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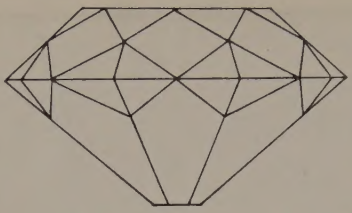
GEMS AND JEWELLERY



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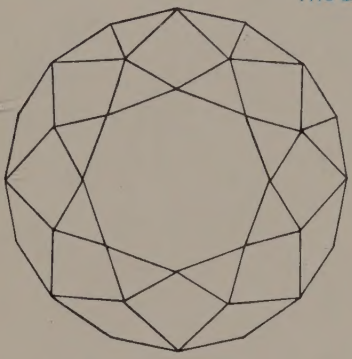

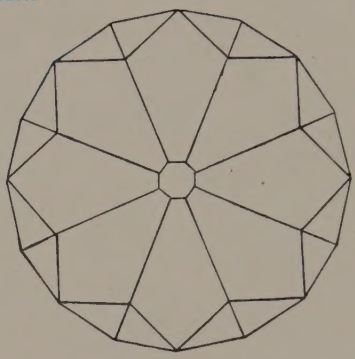

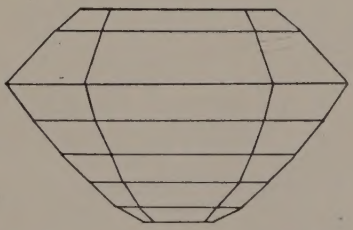

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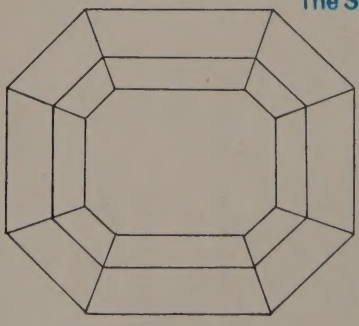

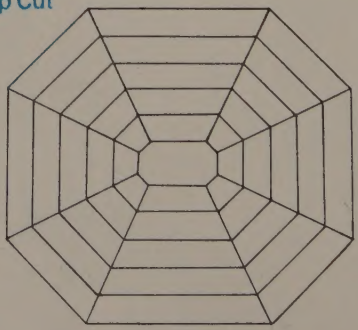

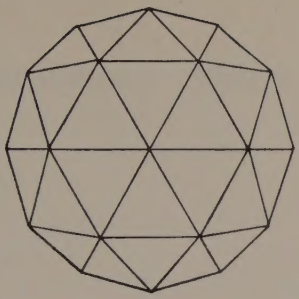

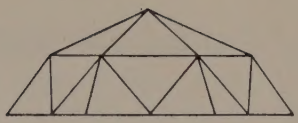

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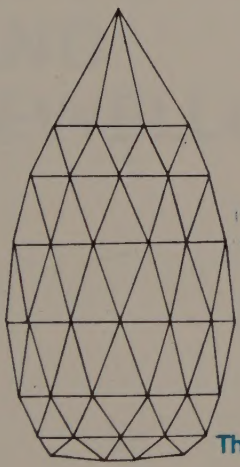
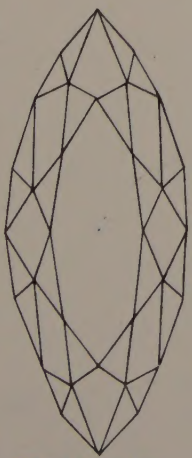


The Briolette

The Simple Cabochon



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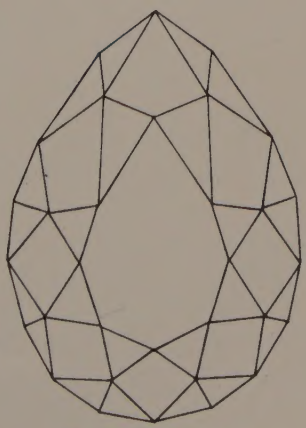

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Editor's Note

This book gives a partly historical and partly scientific account of the most important gems and other materials that are used in jewellery. The book *Rocks and Minerals*, also in this series, contains a fuller description of some of the minerals that are mentioned.

Acknowledgement

We would like to thank the Czechoslovakian Embassy for their help with the illustrations in this book.

Contents

Where Gems Come From

Rare and beautiful minerals and stones used for jewellery and other ornaments are called *gems*. However, not all gems are minerals or stones. The pearl is made by a shellfish called the oyster. Amber, often used as a gem, is made of the fossilized gum of prehistoric trees. Coral is made by tiny animals called *polyps*. Most precious stones and minerals used for gems are formed naturally in the earth's surface. Many millions of years ago, the rocks that form the earth's surface were molten. As the molten rocks gradually cooled and became solid, the minerals in them formed into *crystals*. This word comes from the Latin for ice, because many crystals have an ice-like appearance. Gemstones are very hard, and are found in softer rocks. If the soft rock is washed away, in places such as river beds, the gems may be found lying loose. However, the more rare and valuable gemstones usually must be mined. Different gems may be formed from the same mineral. For example, rubies, which are red, and sapphires, which may be transparent or one of a variety of colours, both come from the mineral *corundum*. These gems are formed by different chemical impurities in the corundum. Gem-bearing rocks are found all over the world.

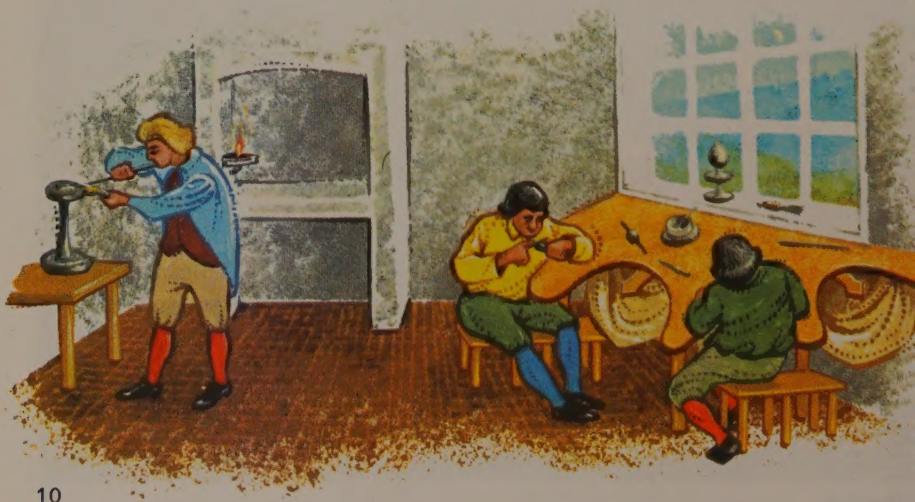
Gems are prized for their beauty. This selection shows the great variety of colour and shapes of semi-precious stones.

Gems and Ornaments

The word *jewel* means simply a precious stone. It can also mean an ornament with a precious stone in it. The word *jewellery* can mean a collection of jewels. It can also refer to the craft of making jewelled bracelets, rings, brooches and necklaces. A *jeweller* is a person who makes jewellery. The names of several beautiful gems have become popular names for girls. Such names include Beryl, Pearl, Ruby, Jade and Coral. The perfect gemstone is beautiful, hard and rare. The diamond, being all three, is usually considered to be the most precious stone. However, some gems are valued for their beauty, even though they are fairly soft and easy to damage. Pearls, for example, do not last as long as diamonds. Turquoise is spoilt if it comes into contact with water or grease. Soft stones are easily scratched by sand and grit in the atmosphere. To be valuable, stones must be rare. Common stones, even beautiful ones, are not highly valued.

A wide range of materials has been used in jewellery, including leather, bone, wood, shells, beetles and cast-iron. At first, jewellery was made from objects close at hand. This early jewellery tells us something about the owners. Jaguar-claw jewellery was probably owned by hunters, shell jewellery by fishermen. On Easter Island, in the Pacific Ocean, where few trees grew, wood was valued and used as jewellery.

Jewellers of the 1700's at work. The same skills are essential today.



Uses of Jewellery

Jewellery has other uses besides decoration. Sometimes a piece of jewellery may also be a weapon, like the fighting bracelets of the Masai people in East Africa. Among the Aztec people of Mexico, a man's rank was shown by the jewellery he wore. In primitive societies, beads are used as money. Usually jewellery has been associated with magic and religious belief. For example, a man might wear amber for the good of his eyes. Fine jewelled *reliquaries* (containers for holy relics) are kept in many churches. Throughout history, jewellery has been worn to show off men's wealth. When men stopped wearing jewellery themselves, they continued to adorn their wives. This showed that they had plenty of money. In India, women showed their social position by the jewels they wore. Much of what we know about ancient jewellery has been learnt from pieces that have been dug up. Much of this jewellery was lost or hidden in times of trouble. Because of this, such finds often do not fairly represent the work of a particular period. Also, by seeing jewellery in a museum showcase, we cannot always get a true idea of how it was used. Luckily, many old paintings can tell us a lot about the kind of jewellery worn in a particular time and place. They also tell how a particular piece of jewellery was worn with a particular form of dress.

Throughout history, jewellery has had magical and ritual importance. Witches who met together in their covens (groups) wore special rings.

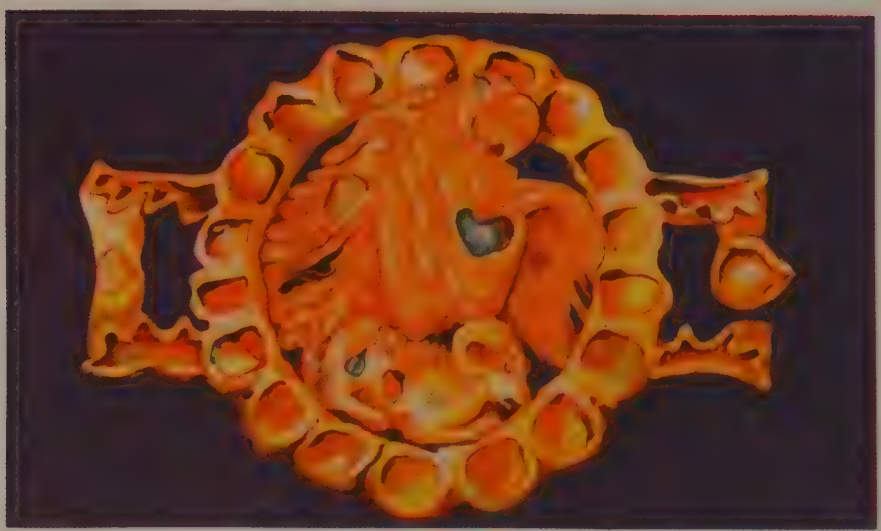
Jewellery in Early History

Early tools for making jewellery were very simple. They were used for boring holes, hammering shapes, cutting and polishing. Early jewellers set uncut precious stones into bracelets, brooches, and similar adornments. Then, jewellers learnt how to *cut* precious stones. The first cut stones were smooth ovals. *Faceting* was a later development that divided the surface of the gem into triangular or square sections called *facets*, which catch the light. Most transparent or translucent stones are faceted, while duller or opaque stones are rounded. The cutting and carving of gems began in ancient Babylon.

Ancient Egyptian jewellers used *motifs* (patterns) such as *scarabs* (sacred beetles), lotus blossoms or falcons. These were copied by the Greeks, and in turn by the Romans. However, the Romans lacked the skill of the Greeks, and their work was less delicate. Poison rings and iron mourning rings were common. Rings that could be turned one way to show a polished stone, and the other way to show a signet, were once popular.

The making of jewellery flourished in Anglo-Saxon England, as minor arts often do in troubled times. It is amazing how ideas in design spread from one country to another in those days, when travel was so difficult. Some animal designs on Anglo-Saxon

This Persian buckle of gold and turquoise dates from the 500's B.C.



This pursetop of enamelled gold comes from the Sutton Hoo treasure.

jewellery are similar to those in Russian jewellery of the period. One Anglo-Saxon brooch even has an Arabic inscription on it. *Inlaid* work, in which the pattern was 'laid' into the surface, was of a high standard. The Kingston brooch is a good example. The Sutton Hoo ship-burial treasure of the AD 600's (kept in the British Museum, London) shows us a great deal about Anglo-Saxon workmanship.

In the Middle Ages rich people felt that they should have a complete collection of minerals – beryl to be gay, chalcedony for a law case, chergoprase for failing sight, and opal to become invisible. *Memento mori*, that is, jewellery to remind one of death, was widespread. Rosary beads were sometimes made in the form of human skulls, and brooches with enamelled skulls were fastened onto hats.

Most jewellery of the Middle Ages had a *symbolic* meaning – that is, it was supposed to remind people of things like death, heaven and hell, and so on. But during the *Renaissance* period (from the 1300's to the 1500's) jewellery ceased to be symbolic. Patterns for jewels began to be standardized throughout Europe because books of designs were published. Fashion in jewellery and costume became closely connected. Sometimes entire dresses were sewn with jewels.

Jewellery in Modern History

During the 1600's, pieces of jewellery ceased to be works of art, and became only personal ornaments. They were beautiful in design and material, but had no deeper meaning. Jewellers' techniques improved, particularly in gem cutting. They produced beautiful clusters of gems set in leafy designs of gold and silver. In 1680, a way of making imitation pearls was invented, and strings of these 'pearls' became very popular with women. Diamond jewellery of great magnificence was made in the 1700's. This looked especially splendid when worn at candlelit balls held at the French court. However, towards the end of the century, decorative buttons, watches and snuff boxes began to be worn as much as if not more than actual jewellery.

In the early 1800's, jewellery set with such semi-precious stones as topaz, amethyst and aquamarine became popular for everyday wear. *Cameos* (gems with carved figurework) mounted in gold and enamel were also common, and many bracelets were worn. The invention of the electric light in 1867 increased the popularity of glittering gems. As a result, diamonds once again became the most prized gemstones. From the end of the 1800's, standardized jewellery was made in factories. As a reaction against this, some jewellers began to produce 'fantastic'

This silver stomacher (waist ornament), set with diamonds and rubies, is thought to have belonged to a Portuguese queen of the mid-1700's.

This deliberately rough golden pendant, the work of the Finnish designer Björn Weckström, is a good example of unusual modern jewellery.

jewellery that was inspired by the French style of art called *Art nouveau*. The French jeweller René Lalique produced elegant Art nouveau designs.

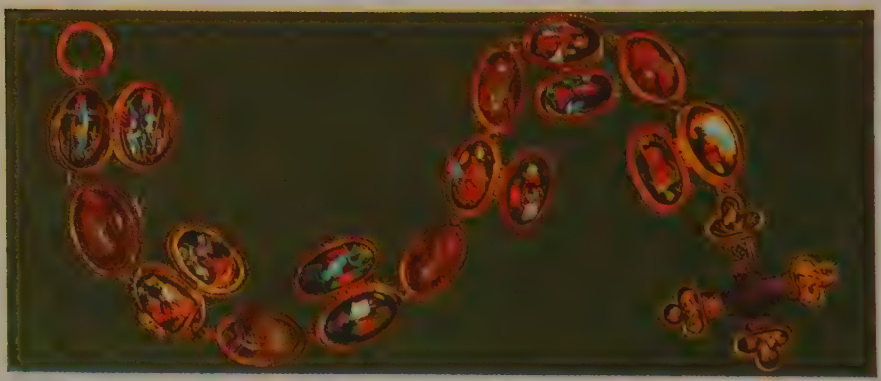
After World War I (1914–1918) diamond bracelets became very fashionable. Platinum was popular as a setting for gems. Many women wore wristwatches, mostly designed by jewellers. Since about 1940, *costume jewellery*, worn on dress, has been popular. Very few craftsmen now at work have the skills of the old jewellers, and most jewellery is mass-produced in factories. A method of mass-producing jewellery that has the appearance of individual pieces is the 'lost wax' technique. In this, a design can be modelled in wax and then cast in metal. In this way, for example, many rings that have the look of a handmade ring can be made from one original design.

The Danes and the Swedes excel at modern jewellery designs. In Britain, the Goldsmiths' Hall in London encourages good design. Some modern British jewellery is very exciting. Designers try to use unusual stones as well as well-known ones. One fine master is Andrew Grima. His work often seems off centre until one looks a little closer. In Europe and the United States there are many exciting new jewellery designs. The artist Pablo Picasso casts jewellery from patterns that he makes himself.

Gems and Jewellery A to Z

AGATE This belongs to the *chalcedony* group of the family of *quartz* stones (see CHALCEDONY, QUARTZ). It always has a pattern either in bands or circles. If the colours are poor and greyish the stone can be soaked in dye to bring out the pattern. Blanched agate was used by the Etruscans, who cut pictures into it to form an engraved gem. The Romans used to soak agate in honey and then heat it to form deep black bands. Today, one use for agate stained with acid or salts is for making umbrella handles. Moss agate is an attractive agate with other materials included in the stone. It looks like pictures of a tiny landscape with moss or grasses growing thickly together. Agate is tough and hard and has industrial as well as ornamental uses. The best agates come from Brazil, Czechoslovakia, Germany and India.

A rosary with agate beads of the early 1500's. It opens to show scenes from the life of Christ. It was probably made by an Italian jeweller.



ALEXANDRITE See CHRYSOBERYL

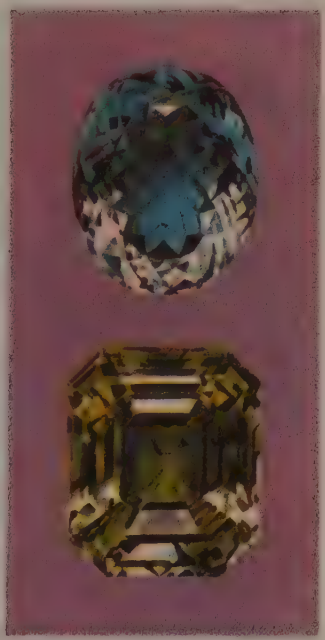
AMBER This is the fossilized gum of pine trees that grew millions of years ago. It was known and treasured in Roman times. Sometimes insects were trapped in the sticky gum before it was fossilized, and we can see how these creatures looked millions of years ago, since they are perfectly preserved in the amber. Amber has been used in Britain since the *Bronze Age* period (beginning in about 2000 B.C.). Today, cigarette holders, beads and umbrella handles are made from amber.

AMETHYST This is one of the most attractive semi-precious forms of *quartz* (see QUARTZ). It ranges from violet to purple in colour, depending on the amount of iron it contains. Siberia produces some of the best amethysts, but they are also found in Uruguay and Brazil. In 1900, a cave was discovered in Brazil which had walls studded with large amethyst crystals. Several superstitions used to be associated with amethyst. It was believed to work as a love charm, to improve sleep and to protect against drunkenness and thieves. So-called *Oriental amethyst* is not quartz at all but corundum, the mineral rubies are made of (see RUBY).

A fine example of a cut amethyst, an attractive form of quartz. This semi-precious stone was popular in the 1800's.

AQUAMARINE This gemstone is a variety of a mineral called *beryl* (see BERYL). Aquamarine is usually green or bluish-green in colour, and the name comes from the Latin for 'sea-water'. Sources include Brazil, South West Africa and Madagascar. The largest aquamarine ever discovered was found in Brazil.

BERYL This extremely hard mineral is a silicate of beryllium and aluminium. It is found in the shape of *hexagonal* (six-sided) crystals that may be very large and may be rose-coloured, red, green, blue or colourless. The most valued beryls are *emeralds* (see EMERALD). *Morganites* (rose-red beryls) are found in California in the United States, Russia, Brazil, and Madagascar. (See AQUAMARINE.)



Above, a rose-cut aquamarine. Below, a table-cut beryl.

BLOODSTONE This gem, sometimes known as heliotrope, is a variety of *jasper* (see CHALCEDONY). It is a dark green colour speckled with red spots that were believed to have been drops of blood from Christ's wounds. Bloodstone also symbolized wisdom. Signet rings made of bloodstone were popular. Sources include India, Siberia, and the Hebrides islands in Britain.

A bracelet and ring of gold, enamel, opals, rubies, emeralds and diamonds made by Georges Fouquet for the actress Sarah Bernhardt in 1906.

BRACELETS These have had a long history and have been used for purposes other than just decoration. In parts of Africa, people used fighting bracelets that could inflict harsh wounds. Sometimes designs have continued almost unchanged. Women of the ancient Greek island of Rhodes wore bracelets shaped like broken rings with the two ends in the form of an animal. Modern Indian women wear almost the identical bracelet today. Roman women favoured a snake bracelet. The same design has been popular in the United States and Britain during the 1800's and 1900's. The British in the 1800's wore bracelets made of dead relatives' hair that was plaited neatly, fastened, perhaps with the initials, also made of hair, and secured under crystal.

BROOCH The original purpose of a brooch was to hold heavy material in place. The simplest form was the *fibula*. It was as

essential to a dress as the modern button or zip. Ancient brooches are frequently found in the cold lands of northern Europe. They are often large and strong because they were usually intended to hold heavy material together. A typical early design was the *long brooch*. This is a little like the modern safety pin. The *saucer brooch* began quite simply but gradually became more elaborate and was set with enamel and garnets. Beautiful saucer brooches were made in Anglo-Saxon England. Sometimes they were sewn on for decoration. The *ring brooch* reached its height in Ireland; a famous example is the Tara brooch. The Vikings produced some beautiful brooches with many animal motifs. An interesting development of the later Middle Ages was the cap badge, a brooch that pilgrims wore on their hats.

In this century, the two World Wars have been commemorated with brooches. Naval crowns have been set with *brilliants* (stones cut to sparkle). Royal Air Force wings have been made in platinum. (See CAMEO.)

An Etruscan gold fibula of the 600's B.C., above, is a simple form of brooch. Below, the Towneley brooch, made of gold and enamel in about A.D. 1000, is a good example of an Anglo-Saxon saucer brooch.

This cameo showing the profile of a Roman emperor is one of a set of Italian cameos of the Renaissance period (1300's to 1500's). It is made of lapis-lazuli set in gold. The set was part of treasure brought up from the wreck of a warship of the Spanish Armada of 1588.

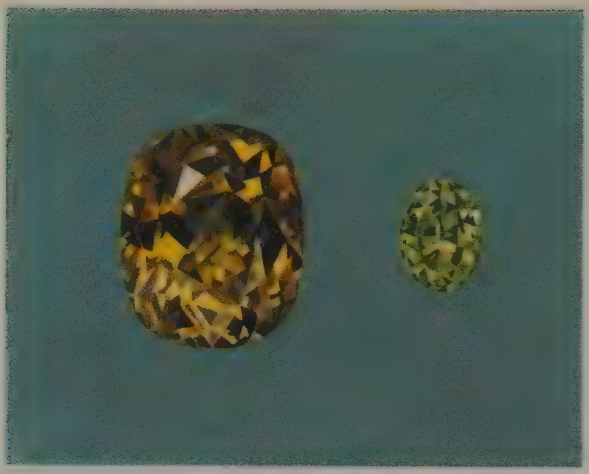
CAMEO This is a small design carved in *relief* (so that the design is raised), usually on precious or semi-precious stones or on shells. The most valuable cameos are those cut in such stones as amethysts, emeralds, agate, garnet, onyx, haematite and quartz. The less valuable cameos are cut in shell.

The art of cameo-cutting originated in Asia as a decoration on the reverse of seals. The Romans were skilled cameo makers, and even matched the material and the subjects. In the Middle Ages, antique Roman cameos were much treasured, and were copied, though not with such skill as the original artists had displayed. Gradually *lapidaries* (gem cutters) of the Renaissance period mastered some of the ancient cameo-makers' techniques. Portraits of princes were cleverly made in shell or enamel, or chalcedony on gold, or even in gold on a hard stone like lapis-lazuli or bloodstone. Some famous Renaissance artists designed cameo jewellery. Cellini's exquisite cameo *Leda and the Swan* uses an antique fragment for the body and his own design for the head. In England in the 1700's, cameos were even made in glass and set with *marcasite* (see PYRITE). In the late 1700's and early 1800's, cameos became very popular in France. The Empress Josephine had a fine *parure* (set) of jewellery made of antique cameos. The English of Queen Victoria's time loved cameos and had them made in malachite or large shell designs.

CHALCEDONY This is a form of *quartz* (see QUARTZ). It is made up of minute crystals that cannot be seen except with a microscope. It has a waxy lustre. There are many different kinds of chalcedony, but the name itself is mainly given to the white, grey, blue and brown types. The *agates* are a large group of patterned chalcedonies (see AGATE). Other chalcedonies vary in colour because of different impurities. For example, *cornelian* is reddish chalcedony. *Jasper* is opaque and has various impurities in it which give it a red, yellow or brown colour. *Onyx* is a chalcedony with parallel bands. Black and white onyx was used for cameos cut so that a white picture stood out against a black background. A red transparent form of onyx is known as *sardonyx*. *Chrysoprase* is apple green chalcedony. Chalcedonies are found in Brazil, Germany, India, Madagascar, the United States, and Uruguay. (See BLOODSTONE.)

This knife, made of chalcedony, was used for sacrificing human victims by the Mixtec people of ancient Mexico (1300's A.D.).

CHRYSOBERYL This is a name for a mineral that is a type of *beryllium aluminate*. There are several different chrysoberyl gems. One called alexandrite was discovered in the Ural Mountains of Russia on the birthday of the Russian Tsar Alexander II and named after him. It has the surprising property of being green by daylight but raspberry-red by night. Real alexandrite is so rare that artificial alexandrite is often sold. This is called *synthetic alexandrite*. Its colour by day is purplish, rather than green. Another chrysoberyl gem, found in Ceylon, is called *cat's-eye*,

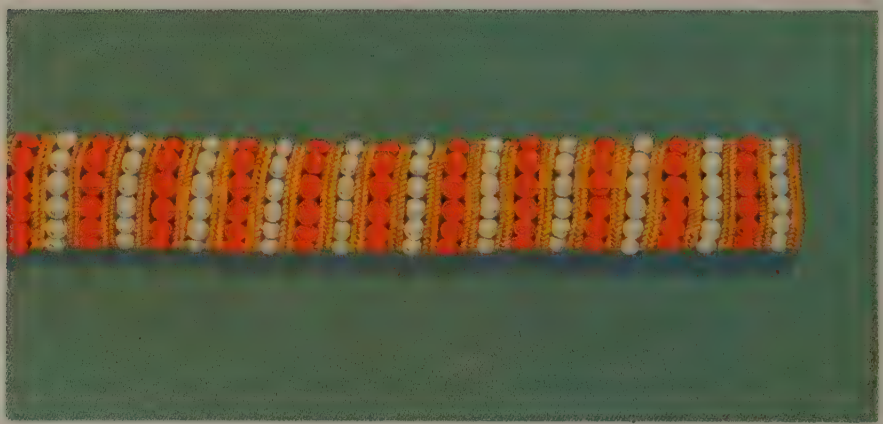


Cut examples of two types of chrysoberyl gems

because it shows a thin band of reflected light on its surface when it is cut with a curved face and polished. Some other mineral gems have this optical property, but chrysoberyl cat's-eye is the most valuable.

CORAL This is the chalky outside skeleton of tiny marine animals called *polyps*. These animals produce the red coral found chiefly in the Mediterranean, and also build the coral reefs of the Pacific Ocean. Coral is not hard and is therefore easy to carve into interesting designs and pictures. It takes a dull polish. The most precious coral is a warm, clear red. Other corals are white

A modern but traditionally-styled bracelet of coral and pearls.



and pink. The Italians have long admired coral and most coral jewellery of the 1800's was worked in Naples and Sicily where it was landed.

COSTUME JEWELLERY This is designed to go with a particular dress, and is usually intended to have only a short life. It is made of some base metal, and is set with pottery, glass, plastics, or *marcasite* (see PYRITE).

CROWN JEWELS The crown jewels of Britain are a splendid collection of jewellery used at the coronations of British kings and queens. It includes swords, maces, orbs, rings and crowns. These pieces have many magnificent stones amongst them with romantic stories attached to them. These include the Black Prince's Ruby, the Timur Ruby, and two famous diamonds, the Indian Koh-i-noor ('Mountain of light') and the Star of Africa. The Black Prince's Ruby is not a ruby at all. It is, in fact, a very fine uncut *spinel* (see SPINEL). It was given to Edward the Black Prince (son of Edward III of England) in 1367. Henry V of England wore this spinel in his helmet at the Battle of Agincourt (1415). An enemy struck him, almost killing him, but the stone escaped damage. In the 1600's, the Black Prince's Ruby was sold for only £4 ($9.6). Today, it has an important place in the Imperial State Crown.

The Timur Ruby is another spinel, in fact the largest red spinel known to exist. It has been famous in the East for 600 years. It still has Persian inscriptions on it. At one time it belonged to the great Mongol conqueror Tamerlane or Timur, from whom it gets its name. Later Shah Jehan, the great Mughal emperor of India who built the Taj Mahal, also owned this 'ruby' and had it set in the fabulous Peacock throne. Eventually, it was presented to Queen Victoria of England. By a strange historical coincidence it has always been owned together with the Koh-i-noor.

It is said that the Koh-i-noor diamond originally weighed 800 carats. Its history is known for certain since 1304, when the Mughals owned it. It had inscriptions on it but these were lost when Queen Victoria had it re-cut. Not only was much of the diamond lost, but the stone was still not cut into a perfect brilliant. It might have been better left as it was. Traditionally the Koh-i-noor is supposed to bring bad luck to any man who

The sovereign's orb and sceptre are two pieces of the British crown jewels, a splendid collection of jewellery used at the coronations of kings and queens. The collection also includes swords, crowns and rings.

wears it. The Star of Africa comes from a large diamond found in 1905 in South Africa. This diamond was called the Cullinan. Uncut, it weighed 3,024 carats and it measured $4\frac{1}{2}$ inches across. It is believed to have been part of an even larger stone, perhaps even double that size. It was later split into the Star of Africa, the world's largest cut diamond, and many other smaller ones.

DIAMOND The diamond is the simplest of all gemstones in its make-up. It is crystallized carbon, but we do not know for certain how it is formed. Many scientists think that diamonds are formed by immense heat and pressure in the rocks of the earth's crust. The diamond is the hardest natural substance known. In the *Moh scale*, a scale that scientists use as a standard for the hardness of gems, the diamond is No. 10. All other gemstones are in descending order of hardness. Diamonds are so hard that they can only be cut by other diamonds. The best diamonds are tinged faintly with blue, and flawless. They are said to be of the 'first water'. Diamonds also can be many other colours – for example, greenish, brown, yellow or pink. Yellow diamonds are valuable. Blue diamonds are the rarest of all. Diamonds were mined in India as long ago as

Diamonds are the simplest of all gems in their make-up. In modern times (since the 1700's) they have been regarded as the 'kings of stones'. These uncut yellow diamonds are being sorted into sizes for cutting.

200 B.C. But they were not considered to be the kings of stones until the 1700's, when a new way of cutting them was discovered.

India has produced many of the most famous diamonds. Diamonds are found in many parts of Africa and South America. In the 1700's, diamond mines were opened in Brazil. Brazil is the only place where black diamonds are found. Today, South Africa is the foremost diamond producing country. Diamonds are mined in Borneo and Australia, and in 1954 a diamond mine was opened in Siberia, Russia.

Diamonds are quite abundant in the world, but their price remains high because their output is deliberately limited, and also because it is very difficult to *cut* them (see DIAMOND CUTTING). Synthetic diamonds are made for industry by crystallizing *graphite* (another form of carbon) at great pressure and heat. Rock crystal, or, later, paste, has been used to make imitation diamonds. The most successful imitation diamonds are made of *zircon* (see ZIRCON).

DIAMOND CUTTING This is such a specialized art that diamond-cutters do not cut other stones. First of all, the diamond-cutter examines the diamond to see which way the grain lies.

A necklace of diamonds set in silver. It was made in France in about 1760.

He then splits it into a rough shape, using another diamond. This is called *bruting*. Powder during this stage is kept for the next stage. Then the diamond is attached to a stick called a *dop*. When the polishing makes the diamond hot, it is plunged into cold water. After polishing, the diamond is boiled in sulphuric acid to rid it of all dirt and oil. Because diamonds are so hard, the machinery used for all this work wears out quickly. Although modern machinery has made the diamond-cutter's work easier, much relies on his skill. The size and purity of the original stone decide the value of a diamond. Any loss in weight by being cut does not matter. The important thing is that the final shape should be good. It is entirely different with other gemstones. Their value depends on the final weight and quality *after* cutting and polishing. Most cutting is done in Amsterdam in the Netherlands or in Antwerp in Belgium. It is also done in London and Paris, and in Kimberley in South Africa.

EARRINGS These have long been an important form of jewellery. Melian earrings were often lavishly decorated with *filigree* (metal 'lacework') and *granulation* (gold filings) and elaborated with birds, insects and animal heads. Perhaps the best Greek earrings were those made in the shape of a boat. These were often adorned fantastically with cockle shell or human head

These gold earrings were made in Czechoslovakia in medieval times.

motifs. A later style of earring consisted of a disc from which hung figures of doves made of dipped enamel. Garnets and onyx were often used. A typical Roman earring was of one stone supporting three smaller ones. This was called a rattle, and English earrings of the 1800's are similar in design. In the Middle Ages, when hair was worn over the ears, earrings were almost unknown. In England in the 1500's, earrings of pear-shaped pearl drops were admired. In the 1600's, Charles I of England always wore a large pearl earring. Today, whenever it is the fashion for hair to be cut short or pinned high on the head, earrings are one of the most popular forms of jewellery. They are made in many exciting designs.

EMERALD These green gems are *beryls*, belonging to the same family as the *aquamarine* (see AQUAMARINE, BERYL). A feature of emeralds and aquamarines is that they do not change colour in artificial light. Emeralds are more prized because they are much rarer. Emeralds are found in Madagascar and in the Ural Mountains of Russia, but the best stones are mined in Colombia. Emeralds are almost always flawed. In ancient times, Queen Cleopatra of Egypt had a famous collection of fine emeralds. These emeralds came from Upper Egypt. The Roman Emperor Nero is supposed to have watched the Roman games

Left, emeralds as they are found in nature, and right, a cut emerald.

through an emerald. In the 1500's, Hernando Cortés, the Spanish conqueror of Mexico, is said to have had five famous emeralds made ready for his bride. One of these was hollowed out into a cup with a golden foot.

ENAMEL This is not a gemstone, but a glass glaze *fused* (melted) onto metal. Enamelled jewellery can be very beautiful. The glaze is coloured with metallic oxides. Great skill is needed to prevent colour from being lost through excessive heat. Sometimes the metal buckles when the enamel contracts too much on cooling.

The ancient Egyptians were masters of enamel work. Probably they learnt some of their techniques from the Phoenicians. Early British jewellers used a crude form of red enamel. In the early Middle Ages, British enamel work reached a high standard. An example is the famous Kentish jewellery. Jewellery of *Byzantium* (the eastern Roman empire) was generally religious, and the Byzantines produced fine crosses in *cloisonné* enamel. Cloisonné work consists of raised metal designs filled in with enamel. In Florence during the Middle Ages, *basse taille* enamelling (nearly transparent enamel laid over designs engraved in metal) was skilfully produced on silver medallions, with religious subjects. In India enamelling has long been used and admired in jewellery.

A waist-ornament in the shape of a book-cover. It is made of enamelled gold and shows Moses and the Brazen Serpent. It was made in about 1550. The lettering in old English means 'Make the fiery serpent and set it up for a sign: that as many as are bit may look upon it and live .

In Russia a charming custom used to be the giving of Easter eggs made of enamel and studded with jewels. These were collected, one each year, until there were enough to be strung into a necklace. The most famous of these were made by the great Russian jeweller Fabergé. In the French *Art nouveau* fashion of jewellery of the late 1800's the master was René Lalique. Since that period, not much enamelling has been done. The Spanish painter Salvador Dali has, however, produced some dramatic enamelled jewellery.

ENGRAVED GEMS See CAMEO

FAKES AND FORGERIES Sometimes inexpensive jewellery is made to appear valuable. There may be no desire to cheat the customer with a fraud, but only to give a cheaper version of the 'real thing'. However, frauds are sometimes intended to deceive. Coloured foil used to be put behind a transparent stone to give it a better colour. Another way of deception was to have a thin piece of a real stone on top, and glass underneath. 'Bristol diamonds' and 'Cornish diamonds' are really rock crystal, which is colourless quartz. *Paste* (glass) jewellery of the 1700's does not seem to be intended to deceive, and it has a style of its own. *Pinchbeck* (a copper alloy resembling gold) and the metal plated

jewellery of modern times were never intended to deceive. Today, the most frequently forged pieces are Greek and Etruscan jewellery, medieval rings and Renaissance enamelled pendants. Watches, rings and brooches of the 1700's are also increasingly forged. One of the most famous fakes is the Odessa tiara. This is a beautiful hat-shaped gold *tiara* (see TIARA). In the 1800's, a Rumanian sold it to the Louvre Art Museum in Paris, France, for 200,000 gold francs. He pretended that the tiara was a genuine Russian antique. However, it was new. This skilful forgery was the work of a craftsman. He had succeeded in making this piece look like an antique by carefully copying old paintings and prints of tiaras.

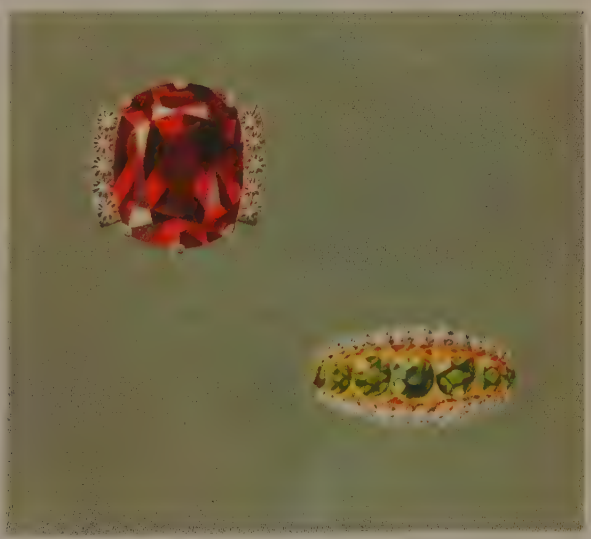
GARNETS These popular semi-precious stones are usually thought of as red in colour. In fact, there are several varieties of garnets, and each variety may come in several colour types. Garnets are *double silicates* – that is, they are compounds of silica and two metallic elements. The following are the main varieties of garnets, together with the metals that are combined with the silica: *almandite* (iron, aluminium); *andradite* (calcium, iron); *grossularite* (calcium, aluminium); *pyrope* (magnesium, aluminium); *spessartite* (manganese, aluminium); and *uvarovite* (calcium, chromium). The colours of these varieties vary with the impurities. Also, two of these varieties may combine to form another variety.

Carbuncle was the old name for deep red, transparent almandite. Carbuncles used to be very popular gems, and in the Middle Ages were believed to have magical powers. Almandites come chiefly from Brazil, Ceylon and India. They are also known

as 'Tyrolese garnets'. Andradite may be a shade of red, black, brown, yellow or green. *Topazolite* is andradite that resembles *topaz* (see TOPAZ). *Demantoids* (meaning 'diamond-like') are green andradites. These are among the most valuable garnets. *Melanites* are black andradites. They were popular for mourning jewellery. Demantoids are found in the Ural Mountains of Russia. The other andradites come chiefly from Europe and the United States.

Grossularite may be a shade of red, green, yellow, or brown. Pure grossularite is colourless. Yellow and brown grossularites, found chiefly in Ceylon, are called *hessonites* or *cinnamon* stones. Grossularites are also found in northern Italy, Mexico, South Africa and the United States. Beautiful green grossularites are found in the Ural Mountains. Ruby-red pyropes are the most popular variety of garnet. They are found in Bohemia (Czechoslovakia), South Africa and the United States, and are sold as Bohemian, Cape or Arizona 'rubies'. Emerald-green uvarovites are found in Russia, but they are rarely suitable for gem use. Rose-red or purple *rhodolites*, a mixture of pyrope and almandite, are found in North Carolina in the United States.

Garnets are not very valuable because they are common and fairly soft. However, they are popular for their beautiful colours and are often used to imitate other more precious gems.



Garnets are among the most popular of semi-precious stones because of their attractive colours. They are especially suitable for rings.

GLASS Today we often look down on jewellery made of glass. One reason for this is that many fakes have been made of coloured glass. Another is that glass scratches easily and does not have much 'fire'. However, glass has not always been despised. In ancient times, glass was used for making tools, weapons and ornaments. The ancient Mycenaeans were fond of glass beads carved into shapes of shells, shields and flowers. The ancient Egyptians inserted glass into frames of gold, giving a rich mosaic look. The Romans were more interested in gold than in precious gems, and did not mind whether a red stone in a piece of golden jewellery was a garnet or glass, so long as it was a good colour and showed the gold up to advantage. The art of *millefiori* (drawing out and twisting of glass thread) was known in the 1100's B.C. Several kinds of natural glass occur. The best known kind is called *obsidian*. This is a dark-coloured glass that is formed when volcanic *lava* (molten rock) cools rapidly. In Bohemia, Czechoslovakia, in the 1100's, a beautiful deep green glass with a furrowed surface was discovered. This was formed when *meteorites* (rocks from space) hit the earth. Other 'meteorite' glass is found in Australia. This occurs in the shape of flat 'buttons'.

GOLD AND GOLDWORK This metallic element (symbol Au) is the metalworker's ideal material. It is extremely *ductile* – that is, it can be drawn out into long lengths. It is the most *malleable* of all metals – that is, it can be beaten and worked into new shapes or very thin sheets more easily than any other metal. It never loses its appearance through rusting or tarnishing because it is chemically inactive. Pure or *raw* gold has a rich, soft shine and is waxy to the touch. Because it is fairly soft, gold is usually hardened by *alloying* (mixing) it with copper, silver or other metals. *White gold* is an alloy of gold with platinum, palladium, nickel, or nickel with zinc. *Green gold* is an alloy of gold with silver. *Red gold* is gold alloyed with copper. The amount of gold in an alloy is measured in *carats*. One carat is 1/24th of the weight of the total amount; pure gold is therefore 24 carats fine. An alloy that is three quarters gold is 18 carats fine. Substitutes for gold include *pinchbeck*, a copper alloy similar to brass invented by Christopher Pinchbeck (1670–1732), a watchmaker; *anodized aluminium*, which is aluminium electrically dyed to

Gold-bearing quartz

Golden dress ornament,
ancient Greece

Decorated gold anklet,
Ibo region, eastern Nigeria

Ceremonial gold knife,
inlaid with turquoises.
Chimu kingdom, ancient Peru

The Alfred Jewel,
Anglo-Saxon goldwork
(A.D. 800's)

Benvenuto Cellini, the great Italian goldsmith of the later Renaissance period (1500's), made this superb salt cellar.

look like gold; and *electroplating*, which is a method of coating another metal with an extremely thin layer of gold.

Jewellery, ornaments and vessels made of gold have been important in most stages of history and in most civilizations as symbols of wealth, rank, and authority. The earliest fine goldwork that we know of is from ancient Mesopotamia, dating from the early 200's B.C. It shows great technical skill. Ancient Egyptian goldsmiths were fine workmen, as gold jewellery with inlaid gems and gold objects from the tomb of the pharaoh Tut-ankh-amen (Tutankhamon) show. The goldwork of the ancient Aegean civilizations shows that many metalworking techniques were used in those times. These include *repoussé* (designs raised in relief by hammering from behind), *inlaying* (ornamentation by 'laying in' pieces of metal or gems), and *openwork* (work in which openings are part of the design). Many fine pieces of goldwork, among them jewellery, drinking cups, vases, death masks, weapons and dress ornaments have been found at Troy and Mycenae. Persian goldwork of the 500's to 300's B.C. is noted for its luxury and skill of workmanship. The Etruscans produced perhaps the finest ancient goldwork. Their rich designs used a technique called *granulation*. In this,

gold filings were soldered onto jewellery. The Greeks developed fine *filigree* (ornamental 'lacework') designs in gold, and combined geometrical designs with figures from their mythology. The Romans followed Greek forms, but tended towards massive forms and too much detail.

In the early Middle Ages, the best European goldwork was produced by the Celtic peoples, particularly in Ireland. Their goldwork is noted for its fine workmanship and intricate design. A famous example is the Tara Brooch, now in the National Museum in Dublin, Ireland. Anglo-Saxon goldwork, using inlaid jewels and spiral and interlacing ornamentation with animal motifs, was extremely colourful. In the later Middle Ages, much religious goldwork, including crosses, *reliquaries* (containers for holy relics), sacred vessels and altar fronts, was produced.

The revival of interest in *classical* (Greek and Roman) forms during the Renaissance period meant that goldsmiths were in demand for *secular* (non-religious) as well as religious work. Benvenuto Cellini (1500–1571) of Florence was the most famous Renaissance goldsmith. Later European goldwork tended to repeat the ideas of the Renaissance, until in the early 1800's there was again a revival of interest in classical forms. Goldwork has been important in many parts of Asia. India has many centres that are noted for ornate goldwork. Tibet has produced much goldwork of religious figures. In China, gold was fairly scarce, but some delicate pieces of goldwork survive. The Aztec and Inca civilizations that flourished in Central and South America before the arrival of Columbus had excellent goldsmiths.

HAEMATITE This mineral is an oxide of iron. It occurs in red or reddish brown earthy masses and steel-grey to black crystals. In its crystalline form it has long been used as a gem. In jewellery, black haematite is used sometimes to imitate black pearls. It is used also for signet rings with an *intaglio* (recessed) engraving and for other jewellery such as men's cuff links. It has been used for *pendants* (hanging ornaments worn from the neck), especially in the first half of the 1900's. The best gem haematite comes from Cumberland in Britain.

IMITATION STONES Most valuable gem stones have been imitated in cheaper materials. Only the colours are the same as

Imitation jewellery is often plastic.

the genuine stones; in every other way the imitations are inferior. Imitation stones were usually made of glass. Therefore they scratched and chipped easily and had only a dull shine. In ancient Egypt, clay copies of jewels were buried in tombs. Glass makers in Roman times were skilled at imitating precious stones. In the 1800's, more people could afford jewellery than ever before. Although they could not buy the most expensive stones, they admired and wore machine-made copies. Sometimes the back of an imitation stone was coated with mercury or backed with foil to make it shine. Today, imitation jewellery is often made of plastic. (See GLASS.)

IVORY Strictly speaking, the word *ivory* applies only to the white substance called *dentine* from the tusks of the elephant. Ivory is prized for its hardness, smoothness and close-grained texture. In the past, the teeth of the walrus, hippopotamus and sperm whale have been used as ivory. Ivory has been used in art since prehistoric times. A famous example of early medieval ivory work is the Frank's Casket. The Danny Unicorn Jewel, supposed to be a unicorn's horn, is a whale tusk set in enamelled gold.

The Anglo-Norman Tau Cross, made in the 1100's, is a good example of early medieval ivory work.

This fine jade bull was made in China during the Ming period (1600's).

JADE This is the common name for two minerals, *jadeite* and *nephrite*, that are used as gems. Jadeite, the rarer of the two, is found chiefly in Burma, Tibet and China. It is a *sodium aluminium silicate*. It is less transparent than nephrite, which is a *calcium magnesium iron silicate*. Turkestan used to be the chief source of nephrite. Today, it is chiefly found in New Zealand. Deposits have also been found in Alaska and Wyoming in the United States. The chief colours of the jade minerals are white and green, although they may come in a variety of shades. Nephrite is often grass-green. *Mutton-fat jade* is greyish-white nephrite. *Spinach jade* is dark green nephrite. Shades of jadeite include grey, orange, brown, mauve and black as well as white and green. Emerald-green jadeite is the most highly prized. Jade has a structure of interlocking 'needles' that makes it very strong and suitable for carving into implements. It can also be carved into delicate patterns.

Jade was much used by primitive peoples to make such implements as axes, knives and arrowheads. The Chinese and the Japanese prized jade as the most precious of jewels. The Chinese, in particular, are famous for their jade jewellery and carvings. Chinese nephrite jadework reached its height in the period of the Ming emperors (1368-1644). Carvings of this period are treasured by collectors. Glass is sometimes used to

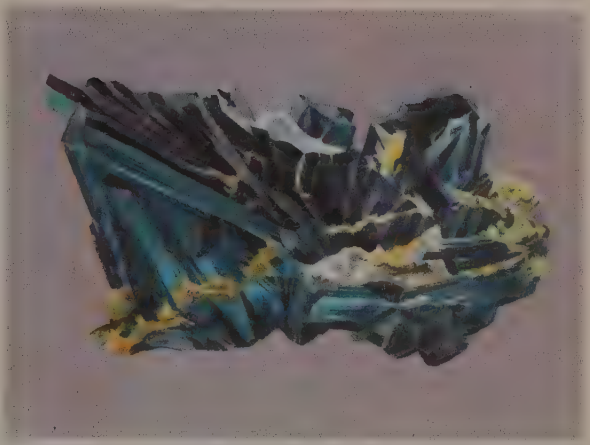
imitate jade. These imitations can easily be detected, because glass is smooth and not 'greasy' to the touch, as are true jadeite and nephrite.

JET This dense and compact black mineral is a variety of coal. It takes a good polish and is often used to make ornaments. The chief source is Whitby in Yorkshire, England. Jet became popular in Britain during the period of national mourning in the 1800's when Queen Victoria lost her husband Prince Albert. *French jet* is in fact black glass.

Jet, a hard black kind of coal, has been used to make jewellery and ornaments for thousands of years. This jet necklace found at Melfort, England, was made between 1350 and 1250 B.C.

LAPIS-LAZULI This is a beautiful blue, opaque stone that has been admired since ancient times. The name comes from the Latin for stone (lapis) and the Arabic for blue (lazuli). Lapis-lazuli is usually deep blue, but it can be violet or greenish-blue. It is a mixture of *calcite* and other minerals including *lazarite*, from which it gets its colour. It is usually dotted with the mineral *pyrite*, which glistens like gold flakes (see PYRITE). The Egyptians used to cut it into the shape of *scarabs* (sacred beetles). They also used to grind it into powder called *chesbet* which they moulded into fine shapes, such as long-necked cats. Painters of the Middle Ages and the Renaissance powdered it also, and used it to make their *ultra-marine* (deep-blue) pigment. Lapis-lazuli has been used to make vases, boxes and *mosaics* (patterns made of small pieces of stone). Lapis-lazuli has been mined in Afghanistan for more than 6,000 years. It is also found in Siberia and Chile.

MALACHITE AND AZURITE These minerals are closely related forms of *copper carbonate*. They are found, usually



Azurite, a form of copper carbonate, occurs in beautiful deep blue crystals. It is very soft, but is sometimes used in modern jewellery.

together with other copper ores, as crystals or as masses. Malachite, also called 'velvet ore', is green with a silky lustre. Malachite stone is fairly soft, but it takes a good polish. It was a popular ornamental stone with the Greeks and Romans, who used it for *cameos*, statuettes and vases (see CAMEO). It is found in various parts of the United States and in Cuba, Chile, Russia, Rhodesia and Australia. Azurite is the deepest blue of all minerals. It is found in beautiful crystals in Arizona and New Mexico in the United States and in France at Chessy. Azurite is sometimes used in modern jewellery, although it has the great drawback of being very soft. Azurite and malachite are sometimes found closely combined. Then, the stone is known as *Azurmalachite.*

MOONSTONE This gem is the most famous member of the large group of minerals called *feldspars*. Moonstones are rather soft and split easily, but they are popular because of their sheen. This is caused by refraction of light by the thin layers of which the moonstone is made up. The finest bluish moonstones are from Burma, but they are also found in Ceylon, Madagascar and Brazil, and were formerly found in the Swiss Alps. Moonstones are considered sacred in India. In Britain and other western countries they have been popular for brooches.

NECKLACES These have been made out of many different substances, including seeds, wood, feathers, fishes' teeth, precious metals and gems. Hawaiian chiefs wore necklaces made

Left, a Roman gold necklace of the 1st century A.D., set with precious stones. Right, a German necklace, made in about 1580, of enamelled gold set with pearls, emeralds and diamonds.

of birds' feathers. Early classical necklaces were simply strings of beads. The Aztecs of Mexico wore necklaces of skulls. In Europe during the period of the Renaissance, it was customary for women to wear a gold necklace. Sometimes, women wore as many as six different chain necklaces. Necklaces with *pendants* (hanging ornaments) were popular for both men and women. Some necklaces of the 1800's are very beautiful. Long gold chains that reached the waist were worn. Turquoise necklaces with the design of a fly were common. Some Indian women wear necklaces of tiny black beads to show that they are married, just as European women wear wedding rings. (See TORQUE.)

OLIVINE This is the name given to olive-green varieties of a rock-forming mineral mainly composed of *magnesium* and *ferrous orthosilicate*. The transparent varieties of olivine that are used in jewellery are *peridot* and *chrysolite*. There are some very fine cut peridots among the Russian crown jewels. Peridots are found on St. John's Island, off south-east Egypt, in the Red Sea.

They have also been found embedded in *meteorites* (rocks from outer space). Gem-quality olivines are found also in Burma and Brazil.

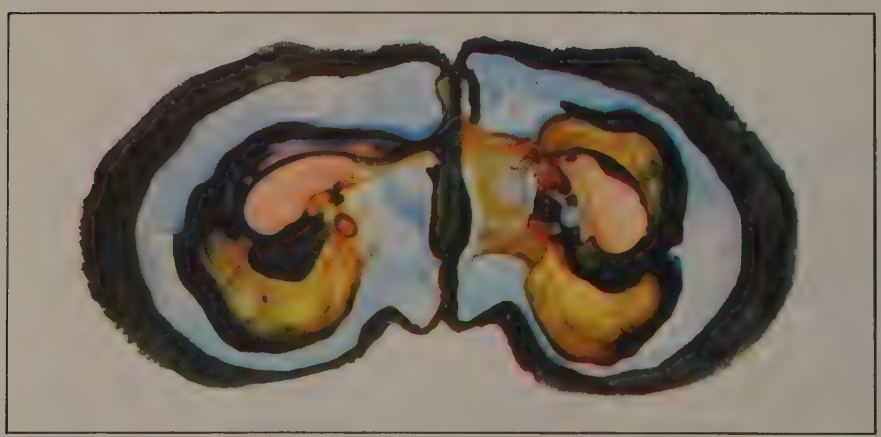
OPALS These are attractive and rather curious gems that show a remarkable 'play' of changing colours. This is called *opalescence*. Opals are not crystals, but shapeless masses of *hydrous* (watery) silica. They are deposited in cracks and fissures in rocks by water containing dissolved silica. As the jelly-like silica hardens, cracks appear in it. These are later filled up by new deposits of silica containing different amounts of water. Opals, therefore, are made up of layers of silica that differ in density. These refract light in different directions, and this accounts for the play of colour. The wide range of colours of opals is caused by different chemical impurities. There are many different kinds of opals. Some are valued as gemstones: these are collectively called *precious opal*. Precious opal includes *black opal*, *white opal*, the rainbow coloured *harlequin opal* and the yellow and orange-red *fire opal*. Precious opal used to be found in Czechoslovakia. Today the finest opal comes from Queensland and New South

Opals are unusual gems that show a remarkable 'play' of changing colours. This French necklace of the late 1700's consists of opals surrounded with brilliants (small diamonds).

Wales in Australia. White opals are found in Japan; fire opals in Mexico and Honduras. Several kinds of precious opal come from India, New Zealand and the western United States. In ancient times, precious opal was ranked as a 'noble' stone. The Romans considered it second only to the emerald. Many superstitions have been connected with opal. In ancient times it was thought to be lucky; in modern times it has been thought to be unlucky. Opal used to be associated with power; today, in Asia, it is thought to represent truth. Fire opals are usually cut into *facets* (small surfaces) but other precious opals are cut *en cabochon* – that is, into smooth, rounded shapes.

PEARLS These gems are formed by the pearl oyster. When an irritating object, such as a grain of sand, gets into the oyster's shell, the oyster coats it with alternate layers of a horny substance called *conchiolin* and *mineral calcite* or *aragonite* (crystallized chalk). Pearls are therefore made of the same substance as the inside layers of the oyster's shell. This is 'mother of pearl' or *nacre*, also used in jewellery. Pearls are also produced by the pearl mussel. Pearl oysters are found in the Persian Gulf, the coasts of India, China, Japan, Australia, the Sulu Archipelago in the Philippines, several Pacific islands, Venezuela, and Central America. Pearl mussels are found in the rivers of Europe and North America. The best pearls are white, sometimes with a cream

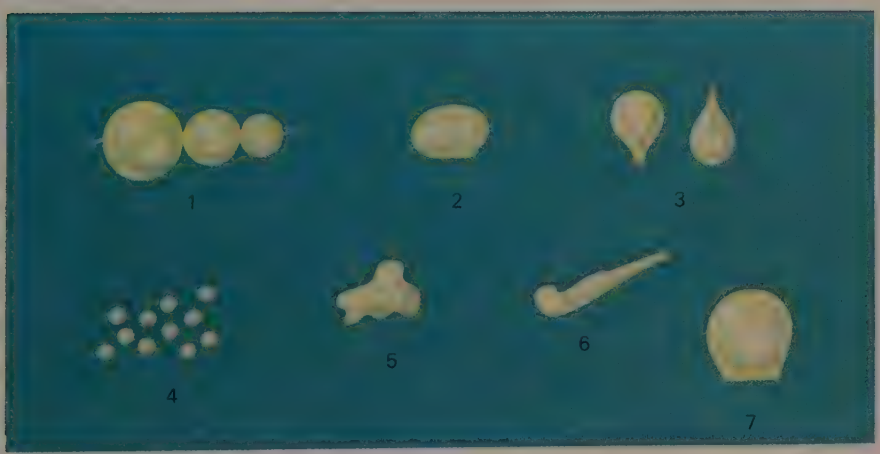
The oysters of tropical seas form pearls when irritating objects, such as grains of sand, get inside their shells. Pearls are precious and rare.



Some pearls are not round, but irregularly shaped. These are called baroque. The Canning Jewel, made in Germany in about 1580, uses a baroque pearl to form the body of a merman. It also includes diamonds and rubies, set in enamelled gold.

or pink tinge, but they also may be tinted yellow, green, blue, brown or black. Black pearls are often highly valued because of their rarity. Pearls may be round, pear-shaped, button-shaped, or *baroque* (irregular), and they are valued in that order. *Blister*

Various pearl shapes: 1. spherical; 2. button; 3. pear-shaped; 4. seed; 5. baroque (irregular); 6. hound's tooth (fresh-water); 7. blister pearls.



Natural pearls are so rare that in the past they were worn only by royalty and nobility. Today they are worn only by people with plenty of money. In this painting (about 1570), Elizabeth of Austria is shown wearing a parure (set) of jewellery made of pearls and coloured stones set in enamelled gold.

pearls are pearls that are attached to the inside of the oyster's shell. Pearls are soft and can be spoilt by acid or perspiration. Therefore, they are not cut and polished like other gems. They do not last longer than about 150 years. The technique of making cultured pearls was known in China in the 1200's. In the 1930's, Japanese cultured pearls came into the European market. Cultured pearls are made by putting a bead of mother of pearl into the oyster and then putting the oyster back into the sea. The oyster then makes a pearl in the usual way. Japan is the chief source of cultured pearls. A cultured pearl sinks in a liquid where a natural one will float. Imitation pearls are made of glass beads that are either varnished or lined inside with fish scales and hot wax. Pearls are weighed by the *grain*. One grain is equal to half a gramme.

PRECIOUS AND SEMI-PRECIOUS STONES The difference between these is not always clearly marked. Some stones are always precious. These are diamonds, sapphires, rubies, emeralds and pearls. However, semi-precious stones sometimes become fashionable. Then their value increases almost to the level of a precious stone. An example was *amethyst*, which

became extremely popular during the 1800's (see AMETHYST).

PYRITE Also called *iron pyrite*, this pale yellow mineral is a sulphide of iron. It usually occurs as crystals, but is also found in massive lumps and in *granular* form – that is, as fine grains. It is nicknamed 'fool's gold' because it is often mistaken for gold; however, it often does contain small amounts of gold. Pyrite is often found as specks in other rocks, especially in *lapis-lazuli* (see LAPIS-LAZULI). When polished, pyrite gives a fine sparkle. It is used for cheap jewellery under the name *marcasite*. Pyrite is found in many parts of Europe and the United States.

QUARTZ This is the commonest of all minerals and, after the diamond, the simplest in composition. It is crystallized silica. It is called the tramp mineral, because it is found almost everywhere. Quartz is found in many different colours. It is hard and cannot be scratched by a knife. One of the most famous quartz stones is the *purple amethyst* (see AMETHYST). *Aventurine*, also known as *sunstone*, gleams with flakes of *haematite* (see HAEMATITE).

Quartz, the commonest of all minerals, is found in many different colours. Some of its more attractive varieties are shown below.

Two examples of cut quartz crystals. Left, rock crystal, often used as a substitute for diamonds. Right, citrine. It can be easily confused with topaz.

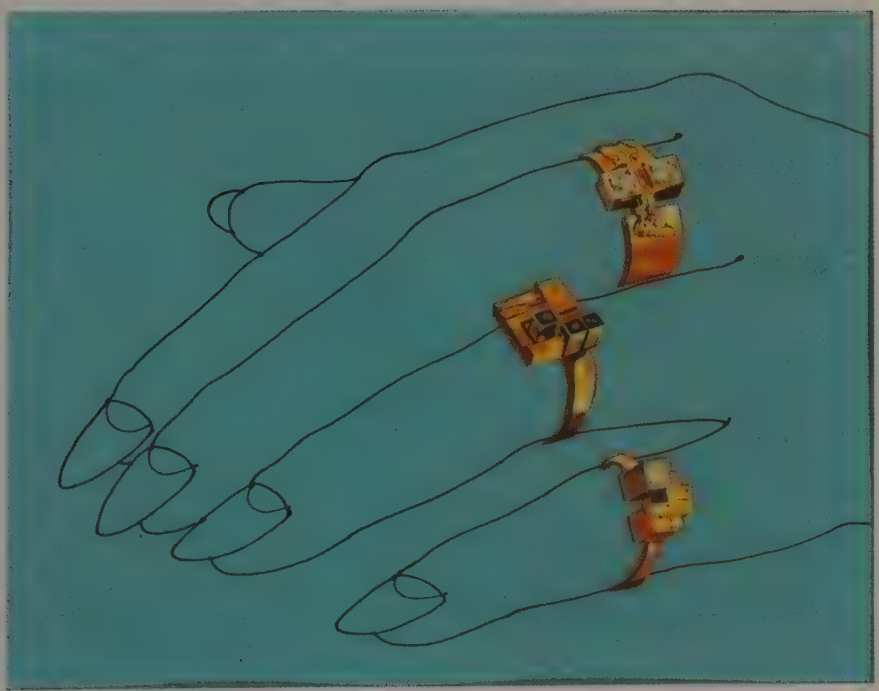
It is usually red, brown or green. It comes from the Ural mountains of Russia, and is also found in Tibet, Spain and Brazil. In the Cairngorm mountains of Scotland, a brownish-yellow quartz was discovered. It is known as *cairngorm* or smoky quartz. Pale amethysts will turn yellow when they are heated. These are sometimes sold as 'cairngorms' or 'Spanish topaz'. Madagascar and Brazil produce a beautiful yellow quartz called *citrine*. It is often confused with *topaz* (see TOPAZ). Rose-quartz is very pretty but not often found and its colour may fade in strong sunlight.

Sometimes quartz crystallizes round other minerals. Thin crystals of *rutile* in rock crystal quartz are known as *rutilated quartz* or *Venus's-hair*. Another mineral, *crocidolite*, is blue, and when enclosed in quartz is properly known as *falcon's-eye*. If the crocidolite turns brown it is called *tiger's-eye*. Sometimes good *cat's-eyes* can be found. These are parallel fibres of *asbestos* enclosed in quartz and the stone is greyish or green in colour. It is similar to more valuable *chrysoberyl* cat's-eye (see CHRYSOBERYL). Other forms of quartz are *agate, cornelian, bloodstone,*

onyx and *sardonyx* (see AGATE, BLOODSTONE, CHALCEDONY). Sources of quartz include Switzerland, France, Madagascar, Italy, India, the United States, Japan, Nigeria, Brazil, South West Africa, Germany, Russia, and Uruguay. (See ROCK CRYSTAL.)

RINGS Of all jewellery of the past, rings have survived in the greatest numbers. This is because they were usually buried with the dead. Apart from their decorative value, rings have always had a special meaning, either to show a person's position, as did for example the Pope's fisherman's ring or a nobleman's-signet ring with a family *crest* (coat of arms), or to symbolize marriage. A signet ring was also used as a mark of authority. The wedding ring goes back to Roman times. In the Renaissance period, engagement rings were often worn hung

Rings have been among the most important kinds of jewellery for thousands of years, partly because they are convenient to wear. These modern rings were designed by the Finnish jeweller Björn Weckström.



from a cord around the neck or in the hat. Jewish wedding rings of the 1500's and 1600's were large and ornate. They were worn only at the ceremony, and then kept in the family. It is only recently that wedding rings have become simple. An early superstition held that the third finger was connected to the heart directly by a vein. That is why it is the ring finger. Finger rings were used widely as *memento mori* (ornaments and jewellery to remind one of death).

ROCK CRYSTAL 'Cornish diamond', 'Bristol diamond' and 'rock crystal' are all names for pure colourless *quartz* (see QUARTZ). During the Renaissance period, wonderful bowls and cups were made in rock crystal. Rock crystal has often been used as a substitute for diamonds. In the 1700's, even noblewomen wore rock crystals cut in the style of diamonds, especially during the day. The largest rock crystals come from Madagascar.

RUBY This precious gem is a red, crystalline variety of the mineral *corundum*. Corundum is mainly pure *aluminium oxide*.

Rubies, which are red corundum, have long been ranked among the most valuable of gems. This traditionally-styled ruby and diamond necklace, together with the matching brooch, is worth nearly £25,000 ($60,000).

There are several other corundum gems, including *sapphires* (see SAPPHIRE). Rubies are found chiefly in Burma, Ceylon, and Thailand. They are ranked among the most valuable of gems. Burmese rubies are blood red; the most valued shade is called 'pigeon's blood'. The best Burmese rubies come from Magok. Since 1929, few large rubies have been mined and most of the richest fields have now been worked out. A famous ruby is the 'Peace Ruby'. It was discovered in 1919 and weighs 42 carats.

Siamese rubies are darker and Ceylonese rubies lighter in colour than Burmese rubies. *Star rubies* that show a star formation when cut *en cabochon* (in a rounded shape) are rare and valuable. Sometimes *spinels*, *pink tourmalines* and *pyrope garnets* are mistaken for rubies (see GARNET, SPINEL, TOURMALINE).

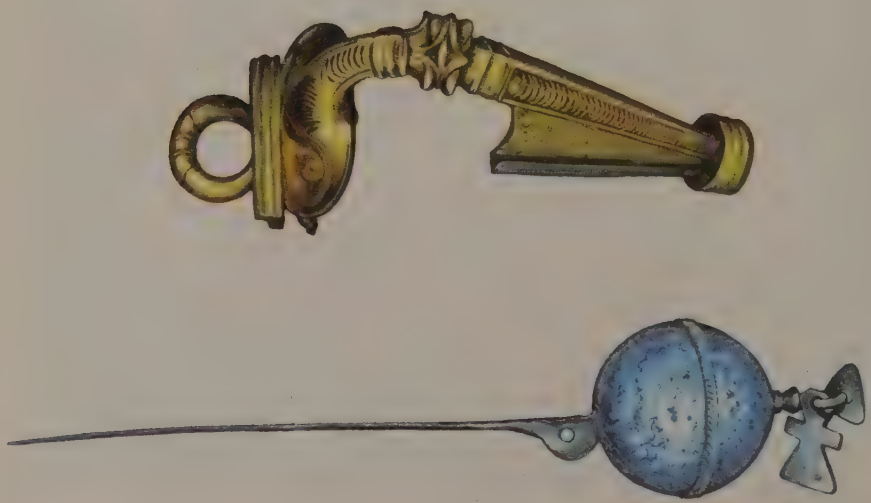
SAPPHIRE This precious gem is a transparent blue variety of the mineral *corundum* (aluminium oxide). The blue colour is due to the presence of the oxide of the metal *titanium*. *Rubies* are another variety of corundum (see RUBY). Sapphires are found

The most striking feature of the Danish royal crown, made of gold, enamel, diamonds and rubies, is the famous Blue Mountain sapphire set in the centre of the headband. Sapphires are valuable corundum gems.

chiefly in Australia, Burma, Ceylon, India and Thailand, and in Montana in the United States. Sapphires from Kashmir are a beautiful cornflower-blue and are highly valued. Ceylonese sapphires are a lighter colour, and Australian sapphires are blackish-blue. Burma and Thailand produce the 'traditional' royal blue sapphire. *Star sapphires*, usually found in Ceylon, show a star formation when cut *en cabochon* (in a rounded shape). A famous sapphire is the 'Gem of the Jungle'. Discovered in 1929, it weighed 985 carats before it was cut. Other colour varieties of corundum are *yellow sapphire*, *purple sapphire* and *green sapphire*.

SILVER AND PLATINUM Jewellers have used silver for a long time, particularly for less expensive pieces. Unfortunately, the sulphur in the air of our modern big cities tarnishes silver. Therefore, silverware is sometimes coated with a special substance to prevent this discoloration. Platinum became known in Europe in the 1700's. Today, platinum is used widely in jewellery. It has a dull shine, but is good to work with because,

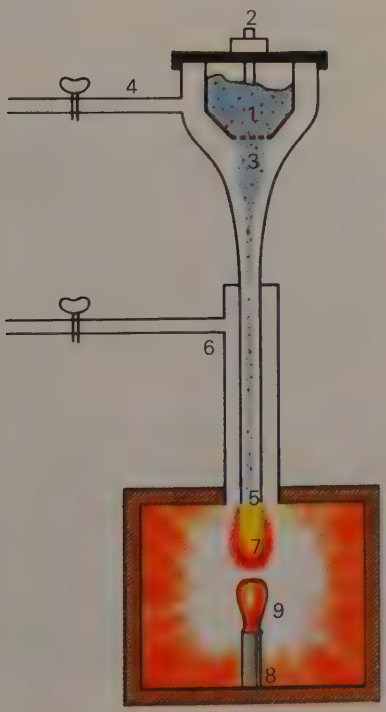
Silver has been used to make beautiful ornaments by many different peoples for thousands of years. Two interesting and unusual examples of silver work are shown here. The silver-gilt brooch, top, is one of a pair found at Backworth in Northumberland, England. It was made in the middle of the A.D. 100's. Bottom, a shawl pin made by the little-known Araucanian Indians of Chile in South America.



like gold, it is *malleable* and *ductile* (see GOLD). But it is not usually thought to be as pretty as gold.

SPINEL This gem is the 'poor relation' of the *ruby*, which it strongly resembles (see RUBY). The spinel is a crystal of the mineral *magnesium aluminate*. Spinels may be many colours. Green is rare. The spinels used in jewellery are found in Burma, Ceylon and Thailand. (See CROWN JEWELS.)

SYNTHETIC GEMS The word *synthetic* refers to things that have been *synthesized* – that is, 'made up'. Artificial man-made gems are produced in the laboratory using the same mineral chemicals as the natural gems are made of. In synthetic gems there are usually air bubbles, and their lines of growth are curved, not straight, as in natural gems. However, it takes an expert to tell synthetic gems from natural ones. The spinel is easy to synthesize. Synthetic gems are usually produced by 'Verneuil's method', named after its inventor. In 1885, Verneuil made rubies by fusing useless fragments of rubies together into

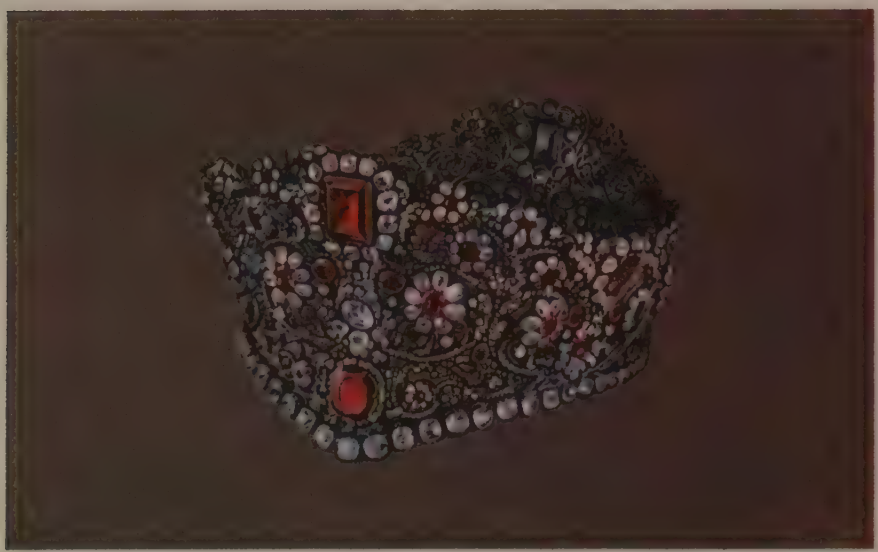


Synthetic gems are usually produced by the flame-fusion process, also known as Verneuil's method after its inventor. Pure alumina powder is placed in a container (1) with a fine sieve at its base. When the top (2) is struck, the alumina powder passes through the sieve into the chamber (3). Oxygen entering through the tube (4) mixes with the alumina and carries down to the tip of the torch (5), where it burns with hydrogen that enters through the outside tube (6). The oxygen carries the fine alumina particles into the intense heat of the centre of the flame (7). They fuse (melt together) into small droplets of gem material which fall onto a fireclay support (8) on which a 'boule' of the gem is formed (9). The support is lowered as the boule grows. This method is used for making synthetic rubies, sapphires, spinels and rutiles.

a large stone in an oxygen and hydrogen flame. In nature a mineral takes thousands of years to grow, but in the laboratory a large *boule* (ball) of synthetic gem material can be ready to be cut into a ten carat stone in only an hour. Synthetic stones have important industrial uses, in man-made satellites, for example. Synthetic stones are very much cheaper than real ones. Synthetic stones are produced in Britain, France, Germany, Switzerland, the United States and the U.S.S.R.

TIARA This is a jewelled head-ornament rather like a small crown. The Russian Empress Elizabeth Petrovna owned a famous tiara. It was noted for its fantastic collection of valuable stones. Tiaras were very popular in France during the early 1800's. Some women wore very elaborate ones. Many of them were a mixture of styles, with a Roman *cameo* (or perhaps a fake cameo) in the centre, and pearls and diamonds hanging down either side (see CAMEO). In England during the 1800's, tiara designs were influenced by the general interest in *Gothic* (late medieval) design. Knights, dames, saints and angels were all carefully drawn in mock gothic arches. Tiaras have always been considered rather special jewellery. They are worn by nobility and rich people for special occasions.

A tiara of rubies and diamonds made for Queen Theresa of Bavaria in 1830.



Left, an uncut topaz, and right, a cut topaz. Topazes are most commonly colourless or pale yellow, but they may also be pale blue or green, sky-blue, brownish-yellow, or, extremely rarely, red.

TOPAZ All yellow gems tend to be called topazes, and many people believe that all topazes are yellow. In fact, many so-called 'yellow topazes' are really *citrines* (see QUARTZ). Also, not all topazes are yellow. Topaz consists of the mineral *aluminium silicate*. The most common topazes are colourless or pale yellow. Pale blue and pale green topazes also occur. Brownish-yellow topazes come from Brazil. If these are heated, they lose their yellow colour and become a beautiful rose-pink. These 'pinked' topazes are used widely in modern jewellery. Very rarely, natural red topazes also are found in Brazil. Sky-blue topazes are found in the Cairngorm mountains of Scotland and in the Mourne mountains of Ireland. Russian topazes are usually brown, and tend to fade. Those from Ceylon can be colourless, yellow, or light green. Other sources of topazes are Germany, Scandinavia, Australia, Mexico and the United States. Topazes range from transparent to opaque. Topazes can be very large. One famous one from Norway weighed 137 lbs. The so-called 'oriental topaz' is really a yellow sapphire (see SAPPHIRE).

Heavy metal collars were worn by the ancient Britons and Gauls as a mark of status. They are called torques, from the French for 'coiled' or 'twisted' because many of them were twisted.

TORQUES These were large neckrings, often very heavy, that were worn in ancient times. Sometimes they were made in plain gold, but the ancient Britons made them in a rough *enamel* (see ENAMEL). Some gold torques were fat rings that ended in a trumpet shape. Others were narrower, and twisted, with a plain piece of gold stuck through rings for a fastening. In Britain in 1958, a collection of jewellery with magnificent, large torques of gold was discovered. These dated from the Ist century B.C.

TOURMALINE This gem is composed of a complicated *borosilicate* mineral. Rose pink to red varieties of tourmaline are called *rubellite*. Rubellites are similar to pink *topaz*, but softer (see TOPAZ). Like many pink gems, their colour may change to yellow after about a hundred years. Blue varieties are called *indicolite*. These, and green varieties, are the most popular. Yellow tourmalines are called *Ceylonese peridots;* violet-red ones, *siberite;* and brown-black ones, *schorl*. Some tourmaline crystals that come from Brazil are green outside and red at the centre. Others, from California, are red outside and green inside. These variations in colour are caused by slight differences in the chemical make-up of the various types. Tourmaline crystals are usually three-sided, six-sided or nine-sided. They are *striated* (grooved) from top to bottom. Tourmalines are found in various rocks, such as granites and gneisses. Tourmalines have only been used in jewellery for a short time. They are popular stones for large rings and heavy *pendants* (ornaments hung from the neck). There are beautiful Chinese

Tourmaline uncut, left, and cut, right. This gem occurs in many colours.

earrings in tourmaline. Sources of tourmalines include the islands of Elba and Madagascar, and Burma, the Ural Mountains and Siberia in Russia, Brazil, Ceylon, and the United States.

TURQUOISE This attractive mineral stone, ranging in colour from greenish-grey to sky blue, is a *hydrous* (watery) *phosphate*

Mexican Mixtec breast ornament in turquoise mosaic, of the A.D. 1300's.

of aluminium and copper. The commonest turquoise is greenish-blue. Sky-blue turquoise is the most valuable. Turquoise is porous, and can be spoilt by contact with water or grease, which turn it to an unattractive green. Sunlight will turn it green also. It is fairly soft, but takes a good polish. Beautiful pendants and *intaglios* (recessed carvings) can be made from it. The best turquoise comes from Iran. Other sources are the Sinai Peninsula and the south-western United States.

ZIRCON This gem is a silicate of the metal *zirconium*. Its crystals may be colourless or one of several colours. The colourless zircon is next after the diamond in brilliancy and fire, but it is not nearly so long-lasting or hard. Clear yellow, orange, red and brown zircons are called *hyacinths* or *jacinths*. Zircons from south-east Asia can be treated with heat to turn to a beautiful blue. The disadvantage is that they sometimes revert to their original colour if they are exposed to strong sunlight. Pale zircons can be darkened with X-rays. Zircons are slightly radioactive, and, eventually, they become first green and finally dull and opaque. Zircons are found in Australia, Ceylon, India, Norway, the U.S.S.R., the United States and western Africa.

Zircons occur in several pleasing colours, as this selection shows.

Beliefs Connected with Gems

People have always been fascinated by gems. Because of their hardness, brillance, colour and apparently unchanging nature, gems were thought to be miraculous and to have mysterious powers. As early as the 400's B.C., Onamacritus, a Greek priest, wrote a poem about the supernatural properties of gems. Many of his ideas probably came from an even earlier civilization, that of ancient Babylon. The ancient Greeks and Romans compiled books, called *lapidaries*, about the science of gemstones. The Romans spread these beliefs in northern Europe. Traces of such beliefs still survive today. An example is the wearing of a birthstone.

In the past people believed that all gems had special properties. Diamonds were supposed to give people strength in battle and to protect them against ghosts and magic. Sapphires were used as pledges of faithfulness and were thought to symbolize heaven. They also protected their wearers against poverty and betrayal. Many people believed that sapphires cured snakebites and prevented eye disease. Rubies were supposed to bring love, happiness, peace and serenity and also to prevent bad dreams coming true. An emerald placed under the tongue was supposed to enable the speaker to make prophecies. However, if the wearer of an emerald was unfaithful to his or her husband or wife, the emerald broke! Emeralds were also thought to bring wealth and fame. Until the 1700's, gems were believed to be valuable as medicines. Pope Clement VII, who died in 1534, is said to have taken 40,000 ducats'-worth of powdered gems.

The belief that it is lucky to wear a gem associated with the month of your birth is still common. The traditional birthstones for each month are as follows:

January:	Garnet	July:	Ruby
February:	Amethyst	August:	Sardonyx
March:	Bloodstone	September:	Sapphire
April:	Diamond	October:	Opal
May:	Emerald	November:	Topaz
June:	Pearl	December:	Turquoise

Characteristics of Gems

Gems are usually divided into three groups: *precious, semi-precious* and *organic.* The first two groups are mineral gemstones. Diamonds, emeralds and the corundum gems rubies and sapphires are precious. Some other forms of corundum are also considered to be precious. The chief semi-precious stones are amethyst, aquamarine, chrysoberyl, garnet, jade, moonstone, opal, peridot, quartz, spinel, topaz, tourmaline, turquoise, and zircon. Gems that are partly or entirely composed of *organic* (animal or vegetable) substances are pearls, amber, coral and jet. Of these, pearls are usually counted as precious and the others as semi-precious.

The beauty of a gem depends mainly on its *optical* properties – that is, how it affects light passing through it or reflected from it. The optical properties of a gem include *lustre* (amount of light reflected), *fire* (sparkle) and colour. Jewellers usually divide gems into seven types, according to lustre: *adamantine,* resembling diamonds; *vitreous,* resembling broken glass; *resinous,* as in amber; *pearly,* as in pearls and moonstones; *silky,* as in malachite; *waxy,* as in opal; and *greasy,* as in jade. Most gems have vitreous lustres.

Other properties that are used to classify gems include their natural crystal form, how they *refract* (bend) light passing through them, their hardness and whether they show *cleavage* or not. A gem that shows cleavage is one that will break cleanly along a line when struck in a certain way. Diamonds show cleavage; quartz does not. Hardness can be measured by resistance to scratching on Mohs' scale, a series of 10 minerals arranged in order from soft to hard.They are:

1. Talc
2. Gypsum
3. Calcite
4. Fluorite
5. Apatite
6. Feldspar
7. Quartz
8. Topaz
9. Corundum
10. Diamond

If quartz, but not feldspar, will scratch a particular gem, its hardness is about 6.5 on Mohs' scale. The colour of a gem can most accurately be seen by its *streak.* This is the colour of a small quantity of the powdered

gem as it appears when rubbed over white, unglazed porcelain. The colour of a gem is one of the most important factors that decide its beauty and splendour. Opaque or translucent stones depend on their colour alone for their beauty. Transparent stones of a rich, deep colour have an added beauty because of their ability to reflect light. Gemstones have two types of colours. The colour of the mineral itself when pure is called *essential colour. Non-essential colour* results from the presence of impurities in the mineral. The weight of a gem is measured in *carats;* one carat equals 200 milligrams.

Gems are usually cut to bring out their natural colour and brilliance, and to remove flaws. Some of the main ways of cutting gems are illustrated on the inside of the covers of this book. The *cabochon* cut was the earliest and simplest style of cutting a stone. The upper part of the stone is smoothed and rounded into a simple curve. The lower part is made *concave* (curving inwards), *convex* (curving outwards) or flat. In all other styles of gem cutting, the surface is divided into *facets*. These are small square or triangular 'faces'. Diamonds may be *table cut, rose cut* or *brilliant cut.* In table cutting, one facet, the table, forms the top of the stone and is ground larger than any other. The opposite facet, called the *culet,* is left quite small. The rose cut consists of a flat base and usually 24 triangular facets. It looks like a cabochon with facets. The brilliant cut is a method that is scientifically designed to bring out a stone's maximum brilliance and fire. The *crown* (top) of a brilliant consists of a table facet and 32 smaller facets. Each of these are squares and 24 are triangles. The base has a culet and 24 larger facets. Of these, eight are squares and the rest are triangles. The base facets are positioned so that they reflect the maximum amount of light through the crown. Generally, the depth of the crown is a third of the stone's total depth, and the width of the table is half the width of the stone. The *step cut,* also called the *trap* or *emerald cut,* consists of a table and square facets above and below.

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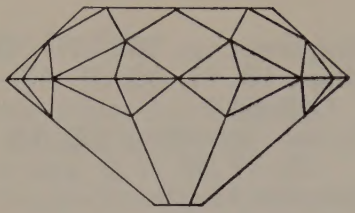
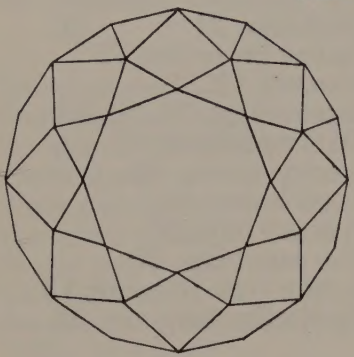
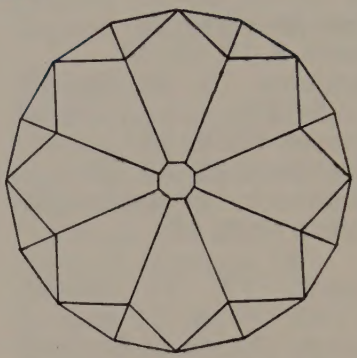
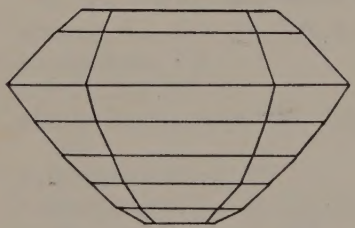


The Cutting of Gem Stones

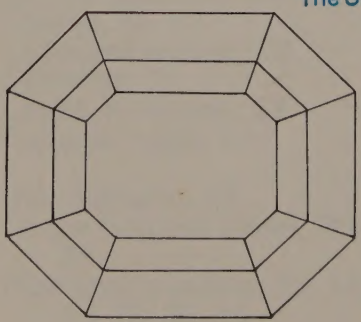
The Brilliant

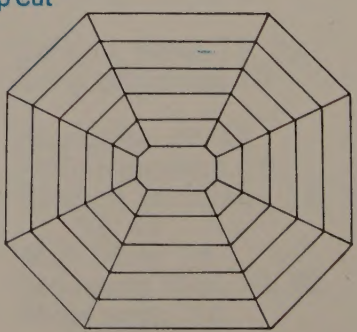


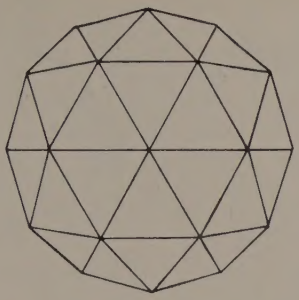


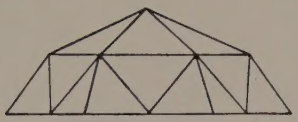


The Step Cut









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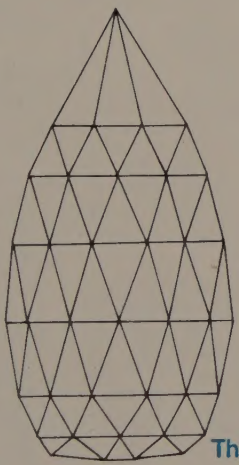

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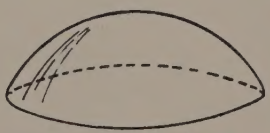
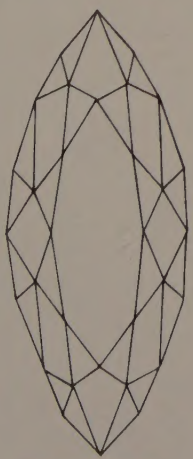


The Simple Cabochon



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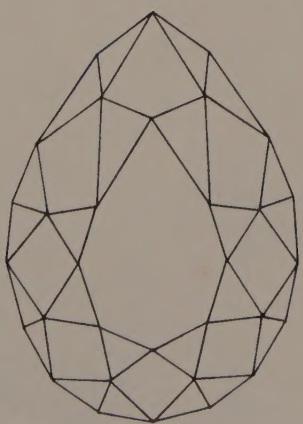

The Pendeloque