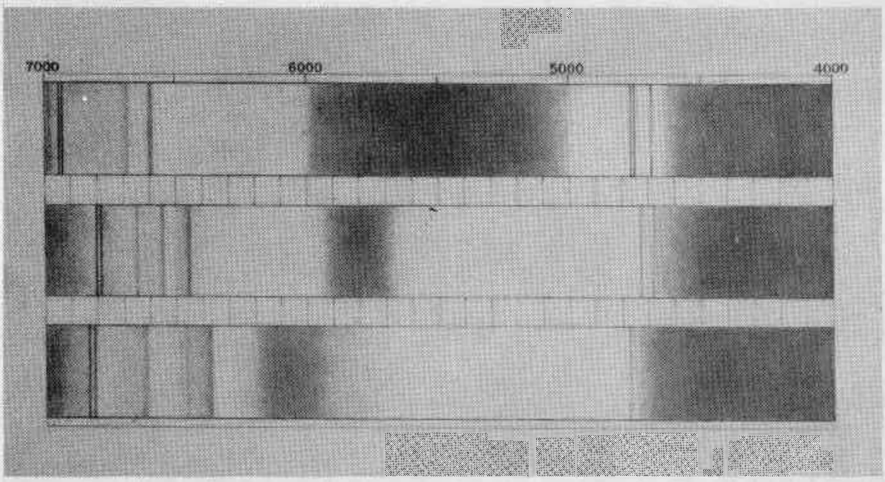
For those who do not possess a monocular microscope with a substage condenser, an alternative method of observation may be suggested, and may even be preferred. In this, the stone is simply placed face downward on a piece of black velvet or other dark cloth, and a beam of the most powerful light available is concentrated upon it at an angle of about 45° from the side opposite the observer. It should perhaps be remarked that here as in the microscope technique, any glare of light other than from the stone should be shielded from the observer by some form of lamp housing. To continue with the description of the second method—the light is reflected from inside the table facet, and can be viewed quite easily through the spectroscope held or clamped at an angle equal and opposite to that of the incident beam. Best results are obtained when the slit is about three inches from the stone.

This reflected light method is particularly effective with weak spectra such as that of white zircon, since the light rays, having passed twice through the stone before entering the spectroscope, are more strongly absorbed than in direct transmission. When practicing either method for the first time it is wise to choose stones showing pronounced absorption bands before attempting more difficult cases. Almandine garnet, if not too deeply colored, is an obvious choice, and readily available, while almost any colored Ceylon zircon will show an exciting series of bands, and synthetic ruby also shows a clear-cut spectrum which is useful for practice.

Just one more word of advice before proceeding with the main part of this article. It is very important that the slit width and focus of the spectroscope should be correctly adjusted. This is perhaps most easily achieved by pointing the instrument at a brightly lit cloud or clear sky, and adjusting the slit and focus until the narrow dark "Fraunhofer" lines which cross the continuous spectrum of the sun can be seen clearly and sharply. When trying to see bands in stones through which little light can be transmitted—e.g. turquoise and some jades, or a deeply colored almandine—it may be necessary to open the slit rather widely to allow enough light to enter. But when observing stones through which plenty of light can be transmitted the best results can be obtained when the slit is narrowed to the point where the *horizontal* streaks crossing the spectrum are only just cleared. Heavy and persistent horizontal streaks are a sign of dirt on the slit. This can easily be cleaned by opening it widely and gently rubbing a sharpened matchstick along the jaws.

Now, after these rather lengthy preliminary notes, let us consider the emerald absorption spectrum. Where chromium-colored minerals are concerned, there are two main regions of general absorption—one in the yellow and/or green, the other beginning in the blue and culminating in the violet part of the spectrum. Upon the position, intensity, and extent of these absorption bands depends the color of the stone. In ruby, a broad absorption band covers most of the yellow and green parts of the spectrum; there is a not very extensive "window" in the blue before the absorption sets in again and swallows up incident light tipping the scale one way or the other.

If these broad absorption regions were all that one could see, the spectra of these minerals would be both dull and undiagnostic; but the hall-mark of all minerals which owe their color to chromium is a series of narrow bands or lines in the red, and sometimes in the blue also. Even at room temperatures these bonds are so narrow as to merit the description "hair lines" which has sometimes been applied to them



• *Figure 1.* Absorption spectra of (I) Ruby, (II) Alexandrite, (III) Emerald.

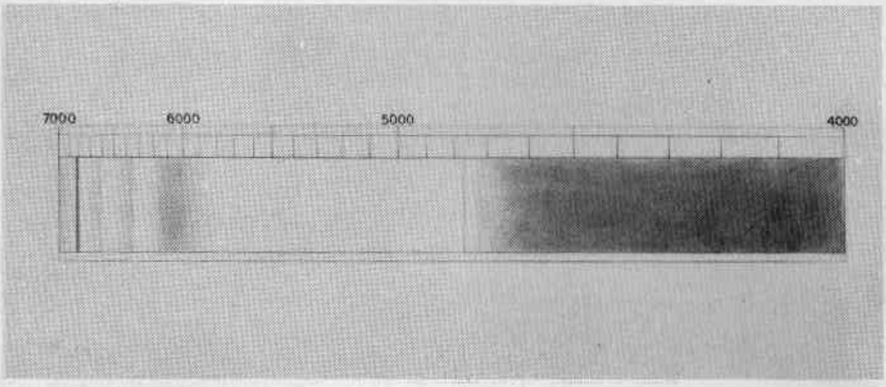
the remainder of the spectrum. The dichroism of ruby depends upon the expansion and shrinkage of the central absorption band, which can be watched through the spectroscope by rotating a nicol or polaroid disc between the specimen and the slit. In emerald, the central absorption region is relatively weak, covering only part of the yellow: the green and most of the blue are quite unabsorbed. In alexandrite, the central band is in an intermediate position and strength, which accounts for the curious half-way color of the stone, balanced between green and red, the nature of the while at liquid air temperatures they are narrower still, and are then almost comparable with the emission or absorption spectra of vapors.

The drawing reproduced in Fig. 1, which has been specially prepared for me by Mr. T. H. Smith, enables the reader to gain a clear conception of the main features of the three typical chromium spectra of ruby, alexandrite, and emerald. The drawing represents the spectra as seen through a diffraction grating spectroscope, with the wavelength separation evenly developed throughout the spectrum. More will be said on this point later. As will be seen from the drawing, the strongest of the narrow bands or lines forms a doublet in the deep red. In addition, there are fainter and rather more diffuse lines nearer to the orange. In the ruby spectrum a doublet and a single line in the blue "window" form a distinctive feature; in alexandrite two rather weaker lines appear in nearly the same position, while in emerald one line is usually visible in the blue, sometimes accompanied by a much weaker member. In pyrope and in red spinel, it may be remembered there are no lines visible in the blue end of the spectrum.

The drawing serves to bring out the essential similarity of these three spectra, and at the same time shows the differences between them which account for the different colors of the minerals concerned. Turning now to consider the emerald absorption spectrum in more detail, it can be seen that the two components of the strong doublet (6795 and 6820A) are twice as far apart as they are in ruby (6928 and 6942A) and can thus be resolved even in a fairly small spectroscope, in which the ruby doublet will appear only as a single line. The next two bands, at 6625 and 6460A, are weaker and more diffuse, and on the short-wave side of each there is a curious transparency patch, giving a characteristic but indescribable appearance to the spectrum. There is a further narrow band at 6370A, as can be seen in the drawing. In the ordinary ray, this is almost as strong as the doublet, and the orientation of a cut emerald can be approximately assessed by noting the relative strength of this band. In deep-colored emeralds, a line in the blue at 4775A can be seen quite clearly.

In transparent specimens, the emerald spectrum is sufficiently distinctive to form a positive test for the gemstone. In translucent specimens, one must guard against confusion with fine pieces of jadeite, which also owe their lovely color to chromic oxide and therefore have a rather similar spectrum, so far as the lines in the red are concerned. In jadeite the doublet is more diffuse, and cannot properly be resolved; also it is 100 Angstroms deeper into the red. But without measurement and a good deal of practice there is certainly some danger of confusion here, and thus with translucent specimens of emerald-green a check test on the inclusions, dichroism, or refractive index (using Lester Benson's valuable "distant vision" technique) will be a wise precaution. Jadeite has its own distinctive absorption band at 4370A, but in green specimens this is

Continued on Page 291



• *Figure 2.* **Absorption spectrum of Emerald, as seen through a prism spectroscope.**

Diamond Jewelry Through the Ages

by
KAY SWINDLER
G.I.A. Public Relations Director

THE LOVE OF ORNAMENTING oneself seems to be inherent in the human being and even those primitive tribes who scorn dress itself will bedeck themselves with bright objects of adornment in the form of shells, teeth, and metal. This love of self-decoration must arise from two distinct emotions; the first, a wish to stand out from the crowd and call attention to one's self; and the second, to portray rank of distinction and importance to the world.

One outstanding feature in the wearing of jewelry is that it was first worn by male members of the race and later, as civilization developed to a greater degree, female members of the tribe also adorned themselves with the bright baubles. This might be compared to the edict of Nature herself in giving to the male of most of the animal and fowl species the most brilliant colored coverings, while to the female she allotted the more drab of Nature's dress.

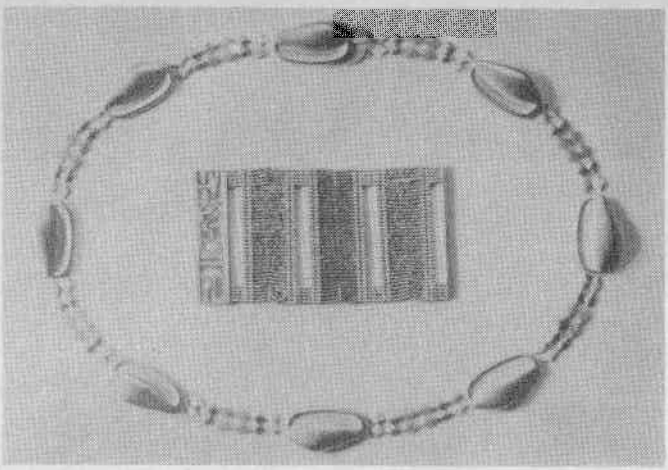
Since some primitive ancestor kicked a calloused toe against a bright colored pebble and picked it up out of curiosity, jewelry has played a part in the lives of humans. However, long before the introduction of gemstones, there were forms of jewelry—the earliest development of which was perhaps from a more or less utilitarian standpoint. To trace the evolution of jewelry from its beginning to the present creation of exquisite diamond pieces is to find that many factors have influenced the changes which have come about in jewelry design through the centuries. One of the greatest of these factors is fashion, and today fashion is still a major influence on the jewelry trends of the current century.

Although we are concerned in this discussion with diamond jewelry, an understanding of the evolution of all jewelry makes it easier to recognize the beauty and value of diamonds and to realize how, once having been discovered, they were destined to become the most cherished of gems.

Many factors have been responsible for changes and improvements in jewelry design, although the passing of the centuries has found fashion the greatest of these factors affecting such changes: climate, conquest, travel, national events, economics, superstitions and beliefs of mankind have all been dominant factors.

EGYPTIAN JEWELRY

Although it is possible jewelry developed to some point of perfection in other prehistoric lands, we have most definite proof of its degree of perfection from Egypt where many fine specimens have been unearthed. The very early use of the cylinder seal and its evolution after the 12th Dynasty into the scarab seal was the creation of a utilitarian accessory which was no doubt the forerunner of the great variety of ornamental and elaborate jewelry of the Egyptians. It is believed much of their jewelry had symbolic

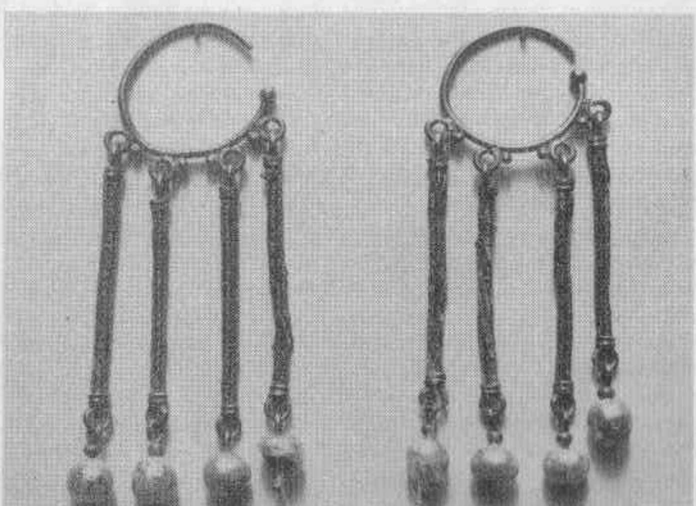


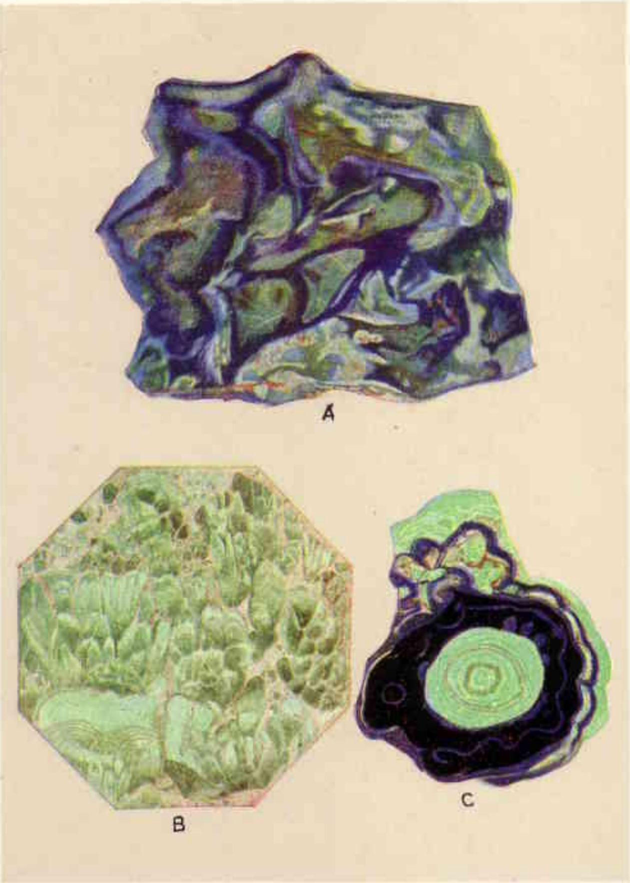
• Gold girdle and armlet from Egyptian 12th dynasty. Green feldspar, carnelian, and gold shells form girdle. Carnelian and turquoise are used in armlet. *Metropolitan Museum of Art.*

significance and it is possible that many objects may have been worn as amulets.

Egyptian objects show a most decided love of color including blue, apple green, red, white, violet, and yellow. Colored stones, or their imitations, were also mounted in gold and indicated a definite striving for color effects. Stones used in-

• Pair of gold and pearl earrings from Egypto-Syrian Period. 3rd Century A.D. *Metropolitan Museum of Art.*





MALACHITE, CHESSYLITE, CHRYSOCOLLA

The specimen (A) is chrysocolla with azurite. Chrysocolla is a hydrous copper silicate, the copper accounting for its color. Because of its extreme softness it is not suitable for gem purposes but is important as the coloring agent in chrysocolla quartz. Another frequently encountered but soft stone is malachite, pictured at (B) and again at (C) surrounded by azurite. The specimen of chrysocolla is from Nevada, the malachite from Arizona. Specimens from the collection of British Museum (Natural History), London.

PLATE XXVI

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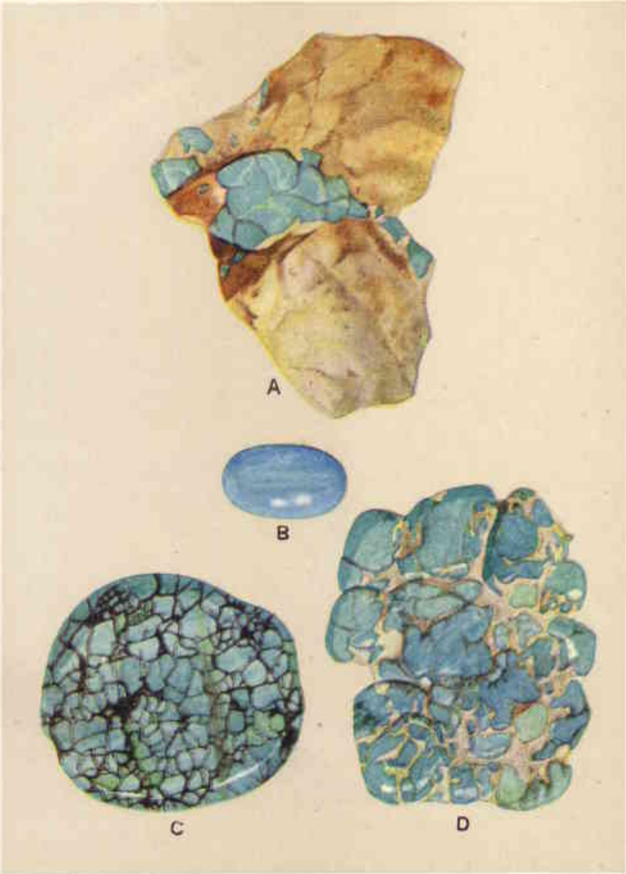

TURQUOISE

Turquoise embedded in matrix from the well known Los Cerillos, New Mexico deposit, is seen at (A), while a fashioned stone from the same location is seen at(B). Pure turquoise such as this in a deep blue is rare and highly prized in Tibet. Persian turquoise matrix is shown at (C) and a specimen from a lesser known deposit, Wadi Maghara, Arabia Petraea, is seen at (D). Specimens from the collection of British Museum (Natural History), London.

PLATE XXVII

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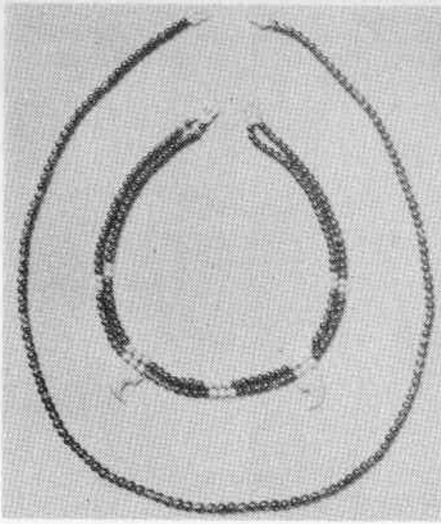
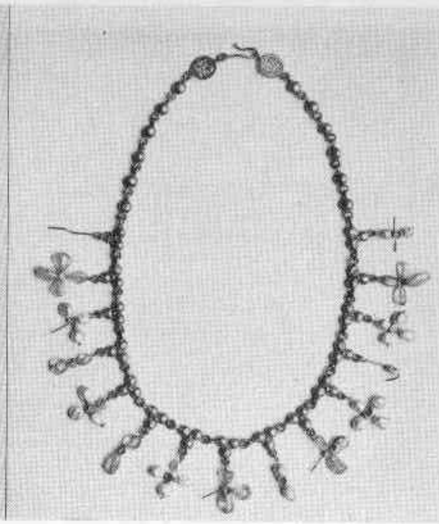


• **Amethyst necklaces with gold from Egyptian 12th dynasty.** ***Metropolitan Museum of Art.***



• **Egypto-Syrian gold necklace with sapphires and pearls. Middle of 3rd century. (Roman Period).** ***Metropolitan Museum of Art.***

cluded turquoise, emerald, feldspar, jasper, obsidian, lapis lazuli, and opaque glass.

Earrings, necklaces, bracelets, rings, pendants, and diadems hung over the temples, all were plentiful. The Egyptians were highly skilled in chasing, engraving, and repoussé and knew the art of soldering. It is believed the jeweler's art of this early civilization reached its climax around 1600 B.C.

PHOENICIAN JEWELRY

The travel factor was never more important to the evolution of jewelry than through the Phoenicians, foremost navigators of the ancient world. As a consequence of their travels, their jewelry was a composite of the art borrowed from the lands they visited—Italy, Greece, and the islands. Phoenician rings were made of many materials—gold, silver, bronze, and even glass. Silver was, however, less prominent than gold.

GREEK JEWELRY

The jewelry of Greece is considered that worn from the close of the 5th century B.C. onward and it is, like all art of Greece in that period, of surpassing excellence. The Greeks were responsible for the artistic development of gold jewelry. As ornamentation they preferred filigree, and obtained color by the sparing use of enamel. Some granulated work was done by them but this type of embellishment is believed to have been invented by the Phoenicians and later perfected by the skilled Etruscans. The Greeks used it most frequently in the 7th to 8th centuries B.C., and it shows the influence of Phoenician art with traces of Egyptian and Assyrian feeling.

Much of the jewelry is designed for head wear, a number of gold crowns being among the more notable objects. Wreaths for gar-

• Greek gold necklace with three pendant medallions of aventurine and pink rubies. Filigree and animal motif are used. 3rd century B.C. *Cleveland Museum of Art.*

landing the head were an important item and hairpins were very ornate. The signet ring was used but more care was taken with the engraving of the bezel or the gem set in the ring—since it was used as a seal—than was paid to the actual mounting.

During the Greek supremacy, the jewelry craftsman went to Nature for subjects and used motifs of fruit, flowers, foliage, and even replicas of animal and human forms. Primitive pieces, which were made in the period preceding this Greek period of classical times, show spiral patterns employed on jewelry which is almost identical with motifs of Celtic ornaments. Fish, butterflies, and other creatures were also used.

ETRUSCAN JEWELRY

The Etruscans, during the time of their prominence in the development of the jeweler's art, were famed for their jewels. Three distinct periods are evident. The earliest shows fine work, not particularly artistic in character, and somewhat Oriental in feeling. This is followed by the period in which the finest work was accomplished in both workmanship and design, with indication of Hellenic influence. The last period 500 to 300 B.C., shows that the Etruscans were following the Greek art but with a noticeable difference as the objects were large and coarse of execution.

Much repoussé was used by the Etruscans but the thing which distinguished their creations most of all is the use of tiny grains of gold of microscopic size which seem to have been made separately and soldered on. They also developed a kind of solvent which made invisible the joining of pieces of solder.

The Etruscans particularly loved rings, and they wore them on every finger, including the thumb. Other articles made by them were fibula designed for wearing in rows down the front of the dress, necklaces, long earrings, and bracelets. They paid particular attention to decorations for the head.

ROMAN JEWELRY

In this period two important factors have bearing on the history of jewelry. The first is conquest, and the second wealth. It was a period of great display of personal possessions. The Romans were more extravagant with rings than any other people. Rings for purely decorative purpose were designed in abundance and precious stones and engraved gems were coveted by all classes.

Cameos and intaglios were extensively used and amber necklaces were largely favored. The snake was a favorite form both for bracelets and rings. During the Roman

• Byzantine pear-shaped sapphire and pearl drops, strung on gold wire and encircled by an oval band of gold studded with small pearls. Believed to have been made in Egypt in the 6th century, these pieces show the influence of an earlier Roman period. *Metropolitan Museum of Art.*

• Amethyst necklace with gold beads and chain from South Russia. 1st century B.C. *Cleveland Museum of Art.*

• **Italian fibula of 6th to 8th centuries. Onyx cameo and cabochons mounted in gold.** ***Metropolitan Museum of Art.***

domination of Egypt many pearls were brought into Rome and these were particularly liked for the ears. No doubt emeralds came also from the Egyptian mines. Roman ladies dressed their hair most elaborately and used long jeweled hairpins to hold it in position. Pearls, precious gemstones, and other ornaments were frequently added to embellish the coiffure. Pliny – that erudite old Roman – in his *Natural History of the World,* describes a lady who at a simple betrothal ceremony was covered with pearls and emeralds from head to foot.

BYZANTINE JEWELRY

Again travel and national events were responsible for a change in jewelry fashion during Byzantine prominence. A compromise between Oriental and Western influences appeared after Constantine moved the seat of his empire to Byzantium in 330 A.D. Many subjects were driven from the homeland through the outbreak of iconoclasm and settled in Italy, Germany, and Gaul. The influence of these transported goldsmiths is felt most in the 8th century.

Although mosaics were common, enamel and colored stones seem to have been generally used. Faceting had not been invented so gemstones were mounted either in rough crystal form smoothed off, or cut in cabochon.

Symbols of early Christianity had a remarkable effect on jewelry of this period. A favorite pendant of that time was in the form of the cross. At the beginning of the 5th century, crescent-shaped earrings formed repoussé had a cross within a circle applied in open work design. Coins were frequently mounted in brooches, as in Roman times.

Retained as an early Christian custom, the bride and groom wore at their wedding crowns of gold, silver, green leaves, or flowers. This custom is still prevalent in some countries today.

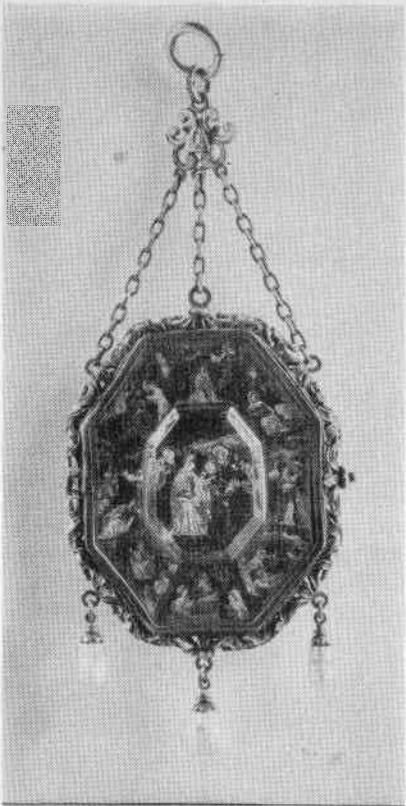
CELTIC JEWELRY

The Celtic period can be said to extend from the Prehistoric or Iron Age through the time of the Roman occupation. Advanced skill in the art of enameling is one of the outstanding contributions by this race. This was applied on bracelets and pins – of the safety pin type – over copper and bronze. A great many dress fasteners or fibula have been discovered in Ireland which would indicate that again fashion had a part in the creation of jeweled ornaments. Amber was often used as a jewel. In addition to this material, the Celts used jet, bone, and glass for fashioning beads. During the period when British goldsmiths were using bronze, gold was in use in Ireland.

One important contribution was made by the Celts after the advent of Christianity in Ireland. This is the Celtic brooch which dates from the 9th century A.D. It is significant both for its great size and for the fact that its ring has an opening, contrary to earlier forms of fastening. Silver was often used for these brooches, but they seem to have disappeared entirely about the 13th century.

ROMANO BRITISH JEWELRY

British jewelry which dates from the Roman occupation (about 43 A.D. to 410 A.D.) follows closely Italian design. Most objects are of bronze and the majority consists of pins employed both as dress fasteners and for confining the hair. In addition to bronze, bone and some colored glass or



• 16th century Italian pendant of gold, crystal, enamel, and pearls. Religious topic is typical. *Metropolitan Museum of Art.*

jet is used. Pins range from three to nine inches in length. Beads of amber, pearl, glazed earthenware, and glass — principally blue glass — are found in abundance. Ornamentation with enamel is also employed.

Again, conquest and migration formed a basis for changes in jeweled ornamentation as the barbarian hordes swept over the continent of Europe. Classical art vanished and there came into being an Oriental love of color. Red garnets or red glass were often inlaid on a metal surface, a process which was used from the 3rd to around the 8th century. This type of barbarian-influenced jewelry diminished, and almost disappeared, when Charlemagne was crowned emperor in 768 A.D.

ANGLO-SAXON JEWELRY

Again invasion in the form of Teutonic hordes sweeping over Britain in the 5th century, following the extinction of Roman power, brought a change. Gold, silver, and some alloy was used during the period between the 5th and 7th century. The greatest number of pieces were of the pin type and were characterized by delicate fold work and a peculiarly harmonious blending of colors. Earrings were not common, nor were rings. However, some elegant necklaces formed of gold beads, amethyst, amber, and other precious stones were used. Brooches were numerous among Anglo-Saxon ornaments and are remarkable for their beauty of workmanship. The brooch pin was often made of iron.

With the advent of Christianity in England around the latter part of the 7th century, a profound change in ornaments was noticeable. Because the pagan custom of

• 16th century Italian rosary of gold, onyx, and enamel. Life of Virgin shown in relief inside beads. *Metropolitan Museum of Art.*

• 16th century Italian pendant. Pearls and enameled gold are fashioned in form of a swan. *Metropolitan Museum of Art.*

burying objects with the dead was no longer practiced, few specimens remain today. Those which have been found are of exceptional merit and include fine examples of cloisonne and enamel work since the Saxon jeweler mastered the art of fusing vitreous colors upon metal. Missionary work of the monks, who were often skilled goldsmiths and jewelers, helped to spread the art throughout the country. Rings dating from the 9th century were for the most part inscribed.

MEDIEVAL JEWELRY

With the beginning of the Medieval Period in history, fashion for the first time became an important factor in the history of civilization. Jewelry now began to have real material value, and the importance of portability of possessions was realized for the first time. At the same time, there was a corresponding advance in craftsmanship. Eastern influence was felt following the Crusades and there was also an influx of artisans from Italian cities who brought with them their own peculiar forms of skill. By the beginning of the 12th century the West seems to have become independent of the East.

Religious objects were of far greater importance than objects for personal adornment, although a great extravagance of fashion was seen at the courts. Garments were often heavily encrusted with pearls and precious stones. Faith in occult power was strong and now precious stones attached to themselves superstitious reverence. At this time, brooches for the hat were introduced and were originally all of religious adaptation. They continued in fashion until

• 16th century Italian pendant. Mermaid of enameled gold and pearl, studded with rubies. Figure holds labradorite mirror and hour glass of baroque pearl and gold. *Metropolitan Museum of Art.*

• **17th century French badge of Order of St. Michael. Shell cameo mounted in gold and enamel.** ***Metropolitan Museum of Art.***

the end of the 17th century. Fashion further dictated jewelry trends and the elaborate hair style which covered the ears, discouraged any use of earrings during the Middle Ages.

A new invention of the period was the pomander. This highly decorated scent case, often used for carrying other cosmetics as well, was no doubt the early ancestor of the present vanity case. The bishop's ring, the gimmel ring, the posy ring, all were products of this period. One of the most popular practices of the Christians in the Middle Ages was the wearing of pendants which took the form of crosses, medallions, or monograms. Some were painted with translucent enamels, while others were wrought in metal.

The long sleeves which were worn throughout the Middle Ages did not favor the use of bracelets, although some ladies wore rosaries around their wrists. Jeweled belts came into prominence among the wealthy at this time.

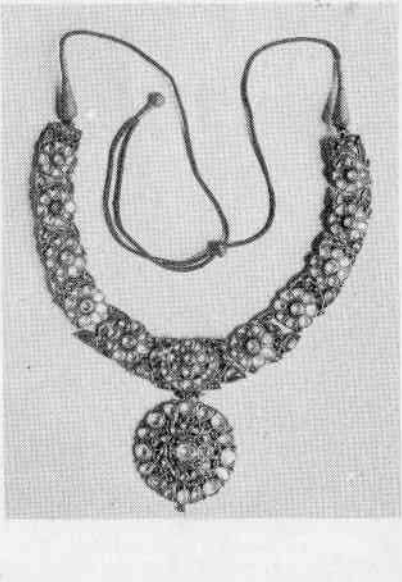
RENAISSANCE JEWELRY

Wealth was abundant in the 15th and 16th centuries and a great new awakening and love of living was manifested in jewelry creations as well as in all other forms of art. There was no kind of technical work—hammering, chasing or casting—and, above all, enameling—which was not now brought to perfection.

The joining of bright colored gems with delicately worked gold enriched with enamels was the fundamental motif of jewelry of the period. Greater masses among the middle classes had more wealth which was a powerful force in increasing the production of jewelry. A similar situation existed in this country during World War II.

The favorite stone of the period was the ruby; also, many pearls were used. Much of the Spanish jewelry was lavish with emeralds after the conquest of Peru. Diamonds were used, but the art of cutting them had still to be discovered, and they were used principally as contrast with more brilliant stones. Cameos again became popular.

• **18th century Indian necklace. Rubies and aquamarines in translucent blue enamel form floral design.** ***Metropolitan Museum of Art.***



British rulers — Henry VIII, Elizabeth, Charles—all followed the extravagant habits of the Italian and French Renaissance. Jeweled initials were worn in the form of pendants. Designs for the larger ones were set with sapphires, diamonds, rubies, and pearls. Many terminated with large pear-shaped pearls. Elizabeth was particularly fond of pearls. The unfortunate and unhappy Mary Stuart, like her cousin Elizabeth, was always most lavish in her display of jewelry.

DIAMOND CUTTING

Until the 16th century, there were two ways of cutting the diamond. One, was to take the octahedral crystal and place the lower half into the mounting and let the second half emerge to a point. The other was to mount the lower half into the mounting but to level off the top portion into a table effect. Often it was foiled, mostly with black. Since faceting was unknown, it is small wonder that the diamond did not enjoy great popularity until later when all its inward fire and beauty had been released.

Toward the end of the 16th century, Daniel Mignot helped to popularize the diamond by producing jewelry in which the diamonds were alternated with colored stones, set closely together. Diamonds when used alone were usually mounted in silver, while colored stones were mounted in gold. This manner of mounting was still used in the 18th century by some jewelers.

17TH CENTURY

Desire for the possession of diamonds and a greater appreciation of their beauty can no doubt be credited to a large extent to French travelers such as Tavernier, Chardin, and others who related the admiration for the stones at Eastern Courts. The opening of the Golconda mines also made available more diamonds and spurred the gem cutters to improve their methods of fashioning the diamond.

The art of cutting is generally credited to Louis de Berghem of Bruges in the year 1475, although Burgess states the art of cutting was discovered in 1456 and some authorities claim that the art was unknown until 1520.

At the beginning of the 17th century, the first rose cut began to appear. This early cutting did little to improve the diamond, for usually, only four to six irregularly cut facets were used so as not to reduce the size of the crystal. By the middle of the century Cardinal Mazarin, a great lover of the diamond, encouraged Dutch lapidaries to experiment in cutting the diamond and a method was eventually evolved whereby sixteen facets were used and the true rose cut was born. Mazarin personally directed the cutting of twelve diamonds which he sent to the French Court. This method of cutting was used until the beginning of the 18th century when the brilliant cut was introduced. It is said to have been invented by Vincenti Peruggi of Venice late in the 17th century.

18TH CENTURY

In this century, the craze for diamonds became an obsession and must have followed the discovery that nothing else shows so well by artificial light as the diamond. Until the middle of the 18th century dancing had been done mostly in the daytime, and outside. This now changed to night dancing and the diamond was much in demand, showing to great advantage in the brightly lighted ballrooms.

Early in the century, the jewelers' art consisted of mounting diamonds and colored stones together in various trivial designs. Each stone had its own tiny setting. Later, diamonds were mounted with no visible line of metal between. The stones were frequently rose cut, although brilliants were more esteemed. About 1770 diamonds were no longer mixed with colored stones. In the last thirty years of the century, demand was for diamonds or pearls only, and color was obtained by enamel or miniature painting. The favorite setting of diamonds for the last thirty years of the century was on a background of rich blue enamel, or blue glass over foil. Diamonds were mounted over this in the shape of a bouquet or basket of flowers, all surrounded by tiny stones exquisitely cut. In favor during this period were brooches, chatelaines with seals and keys, all surrounded by small diamonds and intertwined with initials, hearts, crowns, and flowers.

Late in the 18th century, marquise rings were introduced. These were generally oval or long octagonal and very large with the bezel sometimes one and one half inches long. The backgrounds were of blue glass or enamel over ribbed or matted gold. In the center was mounted in silver, one or more diamonds. The bezel was surrounded with a border of tiny diamonds. Buckles were also in high fashion and the most desired were silver mounted with diamonds.

19TH AND 20TH CENTURIES

In the 19th century diamonds were worn and treasured by all who could afford them. Napoleon's Court was resplendent with the glitter of diamonds. In the New World, rich planters of the South indulged their fancy in the precious gems. Although few diamonds now came from India, the discovery of the South Africa diamond fields late in the 19th century made available a quantity sufficient to supply all who could buy them.

And so, today, the diamond continues to be the most desired and valuable of gems. Nothing will ever surpass its beauty and fine qualities. The 20th century finds designs of modern inspiration — but however it is used, the diamond will remain through the ages the most cherished of all gemstones.

• In the 20th century, diamonds are the unrivaled favorites. This exquisite necklace is fashioned entirely of diamonds, using baguettes and 75 brilliant-cut stones. ***Courtesy of Harry Winston, New York City.***

Progress Report on the Standardizing of the Nomenclature of Gems

by

EDWARD H. KRAUS

President, Gemological Institute of America

LAST YEAR AT THE CONCLAVE held in Boston the progress made during the last twenty-five years in Europe, the United States, and Canada in standardizing the names and descriptions of gems was discussed briefly. It was reported that in 1947 a committee of the American Gem Society requested the Educational Advisory Board of the Gemological Institute of America to prepare and recommend a standardized Nomenclature to the Society. Although some progress was made, it was not until during the past year that it was possible to devote much time to the preparation of the lists.

As a result of a great deal of correspondence, it was decided to prepare three Nomenclature lists as follows: A) Important Gem Minerals, B) Other Gem Minerals, and C) Organic Gem Materials. Copies of the proposed lists A and C were prepared and sent to the members of the Educational Advisory Board. These lists were accompanied by a questionnaire asking for information which would be helpful to the Board in determining its policy in formulating lists which could be recommended for adoption by the American Gem Society, and which might meet with the approval of other organizations the world over. Among the questions asked were: should (1) rubellite be used for red tourmaline, (2) hyacinth or jacinth for red to orange-brown zircon, (3) ruby for red color, (4) cat's-eye precede or follow the mineral to which it refers, and so forth.

The A list of Important Gem Minerals includes the diamond, corundum, chrysoberyl, spinel, topaz, beryl, zircon, tourmaline, the garnet group, peridot, quartz, spodumene, the jade group, opal, the feldspar group, lapis-lazuli, and turquoise. The C list, Organic Gem Materials, includes pearl, amber, coral, and jet.

The replies from the members of the Board in the United States and Canada and from abroad were tabulated and analyzed. The response was very gratifying and the comments made by Dr. G. F. Herbert Smith, President of the Gemmological Association of Great Britain; Dr. L. J. Spencer, Editor of the *Mineralogical Magazine* and for many years Keeper of Minerals at the British Museum; B. W. Anderson in charge of the Diamond, Pearl, and Precious Stone Trade Section of the London Chamber of Commerce; and P. Grodzinski, Technical Editor of the *Industrial Diamond Review,* should prove to be very helpful in our endeavor to

Continued on Page 290

London Laboratory's New X-Ray Equipment

by

ROBERT WEBSTER

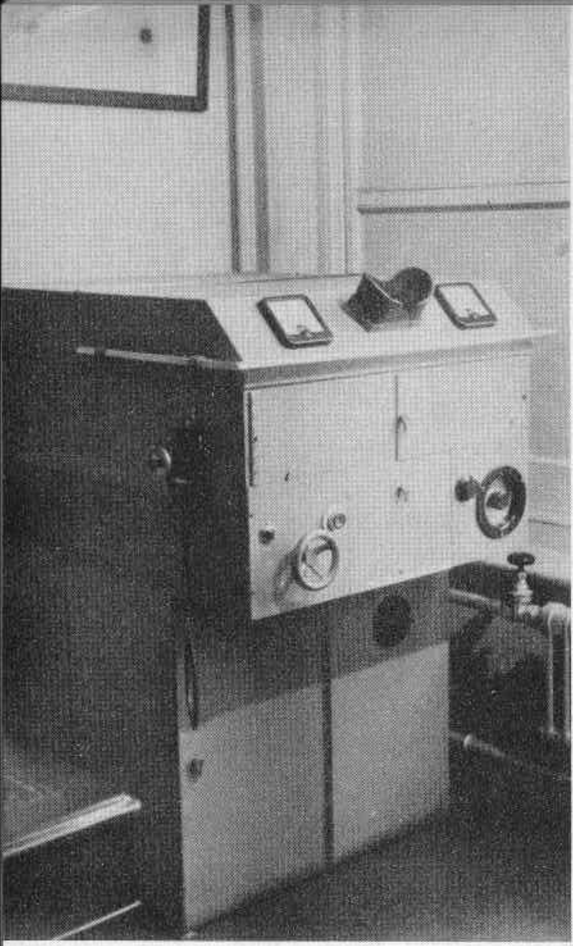
IN 1928, SOON AFTER the Hatton Garden laboratory commenced operations, the need for an X-ray set for pearl testing became apparent, and the Director, Mr. B. W. Anderson, at the behest of the Committee of the Diamond, Pearl and Precious Stone Trade Section of the London Chamber of Commerce, visited the French laboratory to inspect the set already in operation there.

From the information gained in Paris, and with the excellent cooperation of British X-ray equipment manufacturers, a suitable apparatus was designed and installed. This set, built in the day when such electrical equipment had massive proportions, did wonderful service and mercifully survived the holocaust of the Second World War. But the passing of years and the complete removal during the war of such a "roomful" of apparatus to the better safety of a solid basement had taken its toll. Eventually both tube and generator ceased to function, not, however, without a "death-spasm"; when one of the main condensers blew out with a noise like rocket-firing aircraft in full blast—much, it must be said, to the consternation of the laboratory staff.

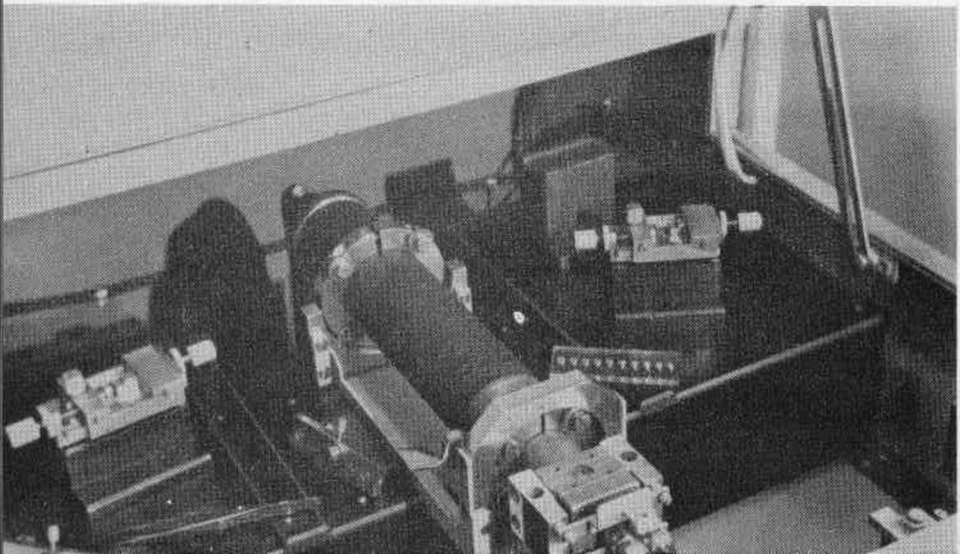
With such a contingency in mind, the go-ahead Committee which controls the London laboratory, had already decided on the provision of new and up-to-date X-ray equipment and Mr. Anderson, with Mr. C. G. Osment of General Radiological Ltd. discussed the design of a new set. However, the need was urgent and to get over immediate difficulties Mr. Osment's firm kindly loaned a small portable medical diagnosis set incorporating an oil-cooled tube with tungsten target. Working with this apparatus was unduly slow for long exposures had to be carried out in several "doses" in order not to overheat the tube. This set taught the laboratory staff much, for to avoid long exposure times, more concentration on direct X-radiography was a natural outcome—a technique which had previously been little explored.

At long last came the first glimpse of the new apparatus—on the test bed at the works—and finally its installation at Hatton Garden. Totally enclosed in a cabinet of sheet metal heavily backed with lead, the set is little larger than a household refrigerator and is tastefully finished in a "crazed" grey enamel. The fore part of the cover, carrying the voltmeter, ammeter, and a lead-glass viewing window (to observe fluorescence effects), opens up in order to adjust the tube head and mount the specimens and film carriers.

Below this cover, and on the over-hung top portion of the cabinet, are two doors which may be opened to make adjustments should it not be absolutely necessary to lift the heavy lead-lined cover. Below these doors are the hand wheel for voltage con-



• Two views of the new X-ray equipment of the Gemmological Laboratory of the London (England) Chamber of Commerce.



trol; the "on" and "off" button; the knob controlling the filament temperature (milliamperes), and a thirty minute time-clock graduated in ten second intervals which insures the set shutting off after the given time exposure has elapsed. The center front has a drop door to allow a removable tray to be placed at either of three levels in the center well so that direct X-radiographs may be taken at various distances from the target.

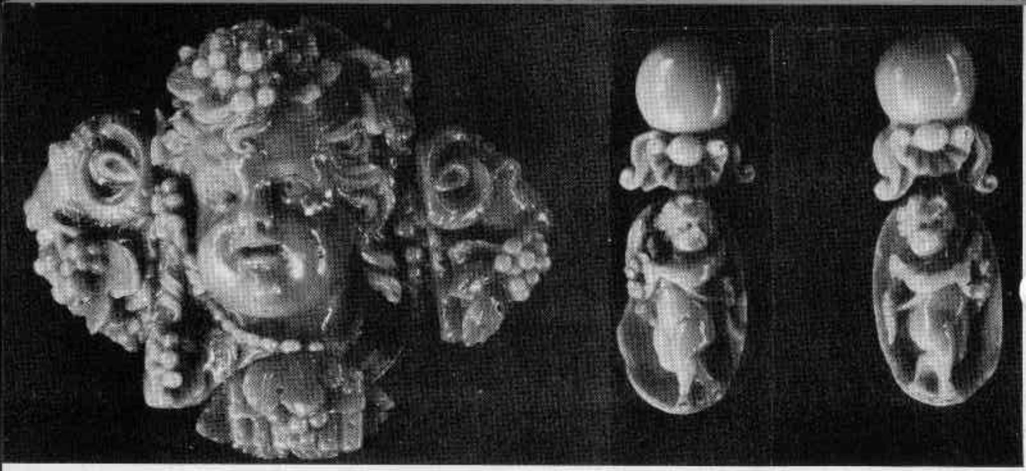
Underneath this "over-hung" top is the main pedestal which is divided into two sections, one of which contains the high-voltage generator with the main switch mounted on the front, while the other half is a shelved cupboard for storing any accessories. On the side of the set hangs a hand timer for short exposures up to ten seconds which is graduated to tenth seconds. Mounted on the wall beside the set is a "flow switch" which shuts the high-tension current off should the water supply to the anode cooling fail, or the pressure become too high; the set automatically switching on again when the water supply becomes normal. In fact the set is practically foolproof for it cannot be started unless all the doors and the cover are closed, and the set immediately stops if any door is opened while the set is running—such switching-off of the set does not invalidate an exposure for the timing clock also stops until the set restarts.

The tube is a Machlett Type 0-2 Diffraction model. It is an oil-insulated, hermetically sealed type of shockproof X-ray tube which runs at a maximum of 50 pkV and 20 mA; has a molybdenum target and two beryllium windows, diametrically opposed, as ports for the X-radiation. The tube is mounted in two sets of roller bearings; one just behind the target head and the other just forward of the rear end of the tube which carries the high-voltage cables. This allows a rotation of the tube through ninety degrees so that the rays can either be directed laterally—this being the position for lauegram work—or vertically for direct X-radiography and fluorescence. The beam not required being "stopped-off" by a brass plug.

For taking laue-spot pictures of pearls, the pearls to be tested are mounted in specially designed screw holders or vices which incorporate a lead collimator for limiting the beam of X-rays. These pearl holders, which snap into spring-loaded recesses in the tube head, are so arranged that they are in correct alignment with the focal spot. Plain brass and lead collimators are supplied for use in cases where the pearl is an awkward shape or is mounted in jewelry from which it cannot be easily removed.

Arranged on arms, which may be swung out of the way when not in use, are the two cassette holders which take Kodak plastic dental cassettes fitted with intensifying screens on two sides in order that double-coated film may be used. When in position for taking laue photographs the cassettes are approximately 7.5 cms. from the pearl, at which distance the exposure needed is not unduly protracted yet at the same time the spot pattern is clear of the heavy trace of the main undeviated beam. The distance of the pearl from the target is approximately 4 cms. which insures a powerful beam being used with great efficiency—a lauegram of a ten grain pearl can be taken in the phenomenally short time of two and a half minutes.

Foolproof, smooth in operation, such a set is a pleasure to use, and to the London staff an incentive to much work in routine and research; an opportunity, too, to study the possibilities of those pearl testing methods more favored in the North American continent—fluorescence and direct X-radiography. Mineral fluorescence under X-rays is another exciting line of inquiry, while, with the addition of a suitable camera, X-ray powder photography will be possible, and serve as a powerful aid in such cases as turquoise and other troublesome gem materials.



• Red coral brooch and earrings from Rome. Positive date unknown.

Coral— The Forgotten Gem

by
LAWRENCE L. COPELAND
Gemological Institute of America Literary Research

CORAL, AS AN ARTICLE of personal adornment, has enjoyed a varying degree of popularity since ancient times. According to Pliny, it was valued as highly in India as was pearl in Rome, but no longer does it hold such a distinction in the Western world. Like so many of the lesser-known and appreciated gem materials, coral possesses not only a rich historical background, but an ample share of tangible attributes as well. Of all the gems associated with the sea, including pearl, amber, and jet, none is more colorful as a costume accent than coral.

An interesting but little-known fact concerns the use of coral in articles of jewelry fashioned by the Indian tribes of the Southwestern United States. Prior to the coming of Coronado and Cortez, the Pueblo Indians of New Mexico and Arizona made extensive use of variously colored fragments of the spiny oyster shell from the Gulf of Mexico. Red was the most highly prized and eventually, through inter-tribal trading practices, it became popular with the Zuni and Hopi peoples as well. Sometime after 1540 the Spaniards, deciding to take advantage of the natives' love for the red shell, began importing coral and selling it as a superior substitute. Historical records indicate that it was readily accepted and soon became quite valuable, often selling for as high as \$100.00 per pound. Just when this trade first began has not been definitely established, but the oldest available reference bears the date 1822. The center of the activity seems to have been Santa Fe, New Mexico.

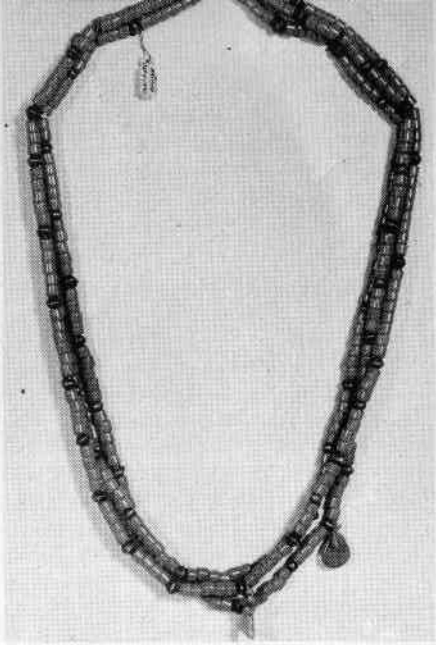
During the last century the Pueblo Indians have worn bits of coral in their necklaces, either in combination with silver beads or interspersed with shell and turquoise. This is also true of the Navajo, but it is not mentioned among the eighteen sacred objects which they prize so highly.

Contemporary Indian craftsmen, however, find little use for genuine coral. Only occasionally will one find a small piece (generally the Mediterranean variety) set in a silver mounting of a ring or brooch, usually by the Zuni tribe of New Mexico. But this is the rare exception rather than the rule and is considered merely incidental to the article as a whole. The red portions of the better quality Indian brooches and mosaic rings on the market today consist of pieces of the red abalone or spiny oyster shell, the same material that was popular prior to the Spanish invasion, while the ultra-modern, less expensive ornaments may contain colored plastic or other man-made materials which simulate genuine coral.

Antique necklaces, consisting entirely of coral beads, are extremely rare at the present time, and always command a high price among dealers and collectors.

It is generally agreed among anthropologists that much of the importance given to coral and shell by the Indians resulted from their instinctive worship of anything associated with water, for to water these people of the semi-arid Southwest owed their very existence. Even today this concept still exists in the form of religious and ceremonial symbols representing clouds, lightning, fish, turtles, and other objects suggestive of water. In former times long pilgrimages were made to the Pacific for the express purpose of obtaining sea water for use in certain tribal ceremonies.

The superstitions associated with coral are many and varied. Not only was it important from the standpoint of beauty, but it was used extensively for medicinal purposes. Ground to a fine powder and mixed with water or wine, coral was said to cure a wide assortment of human ills.



• Navajo necklace of crudely fashioned red coral beads. Late 18th century *Southwest Museum, Los Angeles.*

That coral possessed the power to ward off evil, impart wisdom, staunch the flow of blood, and drive off fever are representative of the numerous beliefs that once persisted.

Among the Romans, branches of coral were hung around children's necks to preserve them from danger. A belief in the potency of coral as a charm continued to be entertained throughout medieval times, and even in this century in Italy coral has been worn as a preservative from the evil eye and by females as a cure for sterility. Although Pliny points with scorn to most of the exaggeration of the magicians of his day regarding the charms of gem materials, he relates their claims that coral quiets the waves of the sea and makes it calm. Further, he tells how they claim that it preserves the wearer from lightning and terrible tornadoes.

During the height of the Roman civilization it was an accepted fact that a dog's collar, set with coral and flint, acted as a positive remedy for hydrophobia! Still another belief, reported by Kunz to have been contained in an old pharmacopoeia, concerns the preparation and use of a "Tincture of Coral." After a lengthy and tedious process of heating a branch of coral in melted wax and steeping the resultant product in alcohol, a red liquid was eventually produced. Not only was it said to be an excellent tonic but, by causing perspiration and diuretic action, it was supposed to have had the power to drive "bad humors" from the body.

Among the more widespread beliefs of early centuries was the theory that red coral changed its hue in conformance with the condition of the wearer's health. According to the writings of Johann Wittich, a German physician of the sixteenth century, the validity of this concept was exemplified by the death of a patient whose red coral necklace turned whitish with the onset of sickness, then a dirty yellow, and finally with the coming of death, became covered with black spots.

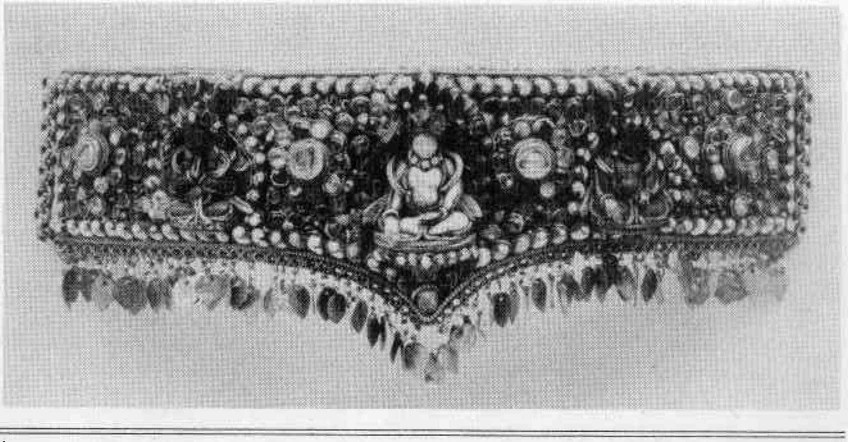
Popular in eighteenth century France was a necklace known as a *pater de sang* (blood rosary), which was supposed to check hemorrhages. In a volume treating of superstitions of the period, however, the anonymous author questioned the practicability of the rosary. Assuming that the beneficial effect could only be produced by thickening the blood, he reasoned that the detriments might very well outweigh the advantages—for if the rosary possessed the power at one time it must possess it constantly, therefore rendering the overall action very dangerous!

Superstition dictated that, in order to retain its remarkable powers as an amulet, coral must not have been carved or otherwise worked by man. In addition, it had to be worn in a conspicuous place. Once broken, the magic powers no longer existed.

In early day Persia, odor played an important part in distinguishing imitation from genuine coral—not without the smell of sea water could it be genuine. The Persians also believed that the precious red coral did not acquire its characteristic color until it had been removed from the sea. Among the Chinese and Hindus, coral was held in high esteem since it was used to ornament the images of their gods.

Together with turquoise and amber, coral ranks as one of the most popular gem materials with the people of Tibet. Aside from its esthetic value it has a deep religious significance, red being symbolical of

• Portion of Tibetan head ornament with coral and turquoise from 17th to 19th centuries. *Metropolitan Museum of Art.*



one of the incarnations of Buddha. During a visit to Tibet in the thirteenth century, Marco Polo, the Italian explorer, noted the predominant use of coral for personal adornment as well as for ornamenting the idols in their temples.

Lieut. Col. L. Austine Waddell who reached Lhasa, capitol city of Tibet, in August 1904 with the British Expedition under the command of Colonel F. E. Younghusband, gives an interesting account of a vase used in ceremonies praying for the long life of the Grand Lama. The vase is beautifully designed of coral, lapis lazuli, and white chalcedony, and is entirely the work of Parisian artisans. The large pieces of coral came from Leghorn, and the high priest went there himself to procure them.

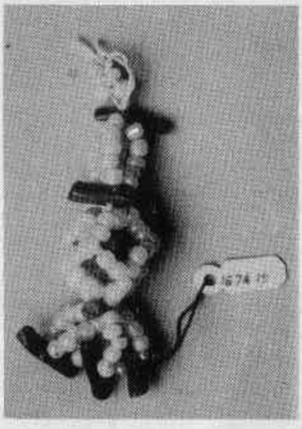
In certain parts of Africa strings of coral once possessed a very sacred quality and were regarded as the most priceless gift a ruler could bestow. So great was the importance of such a royal gift that, should it be lost or stolen, all involved in the incident suffered the penalty of death.

About the beginning of the Christian era a great trade was carried on in coral between the Mediterranean cities and India, where it was highly esteemed as a substance endowed with mysterious sacred properties. Pliny tells us that previous to the Indian demand, the Gauls were in the habit of using it for the ornamentation of their helmets and weapons of war; but in his day so great was the Eastern demand that it was very rarely seen even in the regions which produced it.

In chemical composition coral is primarily calcium carbonate ($CaCO_3$), with minor amounts of magnesium carbonate ($MgCO_3$), calcium sulphate ($CaSO_4$), ferric oxide (Fe_2O_3), and insignificant quantities of water, organic matter, and miscellaneous mineral substances. It is the presence of the organic matter which causes coral to become black upon being heated. The specific gravity varies between 2.6 and 2.7 and the hardness lies between 3 and 4. Precious black coral is somewhat softer, having a value of 2½ to 3 on Mohs' scale of hardness and being appreciably lower in specific gravity—approximately 1.34 to 1.495. As a general rule, the greater the content of magnesium carbonate the greater the hardness. Coral is translucent to opaque. Its luster is dull to greasy in the rough—polished specimens are at best sub-vitreous. While not excessively durable in any respect, it is sufficiently tough to be worked with a knife or file or turned on a lathe.

Coral is formed as a result of the deposition of calcium carbonate by a gelatinous marine animal (polyp) around its body in branch-like shapes which are built up in the form of hollow, fitted tubes. The calcium carbonate is probably in the form of calcite, the fibrous crystals of which radiate at 90 degree angles to the main axis of the skeleton. The calcareous skeleton of a coral colony is firmly attached by a circular-shaped "foot" to any suitable natural or foreign object on the ocean floor. The nature of the cementing process is such that the disc-like foot provides a firm foundation for the entire structure. It is perhaps of interest to note that the coral colony, unlike plants, always grows in a direction perpendicular to the surface to which it is attached. For

• 19th century Turkish charm of pearls and coral. ***Metropolitan Museum of Art.***



example, the direction of growth would be downward in the case of initial attachment to the underside of a rock. Coral occurs in shallow water, generally ranging in depth from ten to fifty feet. Occurrences up to one thousand feet have been infrequently encountered, however. Usually the quality of color increases with depth.

Because of its distinctive appearance under magnification—described as minutely streaked or grained — and its characteristic shape in the natural state, coral is seldom confused with other gem materials. The streaks, sometimes referred to as "furrows," assume either a parallel or modified spiral arrangement, which, in the former instance, seem to correspond to the growth of the stem and its branches. Other distinguishing features are small, circular, shallow depressions which indicate the growth site of the individual polyps. Minute pits, caused by certain boring-type marine organisms, may also be present. The principal substitutes for coral are celluloid, wood, and sealing wax, none of which has the characteristic surface appearance of genuine coral.

When heated, celluloid emits a camphor odor. Wood is scratched by the finger nail, exposing typical wood texture under the artificial surface. Under magnification, sealing wax presents a flowed or glass-like appearance. Coral effervesces briskly with hydrochloric acid, while the above substitutes fail to react. The acid test is of no value in separating coral from conch pearl (often called pink pearl), since both materials effervesce. Higher specific gravity (2.83-2.86) and a decidedly different appearance under the lens—described as scaly, irregular, and porcelain-like—serve to identify conch pearl.

Although many types of coral exist, only one variety is particularly adapted to articles of jewelry. This member of the family is commonly referred to as Precious or Noble coral, and bears the scientific title *Corallium Rubrum* or *Corallium Nobile.* Its color ranges from pure white to dark red, the former said by some authorities to be due to a diseased condition of the organism.

The source of precious coral is confined largely to the Mediterranean Sea and its inlets, with the coasts of Tunis, Algeria, Moroco, Sardinia, and Sicily ranking as the principal producers. Less important sources are the coasts of Ireland, Australia, and Japan. A black variety also belongs to this species, but the color represents the first stage of the decomposition of precious coral and is only superficial, usually extending just below the surface. Black coral proper is a distinct species known to zoologists as *Antipathes Spiralis.* In contrast to the calcareous nature of most coral, this type is often described as a horny substance, lending itself well to carving and molding. The Indian Ocean is its habitat and it is known to the natives of that region by the name of *akabar;* it is sometimes referred to by jewelers as "Kings Coral." A similar material is known to occur in the Mediterranean area where it is known as *giojetto.* An attractive blue coral, *Allopora Subviolacea,* was formerly fished off the Cameroon and Gulf coasts of West Africa, but the supply has long since been exhausted, it is no longer of gemological importance. Fossil coral or silicified coral (beekite) has no value as a gem.

Of the factors affecting the value of coral, color demands first consideration. In addition, although secondary in importance, it must be compact, capable of taking a good polish, and free from visible spots and other obvious structural defects. As with many other commodities, fashion plays an important part in determining which color of coral shall command the highest price. Some variation of red, however, seems always to be preferred. Racial custom, too, is a contributing factor in this respect, as evidenced by the Arabs longstanding preference for the bright red shade. Of perennial popularity in Europe is a "fresh rose" color, known to coral dealers as *pelle d'angelo* (angel's flesh). Other descriptive terms commonly employed are *bianco* (pure white), *roso pallido* (pale rose), *roso vivo* (bright rose), *rosso* (red), *rosso scuro* (dark red), *secondo coloro* (second color), and finally the darkest red of all, *carbonetto* or *arciscuro.* These terms originated in Italy, the past and present center of the coral industry.

A striking pecularity of coral is its uniformity of color — very seldom will it show different colors or different shades or tints of color in the same piece. It has been said that coral experts are able to detect and classify over one hundred shades of red, a fact that forcibly emphasizes the wide color range available. Current prices for fine quality rough material range between $12 and $20 per pound; finished beads of superior quality and workmanship vary from $5 to $7.50 per carat.

The fishing and working of coral is almost entirely an Italian industry. Fishing is invariably done during the summer months, since the winter storms materially increase the hazards to both men and cargo. The boats, built specifically for the purpose, are all constructed along the same lines and, even though comparatively small, they are nevertheless solid and seaworthy. In shallow water little difficulty is experienced by the divers, but areas of greater depth — from which the finest material is obtained — require special apparatus.

Coral is most commonly fashioned into beads — either round or egg-shaped — and used in the manufacture of necklaces, rosaries, and bracelets. Carved ornaments, including cameos and intaglios, are frequently seen — beautifully intricate pieces which represent the height of the Italian craftsman's art. Other carvings may represent such familiar objects as trees, birds, and animals — even pieces of sufficient size for umbrella handles and walking sticks have been carved.

Although the potential possibilities for the use of coral in decorative fashions is unlimited, it will from a sales standpoint probably never merit more than an obscure corner of the jeweler's showcase. Nevertheless its value as an accent or contrast medium should not be overlooked. In combination with turquoise it makes a striking accent when worn with pastel tints. Its wide range of color makes it a suitable jewelry accessory for all women — the pinks for blondes, and red or white most effective for brunettes. In offering coral as a novel and charming effect in personal adornment, the jewelers should stress always the importance of its wide color range as this is his principal sales tool.

1. Dr. Max Bauer and L. J. Spencer, *Precious Stones*, London, 1904.
2. Julius Wodiska, *A Book of Precious Stones*, New York, 1909.
3. Dr. Sydney H. Ball, *A Roman Book on Precious Stones*, G.I.A., Los Angeles, 1950.
4. F. W. Hodge, Director of the Southwest Museum, Highland Park, Los Angeles. (Private communications).
5. Arthur Woodward, Chief Curator of History, Los Angeles County Museum. (Private communications).
6. Museum of New Mexico (School of American Research), Santa Fe, New Mexico.
7. G.I.A. Courses.

• Oriental figurine carved from precious rose-colored coral on teakwood base. ***Courtesy Lelande Quick.***

Gemological Digests

NOTES ON IMITATION PEARLS

MOST gemologists are familiar with the fact imitation pearls are made by spraying or dipping glass beads into a solution made from fish scales. The nature of this solution is of interest and we are indebted to Dr. L. M. Greenstein, researcher, and the Mearl Corporation, manufacturers of New York City, for a more detailed description of the process employed.

Contrary to the belief of some laymen, actual scales are not used in solution but are the source of a material—guanine—which has the lustrous property desired. Guanine, in the form of tiny crystals, adheres to the membrane of the scales and causes the orient as seen on the fish.

Almost any member of the herring family can be used in producing imitation pearls. The tiny crystals of guanine are released from the membrane by soaking the scales in an aqueous detergent, the exact nature of which varies with the processor and is a trade secret. After repeated washings and the use of a centrifuge, the solution is changed gradually from an aqueous one to a cellulose nitrate solution. At no time must the guanine dry out. A standard pearl essence is made of eleven per cent suspension of crystals in cellulose nitrate.

Imitation pearls are currently made by dipping so-called alabaster glass beads into a mixture of six ounces standard pearl essence to one gallon of clear cellulose nitrate. Occasionally plastic beads are used. They have a specific gravity under 2.00, while the glass used has a specific gravity near 2.53.

The drilled beads are placed on thin sticks and a number of them fastened to a board. After dipping, the board is rotated slowly and a 45-minute period is allowed between each of the four or five coats. Finer luster is produced if a thinner mixture is used and more coats applied. However, in either case, the resultant "pearls" lack the orient of natural or cultured pearls, though luster may be quite good.

Orient may be simulated by dipping these pearls into a clear cellulose acetate, after which they are carefully polished and then dipped into clear cellulose nitrate. An interference effect is set up between these last two layers and with the underlying lustrous essence, a good resemblance to nature's product is produced. This process is, of course, more expensive but results in a much more effective imitation.

Large objects, such as statuettes, are sprayed with the essence rather than dipped, in which case a thinner solution is used.

G. R. Crowningshield, G.I.A.

BRAZILIANITE COLLECTION BELIEVED LARGEST

A 127.44 carat parcel of brazilianite, consisting of twenty brilliant-, emerald-, and square-cut stones, is considered to be the largest single collection of gem quality brazilianite known. Outstanding in this group is a 44.02 carat emerald-cut stone—the largest individually fashioned specimen on record.

Owned by Edward Swoboda, Los Angeles gem dealer, these stones of light, greenish yellow conform to the typical color classification of all known brazilianite.

The present deposit on the Corrego Frio in Minas Geraes is reported virtually exhausted, which may soon place brazilianite in the category of an extinct species.

Gemological Digests

JADEITE AND NEPHRITE JADE DISCOVERED IN CALIFORNIA

Of gemological interest is the report by the California Department of Natural Resources, Division of Mines, that jadeite jade was found recently as a single stream-rounded boulder in Clear Creek, San Benito County, California. Although not of gem quality, the jadeite is opaque, grayish green, compact, and extremely tough. This is the largest specimen of jadeite yet found in North America. The discovery was made by K. J. Frisch and the late L. Ph. Bolander of Oakland.

Jadeite is a pyroxene with fibrous, microcrystalline structure; in pure form it is sodium aluminum silicate, but it commonly contains variable amounts of two other pyroxene molecules, diopside or acmite. The wide range of color, usually in shades of green, but also white and nearly black, is ascribed to this variability in composition.

The Division of Mines Laboratories, where the first examination of this jadeite was made, found sodium, aluminum, and silica, indicating a small admixture of the diopside molecule. Further studies were made by A. F. Rogers of Stanford University and by George Switzer of the U. S. National Museum, Washington, D. C. and a member of the Editorial Board of *Gems and Gemology*. They stated, "optical, X-ray, and chemical data show the material to be nearly pure jadeite."

A recent major discovery of nephrite jade has been made near Porterville, Tulare County, California, according to the California State Division of Mines. This material is of medium to dark green color, excellent translucency, and fine cutting quality. Two separate deposits have been found and material in excess of one ton has been extracted from one deposit. Several more tons are in sight. Compressed air drilling equipment is used, but due to the high degree of toughness of jade, mining has been slow and difficult. Two other commercially important nephrite jade localities in the United States are known — one in Monterey County, California, and the other near Lander, Wyoming.

TOURMALINE CAT'S-EYE STUDIED

Among the more rare and unusual colored stones studied in the G.I.A. Laboratory during recent weeks was a small selection of tourmaline cat's-eyes. Owned by a Los Angeles gem and mineral dealer, the chatoyant material represented but an infinitesimal portion of a large shipment of ordinary Brazilian tourmaline. While not common in any quality, the finer specimens are extremely scarce and could, with sufficient supply and proper marketing, gain rapidly in public favor.

The gems were particularly interesting in that the parallel fibers or inclusions causing the "eye" (chatoyant band) were unusually small and compact — in contrast to the very obvious inclusions most generally encountered — thereby closely approximating the silky appearance and well-defined chatoyancy of the better quality chrysoberyl cat's-eye. These features, together with a body color of deep, intense bluish green, resulted in a stone of unusual beauty and uniqueness. Occurrences of gem quality material, however, are sporadic, and the possibility of encountering commercial quantities in the future is very remote.—

Lawrence L. Copeland, G.I.A.

Gemological Digests

IRRADIATED ZIRCON COLORED VIOLET

Prof. Dr. K. Schlossmacher, Director of the Gemological Institute of Idar-Oberstein, tells us of his experiences with violet colored zircon. Some time ago he received samples of zircon from two deposits in Siam. For three weeks he irradiated them with radium of enormous intensity. Among the zircons were two pieces, brown by nature and burned colorless. After the irradiation they showed a violet color, nearly as amethyst. After exposing them at the window to diffused daylight for four weeks, to test the stability of color against light, these zircons turned a pale violet.

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make the Nomenclature international in character.

The various comments were discussed at great length by Messrs. H. Paul Juergens, Richard T. Liddicoat, Charles H. Church, Oscar Kind, Jr., Ralph J. Holmes, Chester B. Slawson, Jerome B. Wiss, Lester Benson, and Edward H. Kraus. The preliminary lists will now be revised, and as soon as list B, Other Gem Minerals, can be prepared, all will be sent to the members of the Educational Advisory Board for further comment.

Since much correspondence is involved, a longer time is required to reach final decisions than would be necessary if the members of the Board could be assembled for a conference of several days. However, every effort will be made to agree upon a standardized Nomenclature which can be submitted to the president of the American Gem Society, and by him, through the regular channels, to the members of the Society for approval at the next Conclave.

1) Given at the American Gem Society Conclave in Detroit, March 26, 1950.

REVIEW

"The Art of the Lapidary,," *by Francis J. Sperisen, published by The Bruce Publishing Company, Milwaukee, Wisconsin, Available through the Gemological Institute of America. Price* $6.50.

Written by a professional lapidary with thirty-five years' experience, this book is not written for the beginner but rather for the more advanced hobbyist who wishes to try new techniques and enter new fields of the lapidary art.

The main portion of this book is devoted to faceting and cabochon cutting. Many new approaches are presented including sphere, cylinder, and cube cutting. The styles and phases of faceting given, differ in many respects from those appearing in other books on this subject.

Other branches of the art of the lapidary presented include hole drilling in stones, engraving, carving, sculpturing, mosaic, inlay, and parquetry.

The entire book is profusely illustrated with excellent drawings and photographs, numbering more than 400.

In the beginning, the author devotes sixty-seven pages to the identification and physical classification of gems. This part of the book, in contrast to the lapidary section, does not cover the subject adequately. The diamond-cutting section also is less effectively handled. The photomicrographs of gems are very well done, but are far in advance of the accompanying material. However, this is a small portion of the book and should not detract from its value. *The Art of the Lapidary* is a valuable addition to the library of any gemologist or lapidary.

Jack Schunk, G.I.A.

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generally masked by the general absorption of the violet, so that it is in paler jades that this band is most useful.

Before leaving the spectrum of emerald the question of synthetic emerald should be briefly considered. In the matter of absorption, synthetic emerald bears much the same relation to the natural mineral as synthetic ruby does to natural ruby — that is, it is virtually the same only rather more intense, owing to the presence of a higher percentage of chromic oxide. In the early German synthetic emeralds, two "extra" bands appeared, not previously noted in natural stones. However, these bands (at 6060 and 5940A) have since been observed in deep-colored native emeralds, and cannot be relied upon. Thus the internal features, refractive index, and density must still remain the surest tests for synthetic emerald.

The absorption spectrum of alexandrite has already been described to some extent above, and can be quite briefly dealt with. The doublet (6795 and 6774A) and the three other notable lines in the red at 6650, 6550, 6450A, are more sharply defined than in emerald, and the two lines in the blue, at 4720 and 4600A, are stronger. When examined "blind" the spectrum might be mistaken for that of Siam ruby, but the red doublet can only exceptionally be seen as a fluorescence line in alexandrite, and there are two lines in the blue instead of three as in ruby. A glance at the stone in daylight would in any case make one realize that one was not dealing with ruby.

Alexandrite is notably pleochroic, and the absorption therefore varies a good deal with direction: in any random direction, however, the bands listed above should be visible. The synthetic corundum colored by traces of vanadium, which so often masquerades as alexandrite, has its own quite distinctive spectrum, in which a single narrow line appears in the blue at 4750A.

It was mentioned above that the spectra in Fig. 1, are drawn as seen through a diffraction grating spectroscope. In the prism instrument recommended (for the greater clarity and intensity of the spectrum produced) the dispersion of wavelengths increases progressively towards the violet, with the result that the red end of the spectrum is far more compressed relatively to the other end of the spectrum. This of course makes the distribution of the absorption bands appear different. This is apt to be confusing to the student, particularly as the colored drawings of spectra which have so far appeared (notably in my book *Gem Testing* and Webster's *Gemmologist's Compendium*) have been drawn with the wavelengths evenly distributed, as seen through a diffraction grating. I have therefore had another drawing prepared showing as nearly as possible, the disposition of the bands in the emerald absorption spectrum as seen through a prism spectroscope. It will be seen from the wavelength scale how the spectrum spreads more and more towards the shorter wavelengths (Fig. 2).

In conclusion I should like to thank Mr. T. H. Smith for his kindness in preparing for me these careful and accurate drawings.

INDEX NOW AVAILABLE

According to Paul Grodzinski, Technical Editor of the *Industrial Diamond Review*, the *Industrial Diamond Trade Names Index* has been completed. This work is a compilation of trade names, firms, addresses, etc., of the diamond industry. Further information regarding this publication may be obtained from the *Industrial Diamond Review*, 226 Latymer Court, Hammersmith, London, W.6, England.