COLOR BOOKS

GEM STONES

by Noriyuki Sakikawa

Seattle, Wash. 98107

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Translated
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HOIKUSHA

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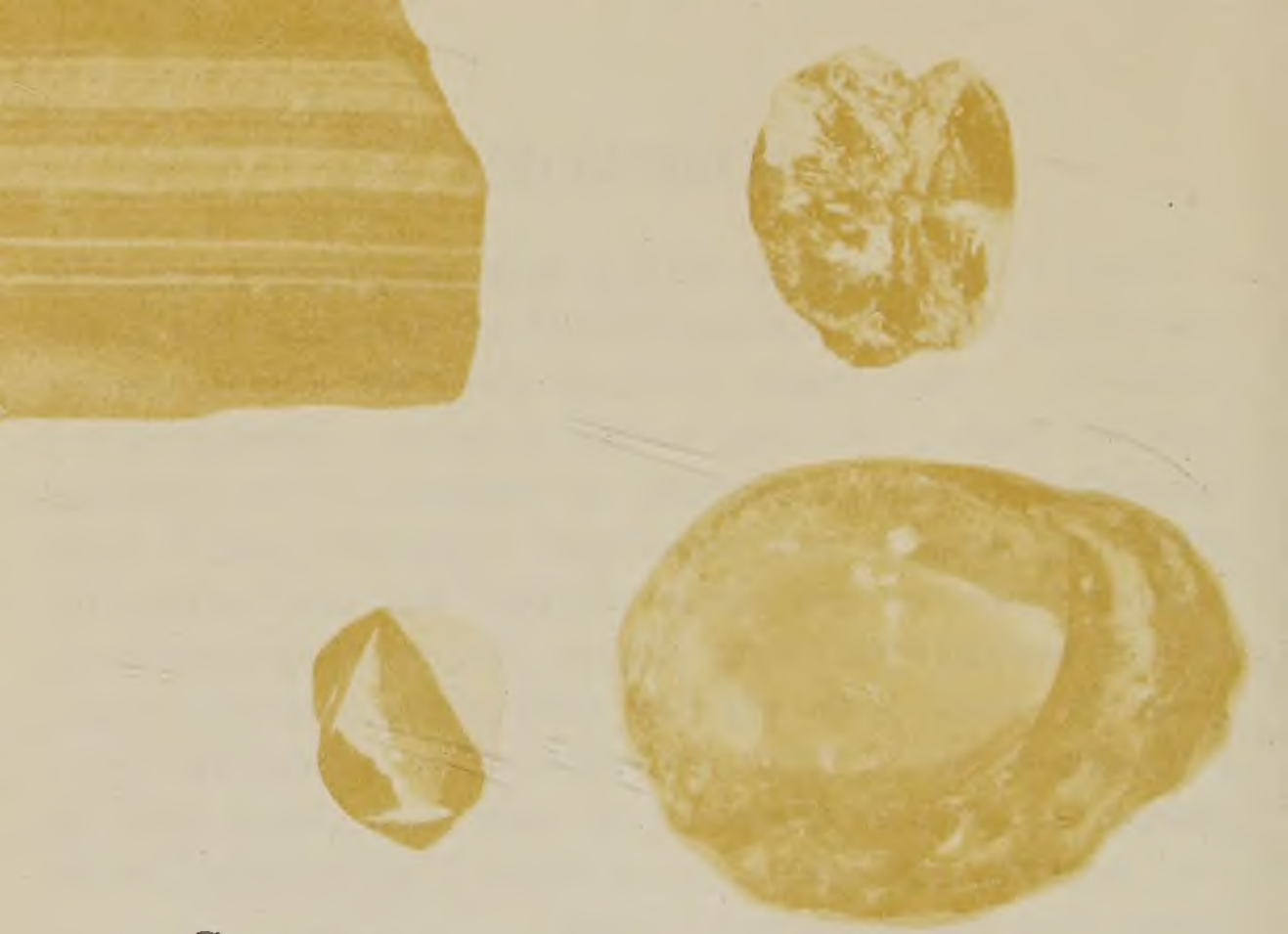
FOREWORD

When I was asked to write a book on precious stones as one of the COLOR BOOKS SERIES of Hoikusha Publishing Company, I was eager to accept the offer, for it was the kind of book I had long wanted to write. Furthermore, I remembered that a number of readers of my previous books on jewelry had repeatedly suggested that I write another book on the same subject, but one, unlike my former books, with plenty of color photos of precious stones. However, since I do not own such precious stones myself, I thought it would be a difficult task to collect the color photos. I decided, therefore, to take such photos with my own camera; moreover, by so doing I knew that I would learn more about precious stones.

Mr. Michio Taniguchi, Mr. Eiichi Matsui, Mr. Keisei Muraji, Dr. Satoyasu Iimori, and Mr. Tetsuro Kinoshita made it possible for me to take photos of various precious stones, their art objects, their rough stones, and other related items. However, many of the photos which I, an amateur photographer, had taken did not turn out well enough to be used for my present book. Therefore, those photos had to be taken by a professional photographer all over again.

I would like to express my heartfelt thanks to those many people who helped me in any way to write this book.

Noriyuki Sakikawa



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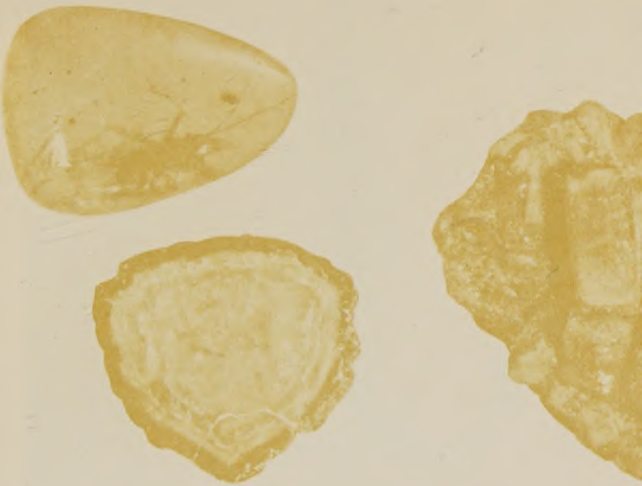


Precious Stones and Accessories

Precious stones are used for various accessories, but expensive stones are used chiefly for rings.

The History of Jewelry

Jewelry has a long history. Today jewelry is used mainly for ring stones. When were rings first made? It is surprising that ancient Japanese did not have rings. Probably the Japanese did not like those ornaments, such as rings, necklaces, and earrings, which are worn directly on the flesh.

In Europe wearing rings has long been established. Primitive rings, as shown in the photograph below, were made only of gold and silver, and had certain symbols or figures engraved on their heads. These rings were also used for signets. In Japan, too, gold rings used to be employed as seals by merchants, but this custom is now out of fashion. The letters on the ring heads in the photo below may well be lovers' initials rather than seals as

Ancient European Rings

such. To these rings have been gradually added precious stones, until our present rings came into being.

When precious stones were first used for rings, it was very difficult to cut hard stones. Therefore, those stones, rough garnets and diamonds among others, which are available naturally in magnificently geometrical patterns were widely used for rings. However, these primitive gem-set rings must have had a certain magic significance rather than been merely ornamental. Among the Egyptian excavations we find rings engraved with gold bugs or serpentine patterns. The very act of wearing rings may have been thought to produce a kind of magic effect. Thus gems for rings were chosen not only for their beauty or rarity but also in the belief that, for instance, the emerald had power to cure the sick and the turquoise was sure to bring luck. Precious stones themselves had some religious characteristics. The present system of birthstones was in all probability decided by the jewelers for their own commercial purposes. However, the very idea of birthstones was linked very closely with ancient religious or magical sentiments.

There is nothing like a gem-set ring, small and yet expensive, to attract one's attention effectively; a small stone weighing only 0.2 carat set in a ring serves this purpose. Furthermore, a ring is not easily lost or stolen. For this reason, it seems that gemstones have come to be associated with rings in Japan, too.

January
Garnet

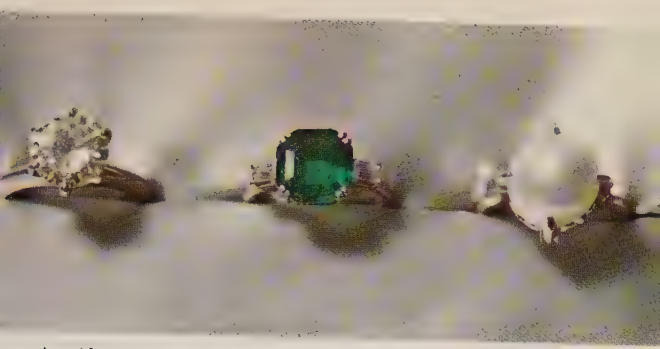
February
Amethyst

March
Bloodstone
Aquamarine
Coral

July
Ruby

August
Sardonyx
(Red Agate)

September
Sapphire



April
Diamond

May
Emerald
Jade

June
Pearl
Moonstone

October
Opal
Tourmaline

November
Topaz
Golden Sapphire

December
Turquoise
Blue Zircon

It is said that those born in a given month will acquire the special benefits of the gem of that month if they wear one. The origin of this story is not certain, but it is probable that the custom of wearing various ornaments for their magic powers has been romanticized and gradually associated with accessories. The Egyptian beetles and the ancient Japanese curved jewels (*magatama*) had similar purposes. The belief that the birth-month determines the course of one's life is to be found throughout the world.

Today the reasons why the garnet was chosen for January, the diamond for April, and so forth are not well known. There is a theory that the beginning of birthstones goes back to the Jewish tradition in which the Jewish high priests decorated their ceremonial dresses with twelve gems. The following list gives the official stone (natural gem) for each month.

Birthstones

Month	Stone	Color
January	Garnet	Dark Red
February	Amethyst	Purple
March	Bloodstone	Dark Green with Red Spots
	Aquamarine	Pale Blue
April	Diamond	Transparent, White
May	Emerald	Bright Green
June	Pearl	Cream
July	Ruby	Red
August	Sardonyx	Banded Red & White
September	Sapphire	Deep Blue
October	Opal	Variegated
November	Topaz	Yellow
December	Blue Zircon	Pale Blue

The foregoing list is not absolute, however; readers should feel free to choose any stone they like. Moreover, todays jewelers even provide those who think they cannot afford natural gems with synthetic birthstones.

The fact that synthetic birthstones are always on display in the show-cases of jewelry stores indicates that these stones are being widely enjoyed. Two of these stones, synthetic ruby and synthetic sapphire, are made of synthetic corundum. Since corundum alone is limited in its color, synthetic spinel is usually included to enrich the color. For diamonds rutile, which is of a high refractivity and which is more brilliant than natural diamond, is used. The following list of synthetic birthstones has white sapphire for the month of April, even though titanic strontium could more effectively be used.

Synthetic Birthstones

Month	Stone	Color
January	Alexandrite	Green in Daylight and Red in Artificial Light
February	Purple Sapphire	Purple
March	Blue Spinel	Blue
April	White Sapphire	Transparent, Colorless
May	Emerada	Green
June	Ceylon Sapphire	Ligh Blue
July	Ruby	Red
August	Erinite	Pale Blue
September	Sapphire	Blue
October	Pink Sapphire	Pink
November	Golden Sapphire	Yellow
December	Zircon	Pale Blue

(The names of synthetic stones above are not those of minerals but trade names.)

photo by
permissio
of BOAC

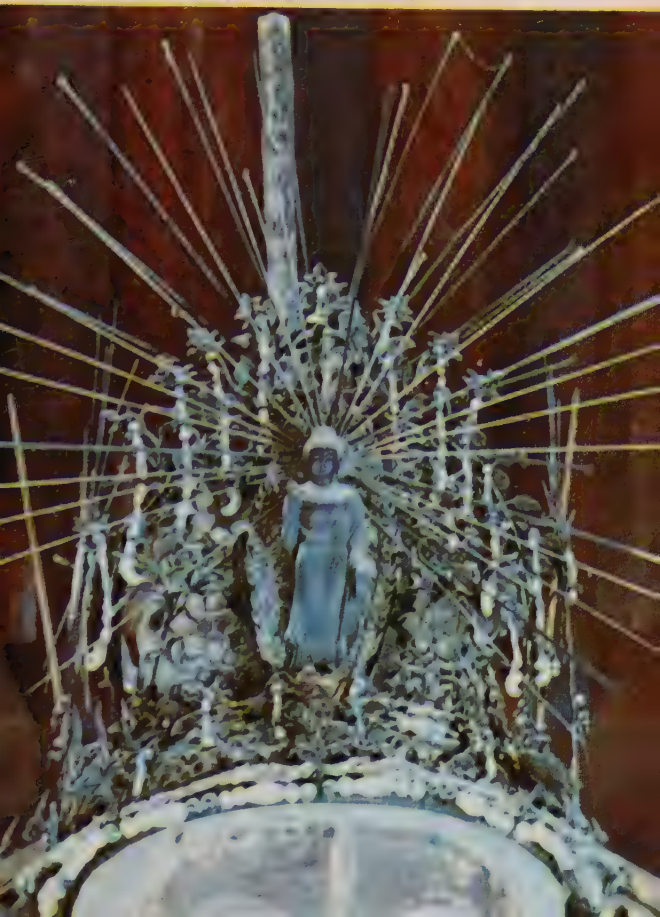
The Crown of Edward the Confessor (Imitation)

This Crown (or, rather, a much-altered replica of the original crown) is used for the coronation ceremony in Westminster Abbey. It has 2783 diamonds, 277 pearls, 17 sapphires, 11 emeralds, and 5 rubies.

In Japan, precious stones have long been used for the coronets which signify Buddha's sanctity.

The Coronet of Fuku-Kenjaku, the Merciful Goddess

Sangatsudo, Todaiji Temple, Nara, Japan



The Imperial Crown and Jewels

The tale of jewelry cannot be complete without mentioning the diamonds set in the British Imperial Crown. The Koh-i-noor diamond, which is in the crown, is probably the most famous such stone in the history of jewelry.

The Koh-i-noor was discovered at Gorgonda in India. It is said that at first it weighed 800 carats. The stone came into the hands of a king of the Mogul empire in 1304. Later it was employed in the Peacock Crown of King Shah Jehan. In 1739, when Nadir Shah of Persia invaded his empire, the diamond was taken into Persia. In 1747 Nadir Shah was assassinated and, in the midst of this confusion, when Ahmad Abdullah of Afghanistan's

(Imitations; photos by permission of BOAC)

Imperial State Crown of England

Queen Mary's Crown

attempt to seize the throne failed, he stole the diamond instead. He later became monarch of the empire of Afghanistan and died in 1773.

His son Timur, who succeeded his father, moved the capital to Kabul and took the diamond with him. Timur was succeeded by his fifth son, Zaman Mirza, who, having failed to govern his country, fled to Lahore, and lost the throne to his brother Armad. In 1803 another brother, Sujah, took the throne but was also forced to flee to Lahore to save his life, for he was very unpopular among his people. When Sujah fell under the protection of Singh of Lahore, Singh took the diamond from him in return for his protection.

In 1849, after the Sikh War, the diamond came into the possession of the British East India Company. In the following year the diamond, the Koh-i-noor, was presented to Queen Victoria. Thus the diamond was settled in the hands of the British Royal Family. All this time the Koh-i-noor had remained as it had been when it was first polished in India. Later, however, it was cut into a brilliant cut, and the weight was reduced from 191 carats to 108.9 carats.

Then the Koh-i-noor was set into a brooch for Queen Victoria. After her death the diamond was set in the front of the Royal Crown. Thus the Koh-i-noor diamond has come to be well known as the chief diamond of the British Royal Crown. The crown was used by Queen Alexandra and Queen Mary. When, later, at the time of Queen Elizabeth II's Coronation, a new crown was made, it also was decorated with this historic diamond.

photo by permission of BOAC

Huge Diamond in the Imperial State Crown of England

THE DIAMOND, the King of Jewelry

Rough Diamonds for Industrial Purposes

Rough Diamond for Use as Jewelry

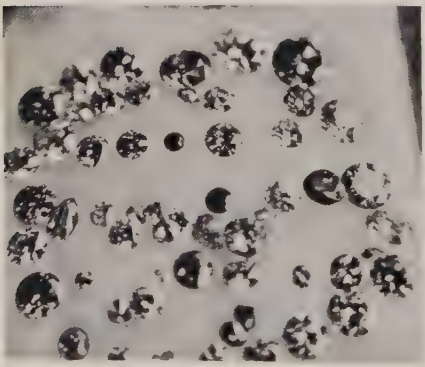
Huge Diamond Polished and Cut into the Brilliant Cut

Diamond Cutting

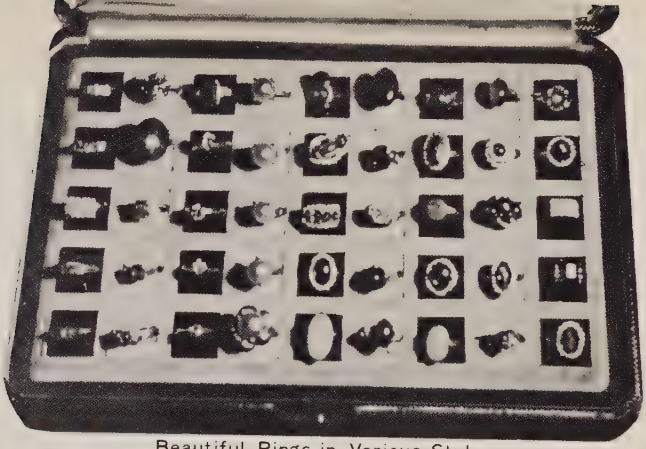
Stones for rings and so forth are usually cut or polished into traditional styles. The brilliant cut is generally used for diamonds. Emeralds are usually cut in the shape of a rectangle, called the "Emerald Cut."

Jade, opals, star stones, and so forth are cut into domed- or egg-shaped objects, whose style is now called cabochon, the oldest of cuttings. There are many other styles of cutting and polishing, but most of them are stereotyped.

Styles of cuts in diamonds include the brilliant cut, the square cut, the emerald cut, the rectangular baguette cut, the marquise cut and the triangular cut. The photo on page 14 shows various styles of diamonds. In reality they are of many colors—for example, transparent, blue, yellow, pink, and green. They come in many different sizes. Therefore, buyers are free to choose diamonds which they themselves can afford.



Various Styles of Diamonds



Beautiful Rings in Various Styles

Diamond Polishing Factory in Holland

Diamond-Set Accessories

Diamonds graded by size (Brilliant Cut)

5.0 CT 2.0 CT 1.0 CT 0.9 CT

Diamond Ring Designs

0.8 CT 0.6 CT 0.5 CT 0.4 CT

Synthetic Diamonds

Many people have long attempted to produce diamonds artificially. About one hundred years ago Hannay in England and, at the beginning of this century, Moissan in France were said to have succeeded in manufacturing synthetic diamonds. Moissan, for instance, thought that he could produce diamonds by smelting iron into which carbon was being melted; when the melted object was abruptly cooled in some kind of oil, a high air pressure was created in the interior of the object. He thought a diamond would thus be produced. However, both he and Hannay were unsuccessful.

A diamond is composed of nothing but carbon, like soot or black lead, but a natural diamond's transparent crystal cannot be easily reproduced. It is now known that only at an incredibly high atmospheric pressure and an enormously high temperature can a diamond be artificially produced. These conditions are comparable to those found extremely deep under the earth's crust. Therefore, the temperature and atmospheric pressure which Moissan's experiment managed to create were far from being capable of producing a diamond.

However, diamonds can now be produced artificially. In 1954 the General Electric Laboratory in America invented a machine which is capable of producing a pressure of 160,000 atm. and a temperature of 2,700 degrees C. These conditions, equal to those about 220 miles (350 km.) below the surface of the earth, are created by using a nickel catalyzer. Using this machine the researchers have succeeded in producing diamond crystals.

The diamond thus artificially produced is not a large,

beautiful, transparent objects. It is not the type of diamond suitable for rings. However, it is superior to broken pieces of a natural diamond when used as an industrial diamond for polishing precision instruments. This diamond is now being mass-produced and exported throughout the world.

In 1962 synthetic diamonds were successfully produced in Japan. The Toshiba Electric Company synthesized diamonds at an atmospheric pressure of 60,000 atm. and a temperature of 800 degrees C. by means of nickel and germanium catalyzers. These conditions were much simpler than those employed by the General Electric Laboratory. Again, however, these Japanese synthetic diamonds are for industrial purposes only. At the present time the largest possible synthetic diamond is 0.1 carat, although a larger diamond is likely to be produced in the future.

In 1962 the General Electric Laboratory also produced synthetic diamonds at a pressure of 30,000 atm. without any catalyzers at all. Synthetic diamonds are also being produced in Russia, Ireland, and South Africa.

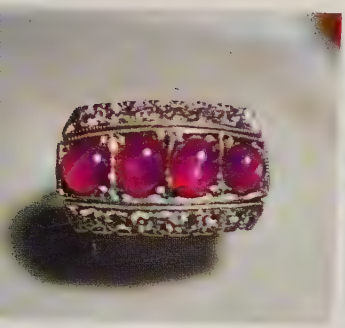
Golden Sapphire

• Beautifully Colored Stones •

It is only in quite recent times that transparent gems like diamonds have come to be treasured. In olden times beautifully colored stones, such as emeralds, rubies, and sapphires, were treasured more.

Even today younger people may prefer colored stones to transparent ones. Such beautiful colors as the red of the garnet, the yellow of the topaz, the yellowish green of the olivine, and the pale blue of the aquamarine are attractive in jewelry.

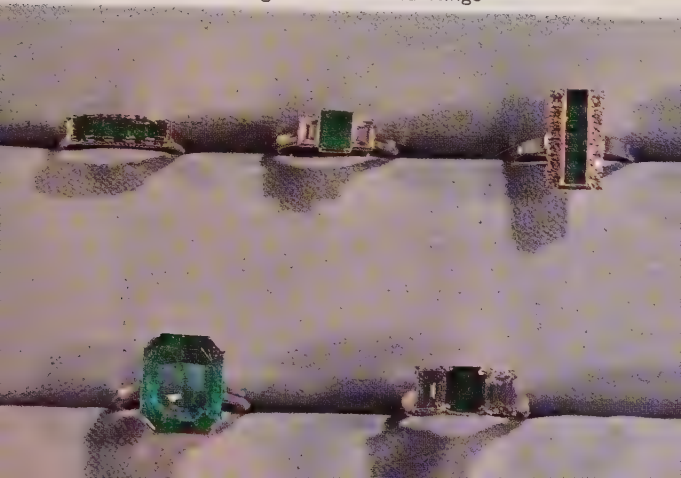
Designs of Sapphire Rings



A Design of Rubies
and Diamonds

An Emerald Design

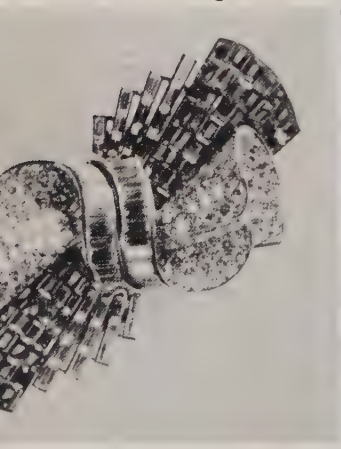
Designs of Emerald Rings



The Emerald Buddha Image

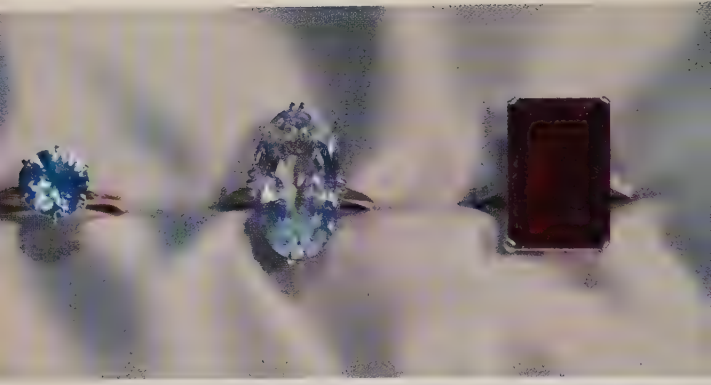
In Bangkok there is an imposing structure called the Emerald Buddha Temple. It is said that the principal image of the temple is made of emerald. I visited this temple and had the honor of seeing the image. Since it was an emerald image, the first thing which crossed my mind was that it would be a dwarf image of the Merciful Goddess; that is to say, I thought that it would be a tiny emerald sculpture in a small box. However, contrary to my expectations, it proved to be a fairly large emerald-colored image enshrined in a glass container on the high altar. Nobody is allowed to go close to the image, let alone to touch it. I paid increasing attention to the image, wondering if it could really be made of emerald.

Designs of Emeralds and Diamonds



People Worshipping the Emerald Image

However, never having heard of so large an emerald, I imagined that the image might be made of jade or jadeite. Since its color was green, it could well be jade or jadeite. As Thailand is situated close to China and Burma, both of which produce jade, it is very possible for the statue to be made of jade, even though Thailand itself is not a producer of jade. On the other hand, the only neighboring producer of emeralds is India. Furthermore, emeralds are extremely hard and are easily cracked. It would have been a very difficult task to carve a large Buddhist image out of the stone. When given another opportunity to visit Bangkok, I would like to observe the emerald image with strong field glasses. I suspect, however, that a person attempting to use such field glasses would be thrown out of the temple as impious. Many people of Bangkok were worshipping the emerald image by kneeling on the floor.



Blue Zircon Aquamarine Garnet

Among red precious stones, garnet, unlike ruby, is dark red. It has probably been in use from time immemorial. The crystals themselves are in such forms as to be effectively employed for rings; they are found throughout the world. Even in Japan fairly beautiful garnets are sometimes discovered. Garnet is the birthstone for January.

Aquamarine, a beryl like the emerald has, unlike emerald, a pale water-blue color. The crystals are often large enough to be used for brooches. Aquamarine is far less expensive than emerald.

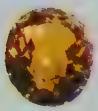
Zircon, which is as bright as diamond, is among the brightest of gems because of its high refractivity. It is a chemical compound of a metal called zirconium. Zircon is available in colors—pale blue, red, yellow, brown, green, and so forth. The pale blue zircon is the most popular.

Olivine is yellowish green rather than emerald-green. It is not very popular in Japan, but it is favored in Western countries.

Topaz is a representative yellow stone, but coloress topaz is also available. It might be taken at first glance for rock crystal, but it is of a higher refractivity and is more beautiful than rock crystal. Yellow rock crystal is, however, often used as a topaz substitute.

Alexandrite

Topaz



White Topaz

Olivine

Hidden Stories of Precious Stones

Diamonds are used not only for ring stones; combinations of many diamonds are also utilized for various other beautiful ornaments. The photo below shows diamonds alone inlaid on a platinum base. The rectangular diamonds in the middle are called baguettes. Brilliant-type diamonds surround the ornament. Sometimes small rough diamonds are used for this kind of handiwork.

A sample of these magnificent works inlaidwith diamonds is a royal crown. Royal crowns generally have a large

A Splended Design Made of Nothing but Diamonds

diamond in the front. The Koh-i-noor of the British Royal Crown, for instance, weighs 108.9 carats. The Pitt Diamond of the Louvre Museum in France weighed 410 carats when first discovered in India. This rough stone was cut into three pieces and set in the front and both sides of the crown. The front one is 30 mm. long, 25 mm. wide, and 19 mm. deep.

World-famous diamonds often have legends connected with them. For example, the Orlov Diamond, which was once owned by the Russian Imperial family, was set in the eye of a sacred Hindu image in India at the beginning of the 18th century. A French armyofficer stationed in India at that time stole this diamond. The officer first pretended to be converted to Hinduism, thereby securing a position as a guard of the Hindu temple. On a certain stormy night he stole the diamond set in the eye of the image and sold it to a British army officer. The diamond weighed 200 carats. The British officer, taking it to London, sold it to a jeweler. Thejeweler in turn sold it to Count Orlov, a Russian who was then taking refuge in London. It is said that Orlov regained his political position by presenting the diamond to the Empress, Cathernie II. This diamond .now may be seen in a certain museum of the USSR.

Some people say that diamonds bring about misfortune. The Hope Diamond, which is blue and weighs 44.5 carats, is well-known for bringing its owners tragedy. Four owners—a Persian king, a French millionaire, Louis XVI, and an English businessman--all met untimely deaths. Since this diamond is now, however, in the possession of the Smithsonian Institution in Washington, D. C., it is most unlikely that it will being tragedy to any individual in the future.

Nepalese Handicrafs Using Colored Stones

The Himalayan country of Nepal has producted beautiful metal artifacts for a long time. For instance, several skilful bronze Buddhist images inlaid with rubies and sapphires exist. The photos are of Nepalese artifacts, characteristically with numerous colored stones set in brass. The blue stones are turquoise, while the red stones may be coral. The Himalayas produce various kind of beautiful gemstones; these are the raw materials for the famous Nepalese handicrafts.

The City of Katmandu

Nepalese Crafts

The secluded city of Katmandu in the midst of the Himalayas provided me with many unforgettable memories. It was in this city that I found the beautiful metal crafts which are shown in the photos on pages 28 and 29. These crafts are unique products of Nepal. There are many other kinds of crafts, the techniques of which have been handed down from generation to generation.

These hand wrought metal articles are customarily used for Buddhist images in Nepal, a Buddhist country. Some Nepalese Buddhist images owned by an American museum are splendid handiworks inlaid with genuine rubies and sapphires. Similar craftsmanship must have been used for the royal crown of the kingdom of Nepal. The

Himalayan Mountains have many colored stones. The Nepalese have contrived to utilize these stones for various crafts.

The Nepalese are extremely dextrous. With small cold chisels and hammers the metalworkers in Katmandu skilfully carve such things as kings' portraits without making models first. They make rare articles using ingot brass melted by a primitive hand bellows. They work very painstakingly from morning to night, without even a lunch recess. I believe that these patient metalworkers, if well-directed, could produce handicrafts of contemporary design or precision instruments. They might also be good at polishing precious stones.

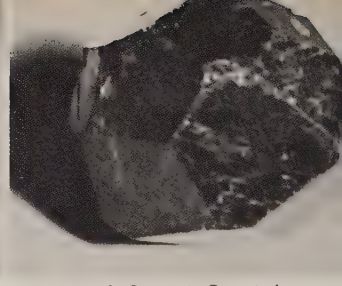
Nepalese Metalworkers

A Jadeite Incense Burner

Since large natural rock crystals are readily available, they are effectively used not only as accessory stones but also for such things as Buddhist images and incense burners. Jasper is green with a smoky-white cast. Found in many parts of the world, it is often used for incense burners and ornaments for the alcove. Sometimes incense burners are also made of jade.


• Rock Crystals •

A Diamond Crystal



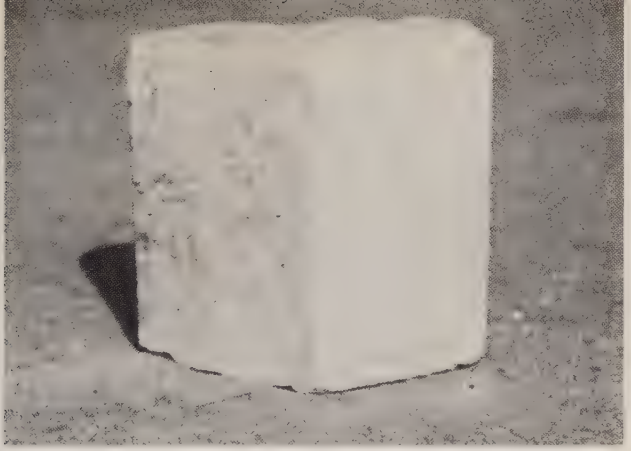
A Garnet Crystal

Rough Stones Which Have Crystal Form

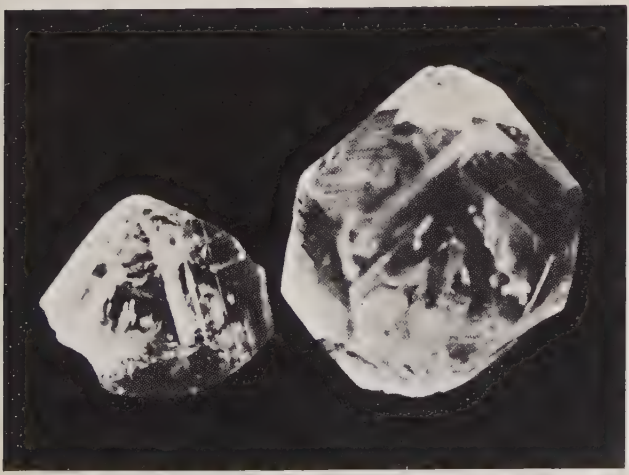
There are many precious stones which are beautiful crystals even in their rough form. In olden times these crystals themselves must have been used as jewelry. The photo on the left shows a diamond crystal with eight splendid, regular faces. The photo on the right shows a garnet crystal which is beautiful enough to be taken for a cut garnet. The rhombic twelve faces are characteristic of garnet crystals.

The lower photo on page 35 shows a crystal of quartz and one of topaz, the latter of which is far brighter because of its higher refractivity. Topaz used to be considered rock crystal and disliked because it is very hard to carve.

The green stone, which, like the emerald, belongs to the beryl family, is found in many regions, including Japan. The photo shows a large crystal discovered in Fukushima Prefecture, in the northern part of Japan. Transparent or pale blue beryls are found almost everywhere. However, the deep green yet transparent stone, emerald, is very rarely found.

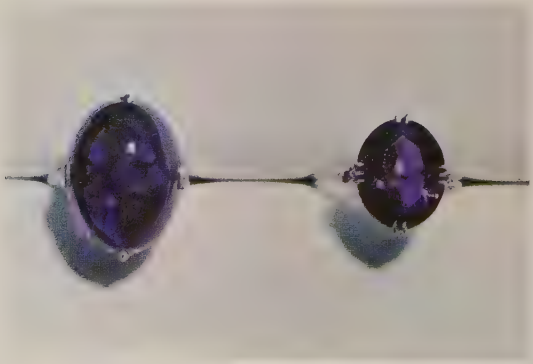


A Large Crystal of Beryl, the Same Basic Mineral as the Emerald (discovered in Fukushima, Japan)



Topaz Crystal (left) and Rock Crystal (right)

• Violet Quartz (Amethyst) •



Amethyst Rings

Rough Quartz

Violet Quartz Smoky Quartz Rock Crystal

A Great Chandelier Made of Amethyst (Versailles Palace)

Rock crystal, which is found in abundunce, is inexpensive, but violet quartz, which is also called amethyst, is quite expensive. The more violet it is, the more expensive it becomes; Japan does not produce beautiful amethyst. Brazil is the main producer of this stone. Amethyst is the birthstone for February.

Aquamarine in County Rock

Sapphire

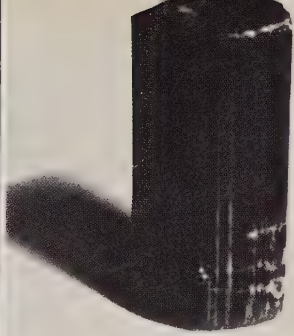
The Rough Stones of Jewelry

Some rough stones have distinctive crystals and some do not. Tourmaline, natural sapphire and aquamarine are hexagonal and occur in prismatic crystals, while diamond and garnet are isometric and occur in symmetrical crystals.

Turquoise

Natural Ruby

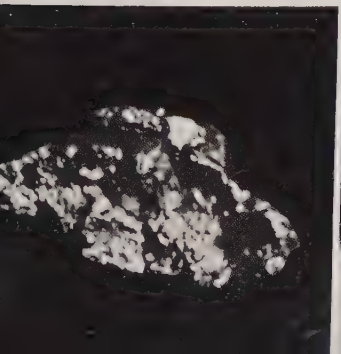
Danburite



Tourmaline

Oobsidian, which is natural glass, does not have crystals form, it is amorphous Natural ruby, which is hexagonal normally has sharp crystals, but those shown in the photos are rounded through natural abrasion as they were found in river beds.

Natural Gold



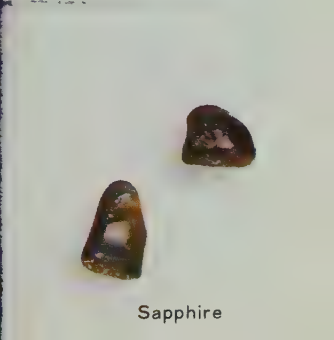
Obsidian


•Rough Stones•
Amethyst
Moonstone
Iolite
Star Ruby
Jade


Garnet
Olivine
Topaz
White Topaz


Emerald


Ruby


Sapphire

Producers of Precious Stones

The most famous diamond mine is the Kimberley Mine of the Republic of South Africa. At Kimberley the rock which includes diamonds is called kimberlite. Wherever kimberlite is found, we may expect to find diamonds. Kimberlite, which is a rock formed extremely deep below the surface of the earth, is regarded as altered olivine.

At Kimberley, diamonds are being mined on a very large scale. However, they are said to be produced moderately enough so as not to reduce the world price of diamonds. Besides the Kimberley Mine, there are many other places in Africa which are known for diamond mines, though most of these mines function on a smaller scale.

Next to Africa, Brazil is best known as a producer of diamonds. In Brazil old river beds are searched for diamonds. A similar method is employed at the diamond mines in Borneo, but only a few diamonds are being obtained. Recently, a city called Mirny in North-east Siberia has come to be known as a diamond producing area. Mirny is now the center of the Soviet diamond-mining industry.

India, at one time a major diamond producer, is no longer very active. However, at Gorgonda and Panna diamonds are still mined on a small scale.

Rubies and sapphires are produced mainly in tropical countries. India, Ceylon, Burma, and Thailand are the chief producers of these stones. Star rubies and star sapphires are also found in these countries. Rubies and sapphires are obtained from river beds; there are no ruby or sapphire mines as such.

Today Colombia in South America, is a famous producer

of emeralds. The Colombian emerald mines are run by the government, and miners work there under the strict guard of the army. Republic of South Africa, Pakistan and Southern Rhodesia are also well-knownp roducer of emeralds, as are India and the Ural areas of Russia. In ancient times the emerald is said to have been found in Egypt, where a 4,000-year-old emerald mine is known to exist.

With regard to other precious stones, Queensland in Australia is famous as a producer of opals. Greenish blue opals are usually from Australia. The opal, which is formed from silica bearing water, obtains its beautiful prismatic colors from its fine internal fractures. The red opal is often called the Mexican opal, for it is produced in Mexico. China and Burma are the chief producers of jade.

Looking into the Famous Kimberley Mine


Blue Sapphire
(Synthetic)
Malachite
Blue Spinel
(Synthetic)
Red Agate
Moonstone
Bloodstone

• Turquoise •

Turquoise, which is in the opaque category, is clear sky blue and gives, like jade, something of an Oriental impression. It makes an elegant ring stone and is favored by many people. Turquoise is the birthstone for December.

Polishing Precious Stones

The term "cut" is used in connection with precious stones. However, no edge tool is employed to cut precious stones into various ornaments. In the case of diamonds, the natural stone is usually cut in two before polishing is begun. All diamonds are polished into the desired form by means of a castiron lap using powdered diamonds, turning at a very high speed. The diamond, held on a long lever attached to a plate, is polished into the desired shape.

Less hard stones are cut not with diamond but with carborundum powder. Diamonds are also polished with diamonds. It takes about one week to polish one diamond for a ring stone.

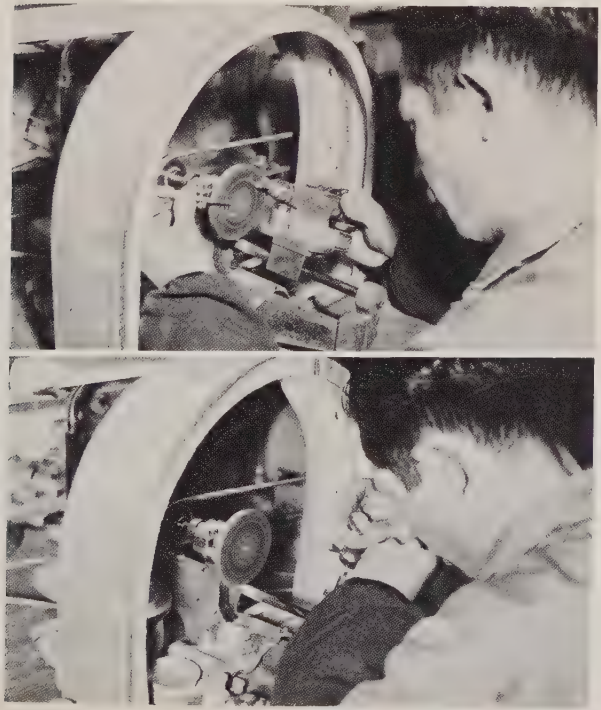
The brilliant cut diamond, which is of a refractivity 2.4 times that of rough diamonds, gains its characteristic brilliance by means of a reflection from the base. For this reason the base of the cut diamond must be cut at an angle of $24^{c}13'$. It is only natural that special instruments, together with trained skill, are needed to make this cut.

The Dutch technique of cutting diamonds is considered the best in the world. Rough diamonds found in Africa are often taken to Holland for polishing and cutting. Diamonds are also cut in Japan. Although in most cases finished diamonds are imported into Japan, there are some foreign firms whose rough diamonds are being polished by the Japanese, who are extremely dextrous and whose techniques are admirable.

In a case like this, it is interesting that the finished products cannot be placed on the market in the country

where the polishing is done. All the materials must first be taken back to where they came from. Thus, it is often the case that diamonds which have been cut and polished in Japan, for instance, first return to, say, America, and are then again imported into Japan. This time they are for sale. Jewelry is a strange sort of merchandise indeed!

Polishing Through a Magnifying Glass



Chrisocolla Lapis Lazuli

Sun Stone Amazon Stone Rhodolite.


Sun Stone
Lapis Lazuli
Tiger's-Eye
Turquoise
Malachite
Jasper
Aventurine
Amazon Stone
Haematite

Rough Polishing

Precious stones are not always formed into brilliant cuts or emerald cuts, both of which consist of straight lines of various lengths. Some of them are cut in a domed- or egg-shape, which is commonly called cabochon.

Jade, opal, star sapphire, cat's-eye, and so forth are cut "encabochon." A revolving grindstone is also used for cabochon cutting As the photo indicates, the circular plate has grooves to which a given stone is applied on a lever and so gradually shaped into a cabochon. In the case of star ruby, a specially skilled hand is required to cut the stone in such a way that it radiates "stars." In order to make this cut, the optical axis of the stone must be kept on top throughout the polishing work.

Diamonds are commonly cut brilliant, but sometimes the square emerald cut is used. In the latter case, the cut is called the emerald cut, even though the stone is a diamond. Diamonds cut in a rectangular shape are called baguette diamonds. Moreover, there are such types as

Cabochon Cutting

tear drop types and triangular types. Since there are no regulations, diamonds can and are cut in almost any form.

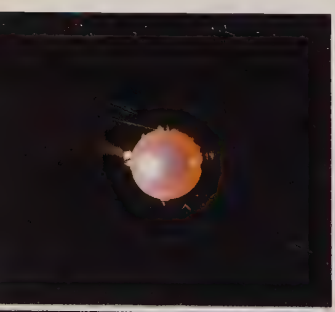
Emeralds are commonly cut in the rectangular emerald cut. However, they are sometimes cut brilliant or even, very rarely, in the domed cabochon shape. However, the emerald is most beautiful when cut in the rectangular emerald cut.

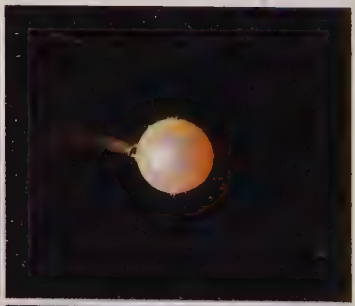
Rubies and sapphires are usually cut in the brilliant cut, though the finished forms are somewhat different from those of diamonds. They are also available in the oblong baguette cut and in the cabochon cut for ring stones.

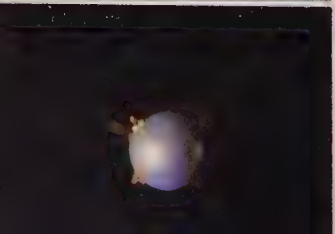
For other precious stones any one of these types of cut may be chosen. The general principle seems to be that stones belonging to the opaque category are commonly cut cabochon or are engraved on their surfaces.

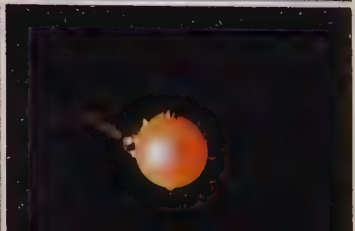
▲ Pearl Rafts floating in Agowan Bay, Shima, Japan

Pink	White
Black	Yellow









Pearls

Pearls which have grown inside oysters are the precious stones of Japan, a country surrounded by the sea. They come in many colors—for instance, silver white, pink, black, and yellow. Pink pearls are the best and most expensive.

Pearl Rings
and
Necklaces

The Pearl,—the Jewel of the Sea

The pearl, which cannot really be called a precious "stone," has nevertheless been chosen the birthstone for June.

Pearl production is brought about inside an oyster when it has an irritating object within it; the oyster covers the invader with a secretion in order to avoid being further injured by this foreign enemy. In Japan this knowledge is applied by tying around a mother-of-pearl bead a little "sac" made from the outer skin of one oyster and by skilfully grafting it into the body of another. In due course a pearl is formed around the bead in this sac.

There are many kinds of shells which form pearls within them — pearl oysters, pearl-oyster shells, fresh-water mussels, and ear-shells. In Japan, pearl oysters are used for pearl production. Along the coasts of South-east Asia, especially Burma, however, large pearl-oyster shells are employed to make large cultured pearls. The technique for this was learned from Japan.

The main source of Japanese cultured pearls is Agowan Bay in Mie Prefecture, where Kokichi Mikimoto, the

Diving Girls at Shima, Japan

Putting the Cultured Shells into the Sea

Inserting the "Seed" into a Pearl Oyster

inventor of cultured pearls, started his business. There are also a few other pearl farms in Japan.

Pearl oysters in baskets of wire-netting are suspended in the water below floating rafts. Little sacs made from the outer skin of other oysters around mother-of-pearl beads are inserted into mature pearl oysters. After this operation, the pearl oysters are put into the water and left there some four years. Thus beautiful cultured pearls are formed around the inserted beads.

After all, pearl oysters are living creatures, and not machines. It is not an easy task to produce pearls in company with these creatures. The whole production process depends on their state of health and on the sea-water. The oysters may die of sickness or of the "reddish tide". Therefore, pearls perfect in both shape and color are not readily produced. The pearls obtained thus, though artificial, deserve being called precious stones not only because of their beauty but also because of the troublesome process needed to produce them.

Pearl Accessories

Pearl Necklace (Double)

It seems that the cultured pearls formed inside pearl oysters are not always regularly shaped. Selected pearls which are even in shape and color are made into necklaces.

Pearl Necklaces

When pearls are formed, the pearl oysters are pulled out of the sea-water so that the pearls may be extracted from the oysters. The photo shows this extracting work.

The pearls are then graded according to color and size. Only after the pearls have gone through a series of such grading processes can pearl rings and necklaces be manufactured. Pearls for necklaces have to have thread-holes bored through them. It is not an easy task to bore the holes, even with an electric drill, for pearls often break when they are drilled.

Necklace pearls have to be regular in shape or arranged systematically from small to large and then again to small. At the same time, their color tones must be kept even.

Cultured pearls are formed in different colors, such as white, pink, yellow, gray, or black. Pink and black pearls are more expensive than yellow pearls. Regulating color tones is one of the most important processes of pearl production. Pearls fresh from the oysters are sometimes bleached by hydrogen peroxide or dyed with special pigments.

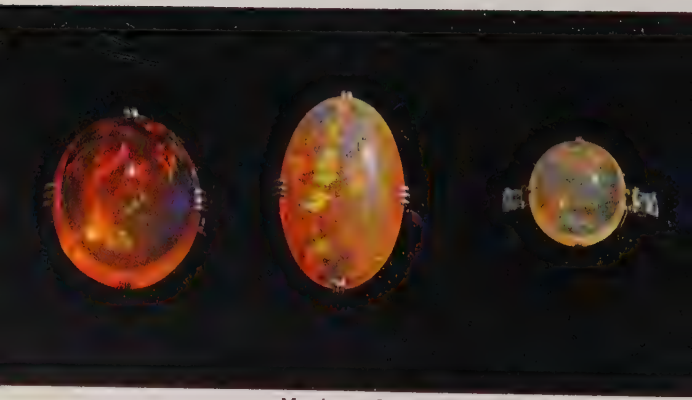
As pearls are hard to dye from the outside, it has been common to make holes in them through which the pigments are injected. Recently, however, another method, in which pearls are dyed directly from the outside by utilizing radiant rays, is being experimented with.

Extracting a Pearl from the Oyster

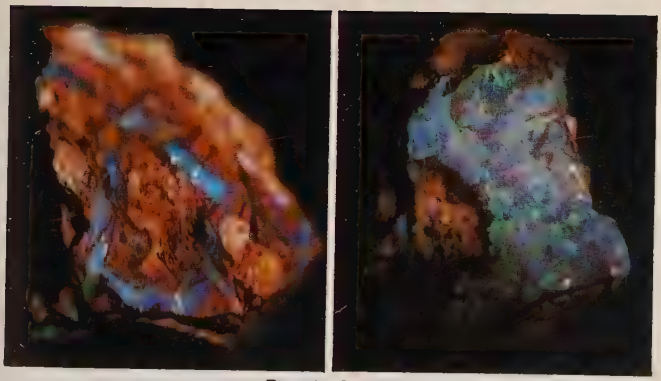
Boring

Grading

Opal Pendants
and Brooch



Mexican Opals



Rough Opals

Blue Mexican Opals

Australian Opals

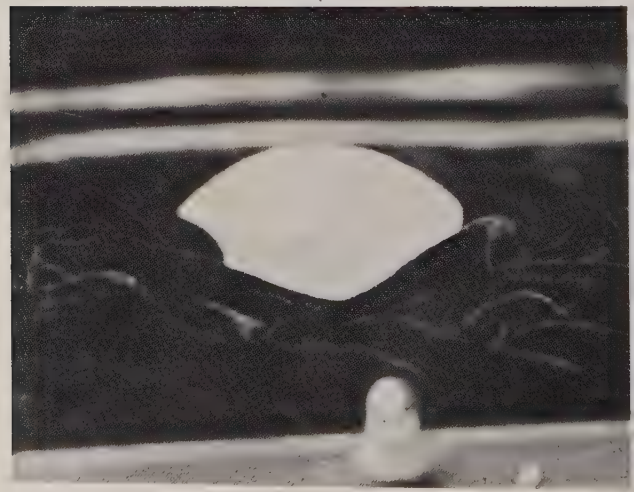
The Charm of the Opal

The opal is the birthstone for October. It gives the impression of being somewhat romantic, but some people call it a stone of sorrow. Scott's "The Lady of the Lake" and other novels are said to be responsible for making the opal an ill-fated stone. Today young people pay no attention to this sort of jinx, and the opal is a favorite gemstone.

The opal is not crystalline like other gems but a hardened silica "jelly." Therefore, fossilopal shells, one of which is shown in the photo, are sometimes discovered. They are sedimented silica jelly in a shell.

It is not well known what chemical actions make the silicic acid form the beautiful opal. The opal's prismatic

A Fossil-Opal Shell



beauty, which is often called its "fire," is due to the breaking up of light by its peculiar crackled structure. The way in which the opal is "crackled" determines the kinds of colors it gives.

The main colors of the Australian opal are blue and green. The Mexican opal varies from red to orange. One variety of the opal, which seems at first glance transparent, gives a delicate "fire" which is extremely beautiful. The iridescent opal, which is often referred to as the black opal, is the best opal. Silica gel, which is an important substance in our chemical laboratories, gives, when very carefully observed, a slightly blue and green "fire." It may be, therefore, that in the not-too-distant future synthetic opals can be successfully produced.

A Large Rough Opal (30 cm. long)

Jade Accessories

Works of Jade

Jade, the Oriental Gemstone

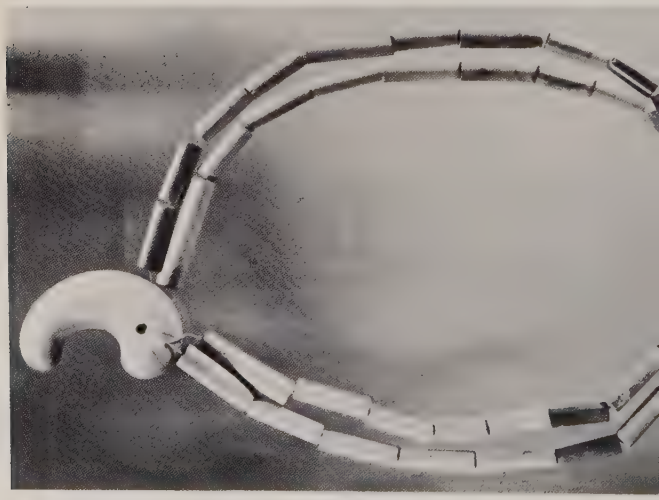
Jade has long been loved by the Chinese and Japanese. The curved jewels (*magatama*) unearthed in old Japanese tombs are often made of jade, which may have been produced in Niigata Prefecture. Jade, known as a green gemstone, is just as expensive as emerald. The greener it is, the better. Jade which is dark green and yet transparent is highly valued. Jade is very easily carved because of its hardness. Jade with peony or bird carvings is often used for brooches or Japanese sash clips. Jade for a ring is always cut encabochon.

The Oriental Gemstone

Ancient Japanese seem to have used precious stones only for curved jewels, which were somewhat comparable to modern pendants. The origin of the curved jewel accessory is unknown, but its design is quite interesting. The gemstones used in curved jewels unearthed in old Japanese tombs are agate and obsidian, among others, and are in their rough forms. Sometimes jade products are also found.

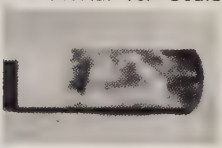
In Oriental countries like Japan and China, accessories are commonly carved stones, among which the curved jewels are only a rather simple variety. Jade, for instance, is often carved for necklaces and sash clips.

Ancient Curved Jewel Pendant



Jade Incense Burner

Japanese Jade
Material for Seals



Jasper and Jade Decorative Articles

Italian Cameos

Cameos are engravings in relief upon precious stones, noble stones or shells. They require a material that will provide at least two layers of different colors, such as is found in sardonyx or in certain shells. In Italy various shells are used. In modern cameos, shell materials are commoner.

Coral Carvings

Coral

Coral, which is gathered from sea-bed rocks, has long been highly treas ured as a precious stone or a noble stone. Since it is naturally irregular in shape, it is cut, round ed, polished, or carved for use. This work has been almost exclusively done in Italy. Coral is used for many varieties of decorative articles.

The Precious Stones of India

The diamond was once called the Indian stone. Most of the famous diamonds in the history of jewelry have been discovered in India. India also produces, among other stones, rubies, sapphires, and emeralds. Therefore, India is a country of jewelry *par excellence.*

When I visited India, I wanted to see some of those mountains which produce precious stones. However, I did not know where these mountains were. I was told that there is an emerald mountain somewhere near the city of Peshawar, Pakistan, which is very close to the border of Afghanistan. I wanted to go there, but I was again told that it would be extremely difficult to find an emerald there; there would be no specific emerald mountain as such. It is said that emeralds are simply found "somewhere," bought by English merchants, and taken away in secret.

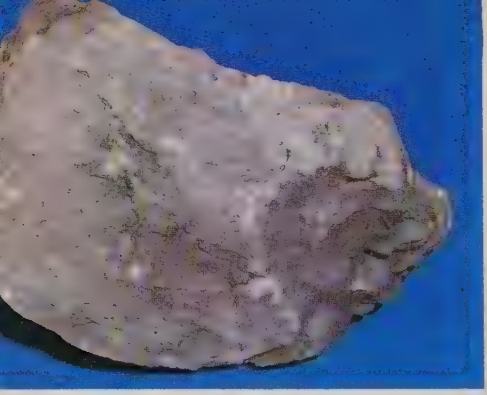
When I went to Peshawar to see for myself, although jewelers were doing business by every roadside, there was nothing special on display. However, I saw some of the townspeople with turquoise-set rings, which have long been considered to bring good luck. For this reason, I suppose, turquoise-set rings were on display in the jewelry stores. Their sober beauty was suitable in this old Hindu city.

Jewelry Store in Lahore
(West Pakistan)

Gorgonda and Panna are the main producing areas of diamonds in India. Both mines are run by the government. The diamond in India is not inexpensive. The state of Kashmir is well known for sapphires; the state of Kerala, for the cat's-eye, and the state of Mysore, for the star ruby. I did not have an opportunity to visit any of these places. However, I did see many beautiful precious stones on display at a number of jewelry stores in various Indian cities.

The people in India, I hear, do not trust banks; whenever they make money, they buy jewelry with it. There were rare and splendid jewels at stores, not for foreign tourists but for native customers. It was a matter of wonder that every jewelry store in Calcutta had an armed guard in front of the store. These jewelry stores in India had mainly emeralds and cat's-eyes, followed by star rubies and star sapphires.

In Ceylon visitors can see precious stones being mined. Digging river beds, they sell basketfuls of river sand to visitors. They do not care whether or not the sand contains any precious stones, It is something like drawing lots.



Star Quartz
in the Rough

Star Quartz Streaked with Light

Star Rubies and Star Sapphires

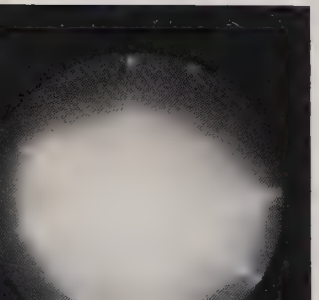
The Star Ruby

One of the most interesting of all gemstones is the star ruby, which, when exposed to light, radiates star-like rays. The cabochon-cut star ruby shows a six-rayed star, as shown in the photo, when it is placed in the sunlight or under a luminescent light. This phenomenon, which is referred to as "asterism," is not confined to the ruby; it also occurs in crystallized minerals with small fiber-like crystals.

The main producers of star rubies are Burma, Ceylon, and India. The photo on page 73 shows natural star rubies from India. Sapphires which are blue are termed "star sapphires."

The Synthetic Star Ruby

Today star rubies and star sapphires are being artificially manufactured in America, and Europe. In synthetic sapphires alumina is combined with titanium in such a way as to form fine fiber-like crystals.



The stars of both synthetic rubies and sapphires are brighter than those of natural gemstones, although their price is one-tenth that of the natural star stones.

Star Quartz

Stars are sometimes seen in rock crystal. As the rock crystal is a hexagonal mineral, it reflects, like the ruby, six luminous rays of light.

Star quartz is often found in pink quartz. The color, pink, is probably due to the fine-grained particles in it. However, small cabochon-cut quartz is colorless or only slightly opaque. The photo shows a number of pieces of star quartz which have just been polished. As they are transparent, their stars are not easily visible. Star quartz in the rough is very much like red silica.

Freshly-polished Star Quartz

Star Quartz Products

Star quartz is made into beautiful products in such a way as to be taken at first glance for the star sapphire. This is done by applying a specular surface to the star quartz and by then dying the base deep blue or by placing blue glass on the base. Thus the radiance of the star is intensified. This kind of star sapphire is, of course, an imitation rather than a synthetic sapphire. However, it is referred to as a "star stone." It is well liked by many people throughout the world because it is inexpensive and yet quite elegant.

Cat's-Eye

Cat's-Eye, properly a mieneral called chrysoberyl, contains numerous small fiber-like crystals. It is always cut encabochon in order to exhibit the feature known as the cat's-eye—a line of light that seems to run across the stone. A cadochon-cut cat's-eye is like a star ruby. A cat's-eye which gives a dis-tinct honey-colored streak of light is the best of all.

Light-Streaked Cat's-Eye Rings

Designs Combining Cat's-Eyes and Diamonds

Tiger's-eye

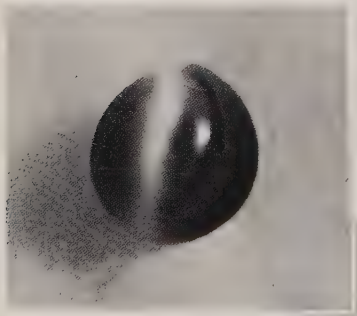
Like cat's-eye, there is another stone, called tiger-eye, with a shimmering streak of light. It differs from cat's-eye in that it is quarz with numerous small asbestos fibers in it. The color ranges from yellow to yellowish brown, through blue, green, red, and combinations of these colors. While cat's-eye is a very expensive stone, tiger-eye, which is often used for cuff-links, is far less expensive.

The Cat's-Eye and the Tiger-eye

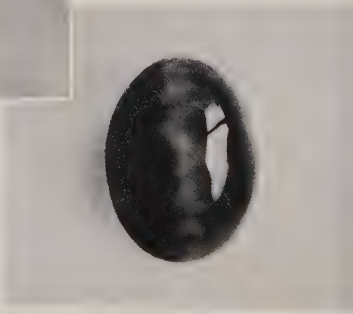
Although the two gems which have a line of light seeming to run across the stones, cat's-eye and tiger-eye, often confused, are really quite different.

Cat's-Eye, like alexandrite a variety of Chrysoberyl, is orthorhombic and contains fiber-like crystal which account for the "eye." A rare gemstone, Cat's-Eye occurs sporadically in the Indian state of Kerala, Ceylon, Thailand and Brazil. Recently synthetic cat's-eye has been produced.

Tiger-eye, like agate and calcedony, consists essentially of quartz, and is a commonly-found golden-brown chatoyant stone from africa which contains asbestos.



Synthetic Cat's-Eye
(German)



Iimori-Synthetic
"Kingaseki"

Rough Iimori Cat's-Eye

Meta-Jade and "Kingaseki"

Jade is an expensive stone; the deep green and translucent variety, called "Rokan," is highly valued. Howeve, an imitation stone, called meta-jade, which can easily be taken for Rokan-jade, is being manufactured by Dr. Satoyasu Iimori. The raw materials for meta-jade are quartz and alumina. These materials are fused in a crucible, colored by pigments, and crystallized. Synthetic gemstones are also made by such quite different methods as the Verneuil method.

Victoria stone, consisting of the same constituents as meta-jade, has large fiber-like crystals, arising from the large quantity of crystallizing agent used to crystallize a mixture of quartz and alumina. These large fiber-like crystals are cut in the cabochon style. The finished products are very much like cat's-eyes. The Iimori Laboratory in Tokyo is manufacturing these synthetic stones as imitation cat's-eyes, called "Kingaseki." In a similar fashion, many kinds of synthetic gemstones will be produced in the future.

• Synthetic Stones •

Beautiful Cuts of Various Synthetic Stones

Today, ruby, sapphire, spinel, rutile (titania), and even emerald are being artificially produced. However, synthetic stones are usually sapphires and rubies, both of which are of the same nature, synthetic corundum. They are made by fusing the raw material, alumina, at a temperature of 2,050 °C. In the photo the stones in the upper row are in the rough, while those in the lower row spilit, ready polished into ring stones.

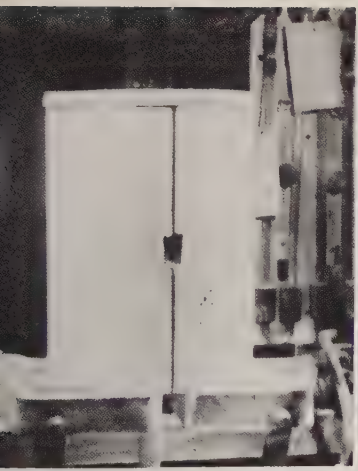
Synthetic gemstones, unlike imitation stones, have the same ingredients as natural gemstones. However, because they are artificially mass-produced, they are extremely inexpensive. They play important roles in the manufacture of watches and precision instruments.

A Synthetic Ruby Factory

Synthetic Precious Stones

In 1904 Verneuil succeeded in making synthetic rubies by fusing in powder form the same chemical constituents as are in the natural gem, alumina and chrome, in a platinum crucible at a temperature of 2,000°C. by burning oxygen and coal gas. Today rubies, sapphires, spinels and rutiles are still artificially made in almost the same way as the Verneuil method; in place of coal gas, however, hydrogen is used as the fuel.

The photo shows a synthetic stone factory at Ofuna, Japan. In the white crucibles a temperature of 2,050°C. is maintained by burning oxyhydrogen. First the "seeds" of rubies are placed at the bottom of each machine. Powder materials are then dropped little by little into the cruci-



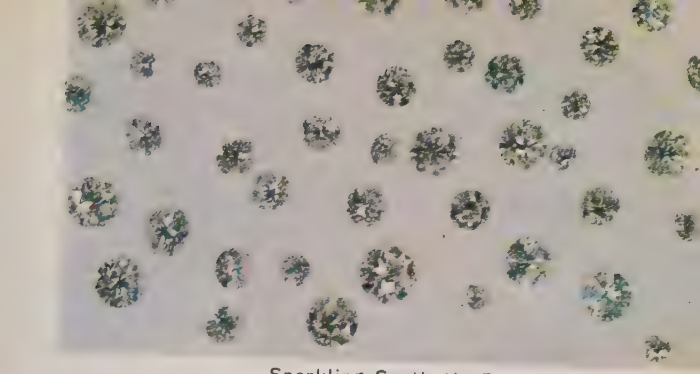
A Vernuil Furnace for Synthetic Rubies

Taking the Rubies out of the Furnace

bles. As these materials are fused around the ruby seeds, they gradually form "boules," or rough, synthetic masses. When the required sizes have been reached, the stones are allowed to cool, after which they are taken out of the furnaces. An oxided chrome, which gives a red color, is used in producing synthetic rubies. In the case of synthetic sapphires, a titanium instead of an oxided chrome is used to make the color blue.

Nickel is used for golden sapphires, and vanadium for alexandrites, which are green in daylight and red-violet under artificial light. Nothing is mixed in for white sapphires, which are used for phonograph needles. Spinels are also synthetically made, magnesium being used to give the color.


Jan. / Imitation Alexandrite
May / Emerada (Green spinel)
Sept. / Sapphire
Feb. / Violet Spinel
June / Ceylon Sapphire
Oct. / Pink Sapphire
Mar. / Blue Spinel
July / Ruby
Nov. / Golden Sapphire
Apr. / White Sapphire
Aug. / Erinite
Dec. / Imitation Zircon



Sparkling Synthetic Rutile

New Applications of Synthetic Stones

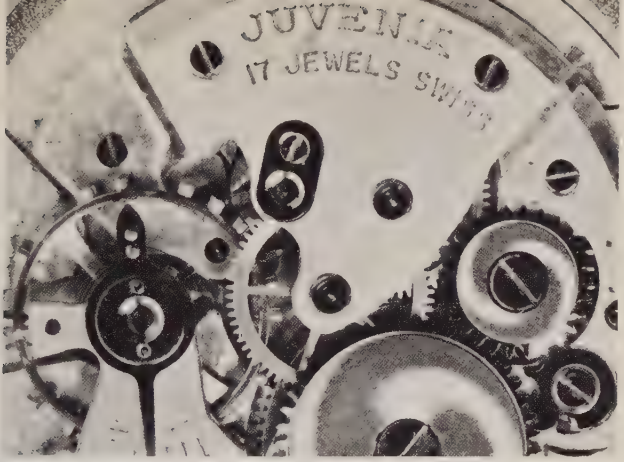
When you open the back of an expensive watch, you are likely to see a tiny red ruby among the toothed wheels. Some watches have 17 jewels, some 23 jewels, and so forth. Better watches have more jewels. Because of their hardness, rubies are used in watches to prevent bearings or other parts from wearing out and to allow the watches to keep time well.

The advent of synthetic rubies has advanced not only the watch industry but also the precision machinery industry as a whole. In the case of phonographs, for example, they would not have been improved to the extent we know now if sapphire needles had not been invented. In this way synthetic stones will be utilized in other areas. The synthetic stone industry is playing an important role not only in the popularization of jewelry for ornamental articles but also in the advancement of modern industrial techniques.

The photo on page 87 shows the interior of a wrist watch. Nowadays there are watches with plastic back covers, so that their inner parts are always visible. In such watches, beautiful rubies will make the watches look better.

Since synthetic rubies are used for watches because of their hardness, it seems that stones of any color would serve the same purpose. In reality, however, the best synthetic rubies are usually chosen for watches, because watches are not only utilitarian articles but also accessories and valuable property.

Recently synthetic rubies have been utilized for lasers in the field of electronics for the interesting purpose of amplifying visible light.



The Interior of a Wrist Watch using Synthetic Ruby Bearings

Among synthetic stones, quartz crystals are being artificially manufactured solely for industrial purposes. They cannot be produced by the Verneuil method; instead, the hydro-thermal synthesis method, simulating the conditions under which natural quartz crystals are formed, is used. The interior of a furnace, in which alkali lye has been placed and in which a "seed" of quartz crystal is suspended from the lid of the furnace and pieces of quartz placed at the bottom, is maintained under an atmospheric pressure of 100 and at 400°C. Synthetic quartz crystals then develop on the quartz crystal seeds in the furnace.

Some varieties of garnets are also synthetically produced, though they are used not for rings but for electronics. They are referred to as yttrium garnets and have interesting magnetic characteristics. Thus synthetic stones are coming to be utilized in many fields of modern technology.

Glass Jewelry Accessories

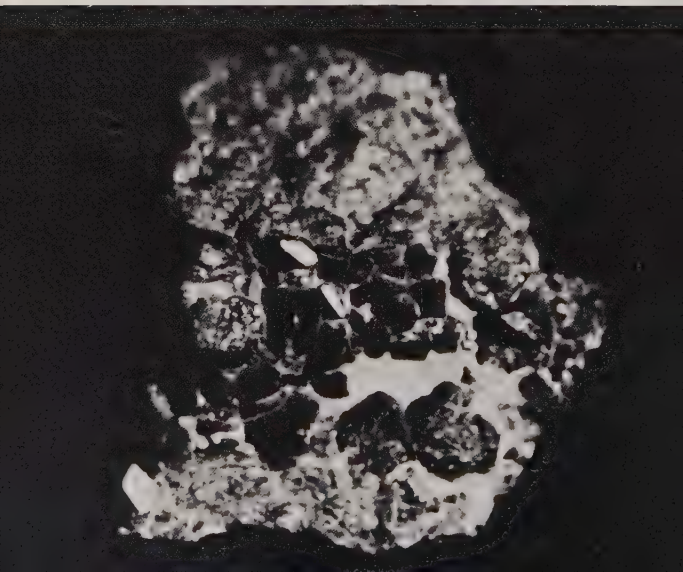
Glass jewelry plays an important role in the field of present-day accessories. The production of glass for jewelry, such as flint glass and opal glass, requires a special technique. A certain variety of glass for jewelry, containing a large quantityof lead, has a refractive index of over 2 and is just as brilliant as diamonds. Because the desired colors can be freely obtained, glass jewelry (which is different from natural gemstones or synthetic stones) is opening up a new market.

Czechoslovakia and Austria are the main producers of glass jewelry.

Garnet

Garnet, because of its form and its abundance, must have been one of the first gemstones to be put to use. This stone, which in its natural state looks like the seeds of a pomegranate, is the birthstone for January. Uuncut garnet has splendid crystals. The photo shows large crystals of rough garnets, which at first glance look like cut garnet. Although the usual garnet is a rather dark red, it is also available in various other colors because of different components—black, rust, brown, reddish orange, yellow, green, and so forth. Ggreen garnet is sometimes confused with jade.

The Pomegranate-like Crystals of the Garnet



Garnet Jewelry

Garnet which is dark red and yet transparent is considered the best of all. Since even the rough garnet is sufficiently beautiful, in the past it may have been used without cutting for ornamental purposes.

Garnet crystal, which has an isometric system, has twelve faces. There seems to be no garnet with diamond-like regular octahedral faces, a solid figure with eight faces. The garnet's crystal, which is, as it is, used for ornamental purposes, can also be observed in iron pyrites.

Ironically, the garnet, which, because of its crystal form, may have been responsible for the fact that diamonds are often cut into the brilliant form, is itself seldom polished into a brilliant cut. Garnet is not a rare mineral; it is found in various rocks, and often large garnet crystals are met with. These large crystals, which are found in many places in the world, are used for necklaces and pendants rather than for rings. Garnet incense burners are also available.

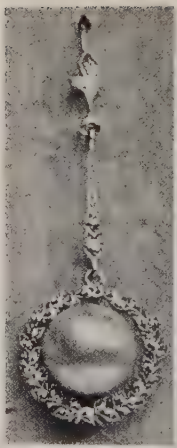
There are many varieties of garnets, but the dark-red variety is most commonly used for jewelry. The garnet was probably chosen as the birthstone for January because it is such a representative gemstone.

Glass Brooches

Necklaces and Pendants

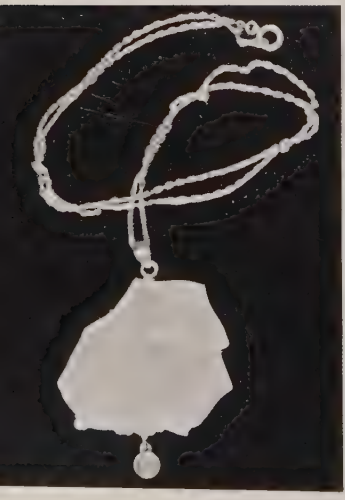
Various Designs of Jewelry

Precious stones, when inlaid in rings or brooches, are sufficiently beautiful in themselves, but in many cases jewelry designers combine various stones, engrave them, or set them in mountings which are intricately and skilfully made of gold, platinum, white gold, silver, brass, imitation platinum, and so on. The photos on this and the following pages show various designs.



Semicircular Pearl Pendant

Opal Pendant

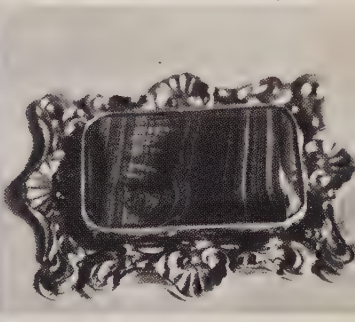


Mexican Opal Ring

Pearl Sash Clip Set in a Platinvm Base

Emerald Ring

Malachite Sash Clip

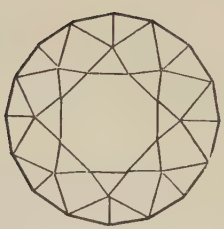


Turquoise Bracelet

Jade Brooch

Venetian (Murano) Glassware and Necklace

Venetian glass originated in the thirteenth century. Beautifully enameled glassware is now sent out to every corner of the world.



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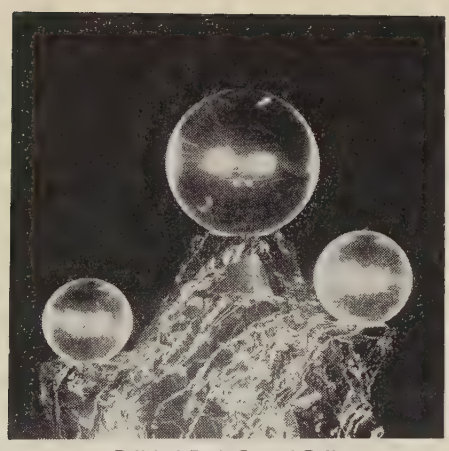
THE SIGNIFICANCE OF PRECIOUS STONES

People often ask why a precious stone is precious. The perfunctory answer to this question would be because a precious stone is very rare and extremely beautiful. However, giving a second thought to this inquiry, we realize that the value of a precious stone cannot always be judged so easily. Precious stones have long held a peculiar fascination for man. Our inherent attention to the mystery of nature, our longing for beauty, our appreciation of delicacy, our desire to collect things, our antiquarianism, our hope of owning expensive property—all of these seem to be potentially satisfied by small precious stones.

The mere fact that beautifully geometrical crystals of diamonds, garnets, and quartz are formed in unpromising-looking stones and rocks is sufficient to give us the feeling of something mysterious in nature. These crystals, of which people in this century have some scientific knowledge, must have seemed nothing but works of God to ancient people; this must be the way in which the custom of wearing precious stones originated in the mists of history.

Since we feel something mysterious about even the ordinary crystals of minerals, it is not surprising that we wish to obatain very rare and beautiful crystals, which might be called "precious stones," in preference to anything else in the world. Be it the diamond or the emerald, minerals which can be called "precious stones" are very rarely found. Quite mysterious indeed is the very existence of these beautiful stones, which, due to a slight difference in their chemical elements, range in color through



Polished Rock Crystal Balls

the entire spectrum and which are sometimes large enough for rings and other ornaments. These stones are born, as it were, clean and pure out of mother earth; they consist of a mixture of manifold ingredients. They may well be compared to unblemished lotus flowers in a muddy pond. Therefore, we can read in them the nature and extent of the vast and boundless natural world and its history.

What has been said so far may sound a little too affected, but it seems that people long for precious stones not only because they are expensive, because they are convenient to possess as property, or because they make one look beautiful when worn as accessories, but also because at bottom there is something in them which appeals to our innermost feelings. Otherwise human beings

in all ages and countries would not have treasured precious stones to the extent they have.

To cite an example, when I take out a tiny precious stone, be it a clear crystal of quartz, a small red garnet, or even simply a beautiful stone, not necessarily a precious stone, and look fixedly at it lying in the palm of my hand. I feel indescribably refreshed and seem to see the whole of natural beauty condensed within it. This is the kind of feeling that makes me forget the transience of this human life and fills my soul with peace and vitality. When I am mentally tired, I look at a skilfully-cut diamond or a very rare stone, be it a precious stone or otherwise, which seems to have been born unexpectedly out of nature and which has been cut, with mathematical precision and with someone's whole heart and soul, into a ring stone; I thereby get a feeling that I am connected very closely with nature's vitality, by which this stone was produced, and with the soul of the artist who cut it. By appreciating a precious stone in this fashion I feel refreshed and lose myself in philosophical meditation. The sort of feeling which we can get from precious stones may possibly be traced back to the days when ancient people began to wear precious stones, thinking that they would have magical effects.

I am one of those people who have a perfect mania for various kinds of minerals, even though I cannot possibly afford to own expensive jewelry, much as I want to. The fact that I am an ordinary lover of the crystals of manifold minerals may have led me to the conclusion that each precious stone has its own unique "personality".

I feel, therefore, that precious stones should be privately loved and appreciated rather than blindly worn as accessories. Every precious stone— diamond, emerald, ruby,

Synthetic Rubies in the Rough (Boules)

jade, and so on—has its own "personality," and each of them gives us a different feeling. Those who love precious stones should enjoy contemplating these different characteristics. Needless to say, gem-set rings or other accessories are to be enjoyed by others, too. In this case, however, those who wear them should not simply be proud of how much they have spent on the jewelry as such; on the contrary, they should wear jewelry in such a way as to enhance their own personalities, as seems to be done by means of the different characteristics of different precious stones.

Let us now proceed to the practical side of the story. There are many naturally beautiful crystals of minerals in this world, but not all of them are treated as precious stones. What makes them "precious stones"? For one

thing, they have to be curiously rare. Even diamonds could not be called precious stones if they were as abundant as pieces of gravel in a riverbed. Diamonds are precious because they are rarely discovered—in only a few places such as Africa, Brazil, or Siberia. There, having been formed more than 350km. below the surface, the diamonds appear on the surface of the earth due to great changes in the earth's crust. The diamond became the king of precious stones only after it greatly excited human curiosity with its unrivaled beauty and unusual hardness.

Today, since precious stones are valued as property, it is only natural that their monetary value, which is founded on their scarcity, should become highly important.

However, on the other hand, synthetic stones, such as synthetic rubies, are being widely enjoyed today. Although their beauty and the various characteristics of their crystals are almost the same as those of natural stones, their prices cannot be compared with those of natural gems. Thus, if the purpose of wearing precious stones as accessories is to enhance one's beauty alone, this purpose will be well served by synthetic stones.

Moreover, precious stones are rarely used for any purpose in their rough forms; they are usually processed into works of art. In this respect synthetic rubies or synthetic sapphires are the same as natural stones and so are to be considered as precious stones. Today, therefore, there are two kinds of precious stones: natural stones, which, being very rarely found, bear the value of antique objects as well as possess their inherent beauty, and synthetic stones, which, being massproduced, are inexpensive and yet beautiful enough to be used for ornaments, such as rings and other accessories.

Natural precious stones, like such precious metals as gold, silver, or platinum which are utilized as a means of investment, have come, in addition to their ornamental purposes, to play an increasingly important role in various fields of modern industry. Synthetic stones are now used in new techniques, such as lasers in the field of electronics, as well as in their traditionally unique functions, such as the bearings of watches, as various parts of precision instruments, as polishing agents and so on.

Thus precious stones, with their important significance, have long been familiar not only to ancient people, but also to the people of this day and age of technological revolutions. Precious stones have long played an important role in human life.

THE KINDS OF PRECIOUS STONES

Precious Stones and Gemstones

How many kinds of precious stones are there in this world? Such precious stones as diamond, ruby, sapphire, and emerald are familiar to everybody, but there are also such stones as danburite and lapis-lazuli which are not as well known. Such stones vary greatly also in price; diamond, for instance, is priced much higher than quartz. Such stones vary also in color; precious stones may be, for instance, transparent, white, red, yellow, blue, or black. Furthermore, precious stones have many different characteristics; for instance, opal is many-colored like a rainbow, star sapphires show "stars," and alexandrite is green in daylight but red under artificial light.

How are these different precious stones to be classified? They are sometimes classified on the basis of their price; expensive stones are called "precious stones," and less expensive ones, "gemstones" or "semi-precious stones." However, this classification is not to be depended upon. The price of a one-carat diamond ranges from $2,500 to less than $10; beautiful emeralds of good quality are just as expensive as good diamonds, but those emeralds which are light in color and opaque are really worthless, being barely useful as mineral specimens.

It is also possible to classify precious stones on the basis of their color, such as colorless or white, red, blue, green, yellow, black, and purple stones. The birthstones were in a way chosen according to this classification, but since there are intricate colors and since, moreover, some stones are significant solely because of their unique brilliance or

Show Window of Jewelry Store

luster, this classification is far from satisfactory.

Mineralogically precious stones can be classified according to their crystal characteristics; diamond, garnet, and spinel, for instance, are in the isometric system, while emerald is in the hexagonal system.

Although this is perhaps a good classification for mineralogists, it is not good for lovers of precious stones in general. Another classification based on chemical composition (the diamond consists of carbon; quartz, of silicon dioxide, and the ruby, of aluminium oxide, for instance) is similarly not generally acceptable.

Therefore, it still seems to be best to discuss precious stones one by one. In this book, then, I am going to discuss each gem separately, without resorting to any specific classification.

Diamonds

It is well known that the diamond is the king of precious stones. Though its chemical element is carbon, like graphite or charcoal, it has a regular an isometric crystal form and is usually colorless and transparent, unlike other minerals composed of carbon. It is the hardest-known natural substance and can, therefore, be used to scratch anything. Moreover, since it has a high index of refraction it is, when cut in the brilliant form which is generally used for a ring stone, extremely brilliant because of the whole reflection of light from the pavilion, or lower part. Diamonds are found in only a few places—in Africa, Brazil, and Borneo, for example; not a single diamond has ever been discovered in Japan. Diamonds are included in rocks similar to peridotite formed at places exceedingly deep in the earth's crust. Though ninety percent of the diamonds now available are merely hard and not beautiful at all, even these play an important role in modern industry and are so considered "precious" stones. Diamonds which are transparent, white or slightly bluish are considered the best of all. When free from flaws such diamonds are, of course, extremely expensive. However, even "perfect" diamonds are often slightly tinged with yellow, and the deeper the yellow goes, the lower the price. A one-carat diamond of a deep yellow costs only about $75. Needless to say, diamonds which are of the same quality but which have flaws or black spots tend to be very inexpensive. Diamonds come very rarely in pink, blue, or green; if they do, they are inconceivably expensive simply because they are of a great rarity.

Among precious stones diamonds are not only the most beautiful and most expensive, but also the most conveniently used as property, because their price, well controlled

throughout the world, is relatively stable, because they come in various colors and sizes and so can be purchased in accordance with one's own pocketbook, and because they can be sold at fixed prices at any time. In other words, diamonds, being comparable to gold, are widely held as property.

Rubies and Sapphires

Next to diamond, ruby and sapphire are the most familiar precious stones. Both of them are representative precious stones, but mineralogically they are the same mineral corundum, which is the hardest material next to diamond.

When this corundum includes chromium, which gives it a redness, it becomes ruby; when it contains titanium and iron instead, and so is blue, it becomes sapphire. Sapphires other than blue are referred to as white sapphires or golden sapphires according to their color. A sapphire not otherwise described is usually a blue sapphire.

Since 1904 rubies and sapphires have been synthetically produced in abundance. Most of the large red and blue ring stones which are on display in the show-cases of jewelry stores are synthetic rubies and synthetic sapphires. Both mineralogically and chemically this synthetic corundum is exactly the same as natural corundum, but its price is extremely low.

Since synthetic rubies have come to be easily produced, we may think that the value of natural rubies, which are rarely discovered in the ground, has declined altogether. On the contrary, beautiful natural rubies are unusually expensive these days; indeed, they are just as expensive as fine diamonds. Natural rubies are still highly treasured because of their scarcity. Moreover, no matter how

skillfully synthetic stones are made, they are still different from natural stones; the two kinds of stones can easily be distinguished. Natural stones often have unique characteristics; sometimes, for instance, they contain impurities which, by interacting with one another, give various color tones, and sometimes they include minute crystals which give a silky luster, called "silk." On the other hand, synthetic stones sometimes contain air bubbles, which are accidentally produced when the raw materials are fused at a high temperature. A strong magnifying glass will reveal them. Thus, although synthetic stones are produced abundantly, the price of natural stones shows no sign of falling; on the contrary, it is gradually rising as the quantity of stones for sale gradually lessens.

Synthetic rubies, artificially produced, come in large sizes, while natural rubies are rarely available in large crystals. However, magnificent natural rubies weighing a number of carats are exhibited in museums in England and America.

Burma, Thailand, India, and Ceylon are the main producers of natural rubies. Burma produces unusually beautiful rubies. It is said that most first-class rubies have been found at a place called Mogok, 150 km. northeast of the city of Mandalay, Burma. Among rubies the best ruby is called "pigeon blood" because its red is said to be like that of the blood of a pigeon.

Siamese Rubies, which are often found in the same mines as spinel are darker red than Burmese Rubies. Spinel, which is similar to ruby, contains magnesium, and its crystal form, unlike ruby and sapphire, is isometric system like the diamond. In its red variety it is certainly not unlike the ruby, but it is a good deal less expensive. It is said to have been disclosed recently that the huge

"ruby" set in the British Imperial Crown is in reality spinel.

The corundum stones discovered in Thailand are usually sapphires rather than rubies. Natural rubies and sapphires, whose usual varieties are transparent, include star rubies and star sapphires. Those latter stones have fine fiber-like crystals and so, when cut encabochon, give six beautiful streaks of light in sunshine or under a spotlight. Star stones need not be expensive; although Burma Star Rubies are very expensive, India Star Rubies are far less expensive.

Among corundum stones, ruby is the birthstone for July and sapphire, for September.

Emeralds and Beryls

Emerald, the king of green stones, was one of the first precious stones to be put to use. Egypt's 4,000-year-old emerald mines are the oldest known mines.
Probably Cleopatra, the Queen of Egypt, decorated herself with emerald jewelry. Thus Egypt was one of the first emerald producers. Emeralds, however, were also discovered in the Ural Mountains. Indeed, although the Egyptian emerald mines have ceased producing, Russian emeralds from the Urals are still sold on the world market today. At present such South American countries as Colombia and Brazil are the chief producers of emeralds, with India and Pakistan also producing them.

Mineralogically emerald is beryl, which contains a metal called beryllium now famous in nuclear physics. The green color of beryl is probably due to an extremely small amouut of chromium ; green beryl which is virtually transparent is called emerald. Beryls other than green ones are sufficiently treasured to be used as jewelry, but

Beautiful Stone Bracelet

they are much less expensive than emerald.

One of these beryls, which is a transparent, pale water-blue, is called aquamarine. The stones of this family in any other colors are simply termed beryls.

Green beryl, i.e., the emerald, is very scarce and is valued the more as its color is marked. Dark green emeralds particularly are just as expensive as perfect diamonds.

Emeralds, though hard, are easily fractured, and the "flaws" they often contain are due no doubt to that weakness. The cloudiness in emeralds is also due to inclusions. These "flaws" are not, however, as disadvantageous in emeralds as they are in diamonds. On the contrary, they are often indications by means of which emeralds can be distinguished from other colored stones.

Recently Chatham, an American, succeeded in synthet-

ically producing emeralds; these are now on the market under the name of "Chatham Emeralds." Both mineralogically and chemically they are identical with natural emeralds.

Recent products can not easily be distinguished from natural emeralds, though their specific gravity is slightly lower and the processes used in developing the crystals is somewhat different.

With emeralds, as with rubies, the advent of synthetic stones has not affected the price of natural stones. The emerada, a synthetic green stone, is not a synthetic emerald, though it looks like one. It is a green variety of synthetic sapphire or synthetic spinel. Emerald is the birthstone for May, perhaps symbolizing the fresh verdure of spring.

There is another mineral called chrysoberyl which, like beryl, contains beryllium. While the usual variety of beryl, however, consists of beryllium, silicon and aluminium oxide, chrysoberyl is a chemical compound of beryllium and aluminium oxide. One variety of chrysoberyl, called cat's-eye, contains fine fiber-like crystals which give a streak of light. Cat's-eye is a very expensive stone. First-class cat's-eyes are a translucent honey-colored green.

Another variety of the chrysoberyl family is alexandrite. It has a unique optical feature : in daytime it is green, but under artificial light it appears red. This is, again, an expensive stone. Synthetic alexandrite consists of sapphire and vanadium.

Garnet

Though garnet is a rather common mineral, its dark red variety is valued as a precious stone. It is usually produced in rhombic dodecahedral crystals. Many garnet crystals gathered in a rock cavity are often likened to a ripe pomegranate. Brilliant-cut garnets are used as ring stones, while large garnets are used as pendants.

Garnet is a representative red-colored stone, but it also comes in various other colors, ranging from brown to purple. One variety, resembling ruby in color, is sometimes called Ceylon Ruby, Arizona Ruby, or Cape Ruby. Emerald-green garnet, uvarovite which is sometimes called the Ural Emerald, is occasionally confused with jade. Moreover, there is a yellow variety of garnet.

The garnet is the birthstone for January.

Topaz

Topaz is a representative yellow stone. Some people think that topaz is always yellow and that, conversely, any yellow stone is topaz. However, this is not always the case, for topaz also comes in other colors, and besides topaz there are other yellow stones, such as yellow quartz and golden sapphire.

The topaz on sale today is frequently none other than yellow quartz. Even in Brazil, which is a world-famous topaz producer, yellow quartz is the first item you get when you ask for topaz in jewelry stores. What are you expected to say when you want to buy genuine topaz? You ought to say that you want "precious" topaz. Since this is the common practice even in Brazil, it is not at all surprising that yellow quartz should be referred to as topaz elsewhere, as in Japan.

Japan is a topaz-producing country. One place in Shiga

Prefecture, near Kyōto, was once well known for producing colorless, transparent topaz which was exported in abundance. However, it ceased working some time ago. Shiga topaz came also in green and yellow, both varieties of which were opaque and not fit for jewelry.
The red and yellow varieties of topaz are, however, quite precious items for jewelry.

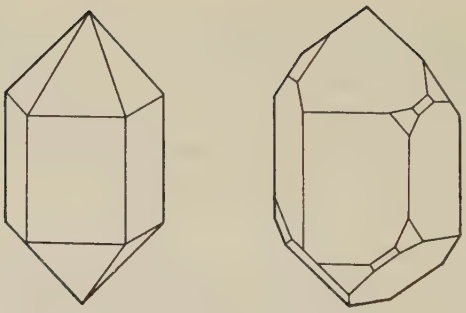
Topaz is the birthstone for November.

Rock Crystal

Rock crystal is in abundant supply throughout the world, and therefore it is quite a familiar gemstone or semi-precious stone. It is, indeed, one of the commonest of such stones. In Japan even in centuries past rock crystal, transparent and brilliant in contrast with the predominantly quiet and sober taste of the times, was widely enjoyed as, for instance, material for seals, ornamental bottoms for suspended tobacco-pouches, or decorative carvings. Today this stone, with its six sides and six pyramidal faces at each end, indicating a hexagonal symmetry, is still employed in its natural state as an ornament for the alcove.

Since rock crystal is a typical crystal line quartz, the chief variety of rock-forming minerals, it may be expected wherever rocks containing quartz are found. However, large transparent crystals are rarely unearthed. In Japan the main supply comes from Yamanashi Prefecture, near Mt. Fuji, rock crystal ware having long been a specialty of Kōfu, the capital of that prefecture. Today, even though large quartz crystals are no longer discovered there, rock crystal ware remains a special product of Kōfu, most of its raw materials being now imported from Brazil.

Yamanashi Prefecture was once known only for its rock crystal ware, but today its techniques have been widened



Crystal of Quartz (Polished and Rough)

to include the polishing or processing of precious stones and gemstones in general. Diamonds are being polished there, and synthetic rubies and synthetic sapphires. A research institute for synthetic stones has been established at Yamanashi University where rock crystals for industrial purposes are being synthesized. Thus "The Prefecture of Rock Crystal" has now become "The Prefecture of Precious Stones."

The clear variety of quartz is rock crystal; this is most common, but quartz also comes in different colors—amethyst, morion, citrine, rose quartz, cairngorm or smoky quartz, and sagenitic quartz.

Quartz is usually an inexpensive stone, but its purple variety, called amethyst, is quite expensive. The more purple the stone is, the more precious. Since beautiful amethyst is only rarely found in Japan, the amethyst ring stones available at jewelry stores in Japan are most likely to be from Brazil. Amethyst is the birthstone for February.

As has already been mentioned in discussing topaz, yellow quartz (citrine) is generally called topaz and serves as a topaz substitute. In this respect yellow quartz is an important stone. Black quartz (morion), smoky quartz (cairngorm), and rose quartz are more for seals than for ring stones in Japan. The sagenitic quartz contains characteristic needle-shaped crystals of tourmaline which look like grass. Quartz frequently contains various minerals, sometimes even sulfur.

Rose quartz, which is opaque because of the fine crystals it contains, sometimes gives, like star ruby, six streaks of light when polished. This type of quartz, star quartz, is being produced in Japan. However, that polished quartz which is white and transparent gives only lighter streaks of light. Therefore, a reflex apparatus and pigments are often applied to the back of the layer of quartz in order to intensify the streaks of light. At the same time, quartz can be made to look blue or red, so the stone can be used as a star sapphire or a star ruby substitute. Since star quartz is a good deal less expensive than star ruby, it ought to be more popular.

Agate, unlike quartz, is not crystalline, but, like quartz, it consists of silicon dioxide which was sedimented in ancient times. It is easily recognized by means of its beautiful flowing bands or mottled texture of light and dark. However, many agate handiworks are dyed through heat treatment or are made the desired color by heating them after they have been saturated in color solutions. Agate absorbs colors because it is a porous. That variety of agate called sardonyx is the birthstone for August.

Zircon

Zircon, which is often a diamond substitute, consists

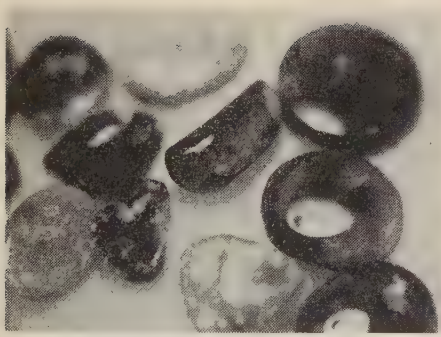
of silicon dioxide and zirconium. Like diamond, zircon is among the brightest of gems because of its high dispersion and refractivity. Though it is the blue zircon which is generally used in rings, the stone comes in various other colors. There are many zircons which are brownish with a resinous luster and which are, therefore, not fit for jewelry. After heat treatment, they turn blue or colorless. Colorless and transparent, blue, red, yellow, and green zircons are used as jewelry. The red variety is called hyacinth. The most common color is sky-blue, followed by pale green, blue, and red, in that order. The fact that zircons come in various colors is due chiefly to their different impurities such as iron, copper, or chromium. Furthermore, zircon usually contains radioactive elements, the reactions of which may be responsible for the different colors. The radioactivity in zircon, however, is so slight that it will never affect the wearer of a zircon ring.

The usual colors of ring zircons are not natural. The pale blue, colorless, and yellow qualities result from heat treatment of rough zircons. Sometime ago I experimented with a colorless and transparent zircon by applying radioactive gamma rays to it. No beautiful color, only a dirty brownish color, appeared in the stone.

A synthetic stone which is called zircon is the synthetic birthstone for December. This is nothing but synthetic corundum which has been colored a pale blue.

Opal

The many-colored opal is extremely popular; many women wear opal rings, and at both jewelry stores and the jewelry sections of department stores opal jewelry is always found in abundance. Opal, consisting of silicon



Various Opals

dioxide hardened in a rock cavity like agate, consists only of silicon oxide, as do quartz, agate, and calcedony. Its prismatic beauty, so called "fire," is due to the breaking up of light by its peculiar fractured structure. Opal which has a fractured structure is highly valued and is called "precious" opal as distinguished from usual opal, without these interior crackles.

The chief producers of opal are Australia and Mexico; the Australian opal is mostly blue or green, while the Mexican variety is of an orange-red hue, to clear with fire. Black opals, which are considered the best, have a vivid play of colors thrown up by their dark underside; they show dark greenish blue, like a peacock feather.

Considering its elements, it would appear that opal could easily be synthesized. Although silica jelly in our chemical laboratory sometimes gives its lighter prismatic colors, however, nobody has yet succeeded in synthesizing opal.

Opal is the birthstone for October.

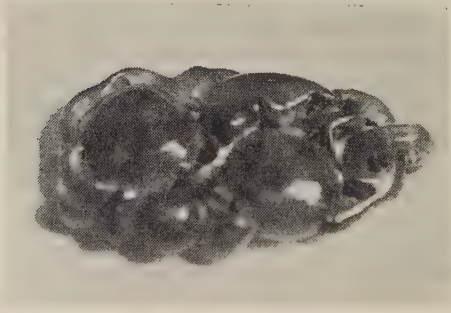
Jade and Jadeite

Among green gemstones jade is just as expensive as

emerald. However, jade is a sober translucent or sometimes opaque green gem, while emerald is clear, transparent, and crystalline. It is probably the sober and quietly lustrous jade rather than the brilliant emerald that appeals more to Japanese and Chinese taste.

Though we often think that jade is a specialty of China, in reality good supplies of the stone come also from New Zealand and Alaska. However, Oriental peoples, not Occidental peoples, are especially fond of jade. That is the reason why jade from places other than China is not well known. Though jade is mined in Burma as well as in China, China is its principal producer. Since China fell to the Chinese Communists, finished jade production has been rapidly decreasing, which may account for the fact that the price of jade has risen considerably of late. Furthermore, as Westerners, who did not treasure jade before, are now beginning to take pleasure in it, the demand for it is now greater. Recently, it is said, some people regard jade as a means of investment.

Jade, as a mineral, belongs to the same family as augite (pyroxene) and hornblende (amphibole). Because it



Jade Handiwork

Jade Incense Barner

consists of small fiber-like crystals, it is so hard that it is not easily broken, even with a hammer, though it is less hard than quartz. Therefore, jade may be smoothly carved and sculpted. The greener the color of jade, the better. Jade with a white smoky cast is highly appreciated when used for sash clips, brooches, and cuff-links. Nevertheless, the finest jade, called "Rokan," is a very deep, clear green and is translucent.

Jade is also produced in Niigata Prefecture, on the coast of the Japan Sea. This Japanese jade is more white than green and is good only for seals. It is not fit for jewelry. In fact, this particular Japanese jade mine is designated as a natural monument and is no longer worked. Splendid jade curved jewels have been unearthed in ancient Japanese tombs in this region. There are a few other jade mines in Japan which also produce quite good jade.

Since the finest jade is used as jewelry, many people have made synthetic jade or imitation jade. The synthetic stone called "meta-jade" invented by Dr. Satoyasu Iimori is

a replica of "Rokan," the very best variety of jade. However, mineralogically it is not the same as jade. Other kinds of artificial jade are all imitations made of glass.

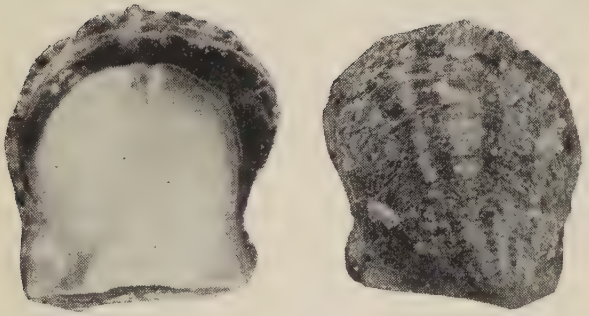
Jadeite is similar to jade. It is, indeed, more correct to say that jadeite and jade are one and the same substance from the mineralogical point of view. Jadeite is a lighter green than jade, gives a somewhat different luster, and since jadeite is mined much more abundantly than jade, it is a good deal less expensive. Jadeite is a suitable material for incense burners and various sculptures. It is, again, a specialty of China.

Pearls

Though pearls are generally treated as gemstones, it is more proper to call them organic, like coral, tortoiseshell, cameos, and ivory. The pearl, consisting of calcium carbonate and a little organic material, is formed within an oyster when it has an alien body within it; the oyster covers the invader with its own secretion in order to avoid being injured further by this foreign enemy. The prismatic beauty of a pearl is due to the unique microscopic crackles on its surface. These crackles are a good deal finer than those on the opal surface.

The different colors of pearls are dependent upon the kinds of shells, their state of health, and their environmental conditions. Yellow pearls are not well liked. The finest pearls are pink, followed by silver white. Bluish-black pearls are extremely valuable. Therefore, the colors of pearls are often modulated by means of bleaching or treatment with various pigments.

There are several kinds of shells which form pearls within them—pearl oysters, pearl-oyster shells, fresh-water mussels, and ear-shells. The best for pearl production are



Pearl Oyster

pearl-oyster shells, followed by pearl oysters. Fresh-water pearl-oyster shells form good pearls, too.

The techniques of producing cultured pearls are unique to Japan. Japanese pearls, which are being exported and so bringing in a good deal of foreign exchange, are composed of exactly the same substance as natural pearls. The only difference between them is that natural pearls probably contain grains of sand or parasitic insects which have become the pearl "seeds," while mother-of-pearl beads as "seeds," with little sacs made from the outer skin of other oysters, are artificially inserted into oysters to form cultured pearls.

Pearl oysters are usually employed for cultured pearl production, but pearl-oyster shells are also used in Burma. Needless to say, the technique for Burma's pearl production was learned from Japan.

Besides cultured pearls, there are imitation pearls ; these also are special products of Japan. The imitation pearls are made of glass balls lacquered with powdered scabbard fish scales. Inexpensive as they are, some of them are so skilfully made that they may at first glance be taken for genuine pearls. Japanese imitation pearls are also being exported in abundance to United States.

Other Gemstones

There are many other stones which are also used for jewelry. For example, tourmaline, which is found in a wealth of colors, such as sky blue, pink, and light green, is highly valued as a ring stone. An ordinary tourmaline is extremely black, like obsidian. It is not fit for jewelry at all. One variety, called "precious" tourmaline, is, however, widely used as jewelry. Brazil is one of the major producers of tourmaline. In Japan pink and green varieties are occasionally found.

Among blue stones there are turquoise and lapis-lazuli, both of which give an Oriental feeling. Turquoise, which is the birthstone for December, is clear sky blue and opaque. It consists of aluminium copper sulfate, but its characteristic blue probably comes from the element copper. It is also synthesized, and lighter blue turquoise can be artificially made deep blue. Turquoise makes a rather elegant ring stone. Lapis-lazuli is a dark blue, opaque stone. Though it is not expensive, it is probably one of the most beautiful of ring stones.

There is an expression "You have eyes like obsidian." Obsidian, which is a representative black stone and which sparkles beautifully, is a volcanic glass. The stone is black because of its iron content. Obsidian used as arrowheads and as the edges of certain tools in the stone

age is unearthed even today in many places of Japan. Obsidian may well be regarded as one of the earliest gems to be known and mined.

Olivine or peridote which is a representative green stone, is composed of the rocks and stones of the earth's crust. Its green is usually a good deal more yellowish than that of the emerald. The name "olivine" refers to the olive green color, in which it is also found. However, the most common variety of olivine is a little darker green than olive green, a greenish brown. Among colored gems, olivine is quite valuable as jewelry.

Rutile is a mineral which consists of titanium dioxide. Though the name "rutile" comes from the Latin word meaning red, synthetic rutile is a white crystal which sparkles beautifully like the diamond. Indeed, because its refractive index is a little higher than that of diamond, a brilliant-cut rutile sparkles very much. It is almost colorless and transparent, but when observed carefully it may be seen to be slightly yellowish. Recently synthetic rutile, made of titanium dioxide in very much the same way as the synthetic ruby, has come to be more popular than natural rutile. Rutile, which is sometimes called a "titania diamond," is frequently used as a diamond substitute. Therefore, synthetic rutile is in a sense an imitation diamond.

Malachite is an ornamental opaque stone whose beautiful green banding makes it suitable for brooches, cuff-links and seals. It is the same chemical compound of copper as the green rust produced by oxidation on the surface of old copper vessels.

The principal precious stones and gems which are generally employed as jewelry have been discussed. However, there are still other minerals which as minerals are noth-

ing special but which are sometimes treated as gemstones when they have specially beautiful colors or rare varities of colors. Such minerals are, for example, rhodonite, apatite, danburite, epidote, and hematite.

A NOTE FROM THE TRANSLATOR

I want to express my sincere appreciation to the publishers of COLOR BOOKS for giving me the opportunity of translating this book. Through translating I realized how little I knew about gems.

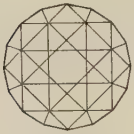
Without the knowledge of a mineralogist I must confess that at times I found the terminology difficult to translate. I am grateful to Professor Noriyuki Sakikawa, author of the Japanese edition, for helping me to translate some of these technical terms.

Occasional liberties have been taken in omitting portions of the text that had meaning and interest only to Japanese readers, and in rearranging parts of the text and adding sentences which I felt necessary for Western readers. Professor Sakikawa is, of course, not responsible for these changes. They were, however, done in accordance with the author's original intent and meaning.

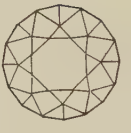
Lastly, I want to express my sincere thanks to Dr. C. L. Colegrove for his patient assistance in correcting my English.

Eichi Kobayashi

• Varieties of Cutting •



American Brilliant Cut



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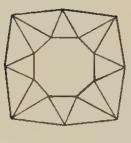
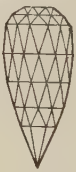


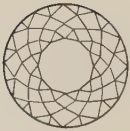
British Brilliant Cut

French Cut

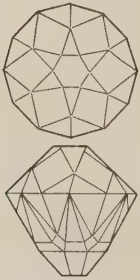
Cabochon



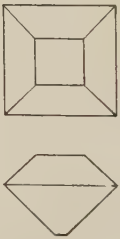
Drop Cut



Star Cut



Cairo Star Cut



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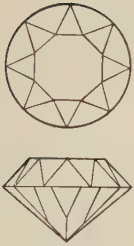

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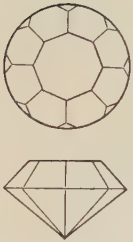

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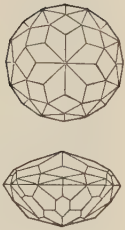

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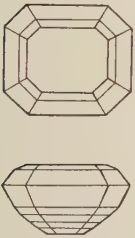

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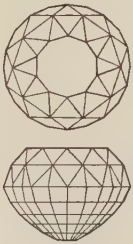
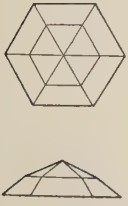
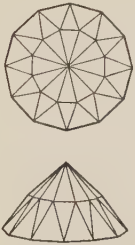


Mixed Cut

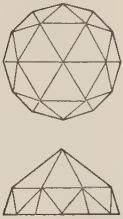
Briolette Cut



Antwerp Rose Cut



Rose Cut



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