

Minerals of the World

Classic
Collection



Sodalite
Sodalith



Rose Quartz
Rosenquartz



Amethyst
Amethyst



Tiger's Eye
Tigerauge



Desert Rose
Sandrose



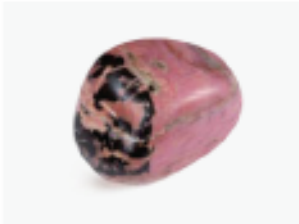
Galena
Galenit (Bleiglanz)



Silver
Silber



Fuchsite
Fuchsit



Rhodonite
Rhodonit



Selenite
Selenit (Marienglas)



Pyrite
Pyrit



Fluorite
Fluorit



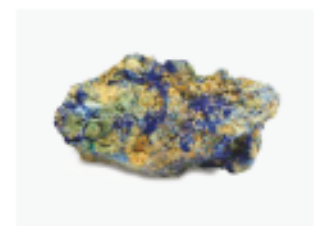
Red Jasper
Roter Jaspis



Iceland Spar
Islandspat



Aragonite
Aragonit



Azurite
Azurit



Sahara Geode
Geode



Obsidian
Obsidian



Orthoclase
Orthoklas



Jadeite
Jadeit

Sodalite

As its name indicates, sodalite is a sodium silicate. It belongs to the feldspathoid group.

EASILY CONFUSED

Sodalite is noted for its blue colour, sometimes with violet tints; it is generally opaque but occasionally somewhat translucent. The crystals, which have a dodecahedral shape, are relatively uncommon – cryptocrystalline aggregates are more often found. The feldspathoid group consists of minerals similar to feldspars but containing less

silica: like other feldspathoids, sodalite is never associated with quartz.

Sodalite is easily confused with other feldspathoids, such as lazurite, hauyne, nosean and leucite, and tends to be associated with them in most deposits. It can also be mistaken for lapis lazuli, a variety of lazurite with an appearance very similar to sodalite, and very occasionally for some examples of fluorite. Sodalite is mainly used to make necklaces and also as a blue pigment.

The samples in the collection come from Brazil, which has some of the richest deposits of sodalite in the world (examples from Poços de Caldas in the Minas Gerais region enjoy particular renown). Canada, the USA and Italy are the other main producers. The samples in the collection contain sodalite with a light violet colour. Special care should be taken that they do not come into contact with acids, especially hydrochloric and nitric acids, as these dissolve the mineral. Like most sodium minerals, sodalite imparts a yellow colour to a flame when burned.



DID YOU KNOW?

- * Sodalite is a naturally-occurring sodium silicate. Chemically speaking, its full name is sodium aluminum silicate chloride.
- * Sodalite is relatively scarce and this, combined with its rich blue colour, makes it a semiprecious stone. The finest examples are usually bought for use in jewellery.
- * Despite being an uncommon mineral, sodalite can occasionally occur in masses large enough to be considered rocks.
- * It is mined in Brazil, Canada, the USA and Italy.
- * As with most semiprecious stones, sodalite is believed by some people to have certain healing properties. Among these are the ability to lower blood pressure and boost the immune system.

Rose Quartz

Quartz occasionally contains titanium or manganese impurities. These give it a pink colour, which can sometimes be quite intense. Pink quartz like this is more usually known as rose quartz.

EASY TO DISTINGUISH

There are not many pink gems and those that do exist are easy to distinguish from rose quartz. Rhodochrosite (manganese carbonate), for example, is much less transparent and also much softer (measuring 3 on the Mohs scale). It also dissolves in hot hydrochloric acid. Rubellite, a pink variety of tourmaline, usually forms more perfect crystals than rose quartz and has longitudinal striations, or

ridges, on its faces. Morganite (rose beryl) is harder than rose quartz (between 7.5 and 8 on the Mohs scale).

IMITATION CRYSTALS

Very occasionally, rose quartz forms properly faceted crystals. Such specimens are rare and highly prized. Because of their value these crystals are sometimes copied. Most imitations are made from glass. Although the colour and banding of these copies is often quite accurate, they usually contain tiny bubbles, which can be used to tell them apart from the real thing. Other imitations can be harder to identify. Those made from synthetic spinels are often particularly convincing.

This sample comes from Brazil, which, together with Madagascar, has the largest deposits of this mineral. This beautiful stone is one of the world's few pink-coloured gems, and is frequently used to make costume jewellery. Its cloudy appearance makes it less suitable for use when making precious jewellery.



DID YOU KNOW?

- * Well-formed crystals are rare and highly sought after by collectors.
- * Rose quartz is often used as an ornamental stone, and may be carved into pyramids and obelisks, as well as statuettes and small decorative items such as hearts.
- * Sometimes used as an alternative birthstone for January (the usual birthstone for January is garnet).
- * Rose quartz is considered by some people to represent love and friendship. It is also associated with affairs of the heart and is sometimes known as the 'Love Stone'.
- * It is a popular crystal in healing, particularly when treating stress. It is also reputed to be able to enhance a person's mood and is said to help with relaxation.
- * Rose quartz has some surprising properties: if it is heated it loses its colour, and if it is exposed to X-rays it turns black.

Amethyst

Amethyst is a violet variety of quartz. Its characteristic colour, once believed to be due to the presence of manganese, is now known to be caused by iron impurities. Chemically, amethyst is very stable: the only acid that can damage it is hydrofluoric acid.

COLOUR CHANGE

Amethyst loses its violet colour if heated to high enough temperatures. If it is heated to between 400 and 500°C, it turns yellowish. If heated further, to temperatures of 600°C or more, it loses its transparency and becomes milky in appearance.

LOOKALIKES AND COPIES

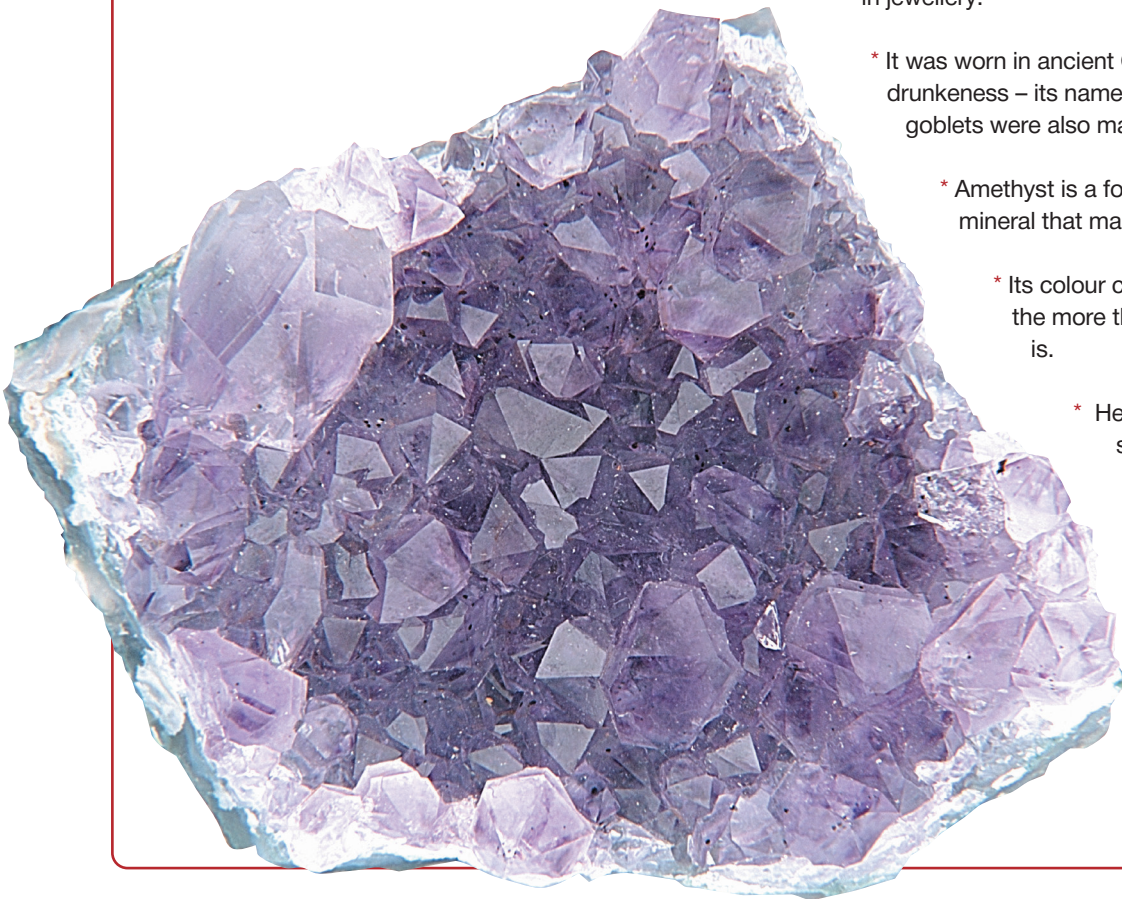
Amethyst may be confused with cordierite and with scapolite, both of which have a similar violet colour. However, amethyst does not have the pleochroism (colour change according to the direction from which it is viewed) of cordierite or the fluorescence of scapolite. Due to the relative rarity of natural amethyst crystals there are also a lot of synthetic amethysts on the market. These are made from synthetic quartz coloured with iron, but are usually very clear and lack the inclusions typical of natural amethyst. Lower quality copies may be made from glass and often contain spherical or oval bubbles.

The violet colour in this amethyst sample from Brazil is not uniform but is more intense on the faces and at the edges of the crystals. It is here that the iron responsible for the colour tends to concentrate.

A narrow band can be seen in the outermost part of the sample, where violet stripes alternate with white ones. Micro-crystalline quartz such as this is known as chalcedony.

DID YOU KNOW?

- * This violet stone is highly prized and is often used in jewellery.
- * It was worn in ancient Greece to protect against drunkenness – its name means ‘not drunk’. Wine goblets were also made from it.
- * Amethyst is a form of quartz – the same mineral that makes up most sand.
- * Its colour comes from iron impurities: the more there are in it the darker it is.
- * Healers believe that if you suffer from insomnia, placing an amethyst under your pillow will induce peaceful sleep.



Tiger's Eye

Tiger's eye is a variety of chalcedony characterized by bands of another mineral, riebeckite, and with a veiny blue or golden appearance. In some deposits, micro-crystalline quartz may replace the riebeckite but retain the veiny appearance of the previous mineral; this phenomenon is known as 'psuedomorphism'.

FALCON'S EYE

If substitution is incomplete, some of the veins retain the typical blue colour of riebeckite, and in that case the mineral is called 'falcon's eye'. The golden colour of tiger's eye is due to the iron in riebeckite.

OX EYE

Ox eye is another gem similar to tiger's eye, but reddish in colour. Although it may occur naturally, it is almost always a processed gem whose colour is achieved by heating tiger's eye. During the heating process, part of the iron the tiger's eye contains is oxidized and converted to haematite, a mineral that often acquires an intense red colour.

THE ETERNAL AMULET

Tiger's eye was the gem most used as an amulet (or charm) in antiquity. Even today, it is believed by some people to ward off the evil eye, and also to bring its wearer riches.

The sample of tiger's eye in this collection comes from Spain, a country in which deposits of this mineral are directly associated with riebeckite. Spain's principal deposits of riebeckite are found in Galicia and Asturias. As well as being dug from the ground, examples of tiger's eye can also be found in the form of rounded pebbles

in the beds of some rivers. When tiger's eye is rotated between the fingers, some of its veins appear to change size. At the same time, the brown and gold colours seem to interchange. This optical illusion is known as the 'cat's eye' or 'iridescent' effect.

DID YOU KNOW?

- * One of the best-known of all gemstones, tiger's eye has long been used to make jewellery and other decorative objects.
- * Its characteristic bands are formed from a mixture of chalcedony and the mineral riebeckite.
- * Its name is taken from the resemblance of the colours it contains to a tiger's stripes. It is also sometimes known as African cat's eye.
- * Most tiger's eye today comes from mines in South Africa.
- * It is usually cut in a rounded, or cabochon, shape to enhance its natural beauty.
- * Tiger's eye is reputed to have been worn as an amulet in Roman times by soldiers for protection when they went into battle.



Desert rose

Desert rose is made up of aggregates of lenticular gypsum crystals that encompass really fine grains of sand in its interior. The flat shape of the crystals and the way they overlap resembles the open petals of a rose, hence the name.

HOW IT IS FORMED

The formation process of desert roses begins when the short, but very intense, rainfall typical in such places, washes sands rich in gypsum; this is dissolved by the rainwater and transported a few metres underground. However, high

temperatures reached afterwards cause the water to rise to the surface by capillary action, and evaporate. The gypsum precipitates and crystallises around the sand, which stays locked inside the crystals. Successive rainfall enlarges the crystals and they can become very big in some cases.

A DIFFERENT COLOUR IN EVERY DESERT

The colour of desert roses depends on the surrounding sand. There are white roses in the Tunisian Sahara and in Sonora, and black roses in some deserts in Argentina. Specimens from the Algerian Sahara present very bright, reddish tones.

This sample comes from Mexico and presents the light brown colour typical of desert roses. This type of rose is to be found in the Samalayuca desert, close to Chihuahua, in the state of Zacatecas. This is a very soft mineral that can be scored with a fingernail, so it must be handled with extreme care. Even the smallest impact can affect the sample, as each one leaves a white mark, the same colour as gypsum's streak. When handled, the grains of sand enclosed within the gypsum break off very easily, so it is advisable not to over-handle it.

DID YOU KNOW?

- * This beautiful mineral forms in deserts and other hot, sandy places.
- * It grows on the surface as water evaporates under the heat of the Sun.
- * Desert rose contains grains of sand and is usually formed from gypsum. However, it may be made instead of baryte, celestine or other precipitated minerals.
- * Desert rose is sometimes called sand rose or rose rock. Although beautiful, it is brittle and should be handled with care.
- * Some people believe that desert rose has healing powers, dispelling negative energy and aiding meditation.



Galena

Galena is a mineral made up of sulphur and lead. It has an intense grey metallic sheen, which it tends to lose after a few years of exposure to the air. Its density is so high that even small samples appear heavy. However, it is also very fragile: even a slight shock can cause samples to break with perfect cubic exfoliation.

LEAD ORE

Galena has been highly sought-after mineral for millennia, as it is the main ore of lead. Since lead was found to be a pollutant its use has declined dramatically in the last 30 years. Once used in the manufacture of pipes and as an

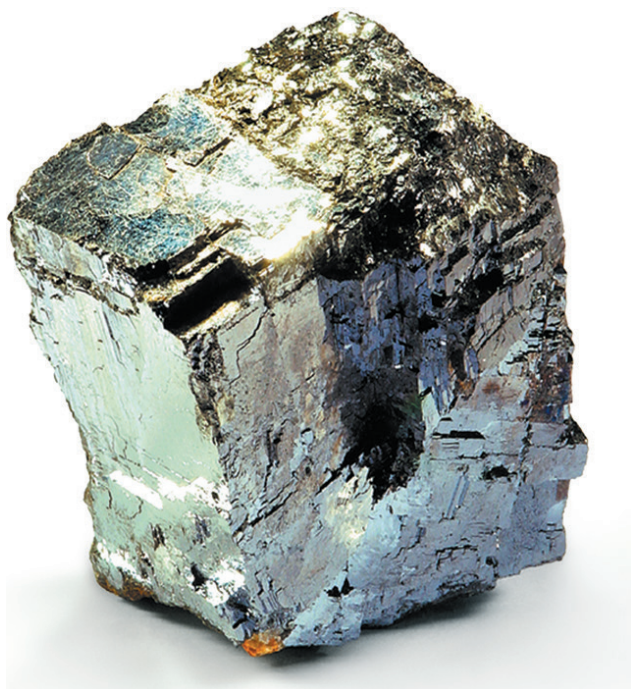
anti-knocking agent in petrol, it has since been replaced by other materials. However, it continues to be used to make cables, lead plate, electric batteries and some types of paint.

GALENA IN RADIO

Galena is such a dense mineral that it easily picks up electromagnetic waves. By applying a metal wire, an aerial and a needle to locate transmitters, a simple radio set can be constructed without the need for electricity. This kind of radio, known as a 'galena radio', was very popular between the end of the 19th and the start of the 20th centuries.

The sample comes from Spain, where galena has been extracted since Roman times, from deposits at Linares and La Carolina (Jaén) and at Priorat (Tarragona). The exfoliation planes along which galena tends to break can easily be seen by looking carefully at the sample. You may also be able to see small white or transparent

crystals, which will be of calcite, quartz or dolomite. To determine which of these materials they are, you can try scratching the crystals with glass: calcite and dolomite can be scratched, whereas quartz cannot. Another way of telling is to place a drop of vinegar on the crystal: if it is calcite, a gas will be emitted.



DID YOU KNOW?

- * Galena is the natural form of lead sulphide. It has a simple composition, being made up of equal amount of sulphur and lead.
- * A common mineral, galena is the most important lead ore - most of the lead used for roofing and other purposes is extracted from it.
- * Due to its high lead content, galena is surprisingly heavy. A cube of it with sides 10 cm long would weigh more than a kilogram.
- * Galena is often found with the minerals sphalerite, calcite and fluorite.
- * In ancient Egypt it was used in powdered form as a sort of eye shadow, being applied around the eyes to help reduce the glare of the desert sun.

Silver

Silver has been admired, extracted and used since the earliest of times. Its name comes from an ancient Germanic word meaning 'shiny grey', although the metal's chemical symbol of Ag from the Latin term argentum.

FLUFFY BRANCHING MASSES

Silver is a metallic element crystallising in the cubic system. It is a highly ductile and malleable mineral, and so does not form crystals with well-defined faces and edges. It almost always occurs in laminated masses, in fluffy, fibrous, dendritic or branching aggregates, with highly elongated crystals, often hooked and almost always of an elongated octahedral

or cubo-octahedral shape. Kongsbergite, a mercury-rich alloy of silver is also known. The mercury is removed by heating this mineral to obtain pure silver. Silver associates with other similar species like acanthite, embolite, chlorargyrite and pyrargyrite, but it is also accompanied by other more common species, such as calcite or quartz. For millennia silver was indispensable to the precious metal and jewellery crafts, and in the minting of coins, whereas more recently its industrial uses have become very varied, especially in electronics (in computer integrated circuits) and in a number of alloys used in dental repairs, photographic film and high-capacity batteries.

The samples in the collection come from the now legendary silver of Mexico, one of the main countries producing this metal. The thin plates are suspended in propylene glycol to enhance their basic physical properties -the characteristic white colour and intense lustre, while the curvature of the glass, acting as a magnifier, allows more detailed observation. The preservative also ensures that the silver keeps better, preventing it from tarnishing and turning black.



DID YOU KNOW?

- * The cell structure of the brain was a mystery until a silver-based dye was developed in 1870s that could show it clearly under the microscope.
- * Silver is antibacterial, meaning germs do not grow on it, making it ideal for use in medical equipment.
- * Silver is the most electrically conductive of all metals, superseding even copper.
- * In World War II, when copper and tin ran short, silver was used in its place for manufacturing crucial items.
- * The food additive E174 is silver used as a food colouring!

Fuchsite

Fuchsite, a mineral owing its name to the German geologist and mineralogist Nepomuk von Fuchs (1774 - 1856), is a variety of muscovite containing chromium, the element responsible for its intense emerald green colour.

VARIETY OF USES

Despite the fact that it contains chromium impurities, fuchsite has only very rarely been used as an ore of this metal. Instead, its laminar structure has encouraged its use in the industrial production of materials that can withstand high temperatures.

Indeed, 'isinglass', used to manufacture the clear doors of stoves and ovens, is simply finely powdered fuchsite. In addition to being a good heat insulator, fuchsite melts at a high temperature, above 1300°C.

Moreover, like all of the minerals of the mica group, fuchsite is an excellent dielectric (electrical insulator), retaining very low conductivity up to 600°C; for this reason it is used in many items of electrical equipment.

The sample comes from in Bahía state, Brazil, where fuchsite occurs in association with emeralds. Careful study of the sample reveals zigzag exfoliation surfaces indicating its metamorphic origin. This mineral exfoliates easily along its laminar surfaces, and hence it has to be handled very carefully and must not be

subjected to blows. If the sample is observed in a direction perpendicular to the exfoliation surfaces, the characteristic oily-to-nacreous sheen of fuchsite can be seen. The sample also contains ochre patinas, con

DID YOU KNOW?

- * This beautiful mineral forms in cooling magma within the Earth's crust.
- * Fuchsite is always green, due to the presence of chromium impurities in its structure.
- * It is a variety of muscovite - one of the most important of all rock-forming minerals.
- * It is quite soft and has perfect cleavage, breaking apart to form sheets.
- * Fuchsite is one of many minerals thought by some to have spiritual and healing powers. It is said to be helpful in treating stress and muscle stiffness, especially when used in combination with other stones.



Rhodonite

Rhodonite is a silicate belonging to the inosilicate subclass and its name comes from the Greek word rhodon, meaning 'rose'. The presence of manganese in the chemical composition of this mineral is responsible for its characteristic pink colour.

HOW TO DISTINGUISH IT FROM SIMILAR MINERALS

Rhodonite can occur in the form of prismatic crystals, in which case it is considered a precious stone, or in the form of massive aggregates. In the latter case, it is easily confused with rhodochrosite and with pyroxmangite. It can

be distinguished from the first by its hardness, as rhodochrosite has a hardness of 3 on the Mohs scale, whereas rhodonite oscillates between 5.5 and 6.5. Another pointer is that rhodochrosite, being a carbonate, reacts vigorously with acids and emits bubbles when it is placed in lemon juice or vinegar, whereas rhodonite remains unchanged.

However, it is not at all easy to distinguish rhodonite from pyroxmangite, as both are manganese inosilicates. The use of X-ray analysis is the best way of determining the difference between the two.

This sample of rhodonite comes from South Africa, a country where the mineral occurs in abundance in the KwaZulu-Natal and Northern Cape provinces, especially in manganese deposits in the Kalahari Desert. The sample was obtained from massive aggregates, which have been broken up and polished to bring out the pink colour and the sheen of the mineral, which varies from vitreous to mother-of-pearl. Some samples may have brownish to black patinas - these are manganese oxides formed by alteration of the mineral.



DID YOU KNOW?

- * Rhodonite is a silicate mineral rich in manganese, which gives it its characteristic pink colour.
- * It usually forms massive aggregates, although tabular crystals occasionally occur.
- * Rhodonite changes colours over time when exposed to the air, due to the appearance of manganese oxides on its surfaces.
- * In some examples, the manganese may be partially replaced by iron, magnesium, calcium or zinc.
- * Like many minerals, rhodonite is associated by some people with healing. According to them, it can help to calm nerves and bring relaxation. It is also said to help with the treatment of swollen joints.

Selenite

The purest, whitest forms of gypsum are known as selenite in an ancient-Greek allusion to the brilliance of the full moon. Present in many deposits of gypsum, selenite is an indispensable mineral for any collection.

DELICATE FIBRES

Selenite, which is white slightly greyish hues and occasionally translucent, is a morphological variety of gypsum. This makes it a hydrated calcium sulphate. Soft and smooth, it is easily scratched, even with a fingernail, and should be handled with care if its appearance is to be preserved. Selenite can occur in laminar clusters with a

silky appearance or as compact fibrous masses, also with a silky sheen. Selenite is found in most gypsum deposits and tends to accumulate in fissures at the edges of strata. Such fissures can be found in large formations and it is not unusual for large thin 'loaves' (just a few centimetres thick but several square metres in area) to be extracted. Although this variety has been given the name selenite because of its pale colour, it may adopt other tints as a result of its composition. These are usually in the form of reds, yellows and browns due to the presence of iron oxides. Less commonly, greenish hues may appear due to copper salts.

The sample in the collection comes from Spain, a country particularly rich in gypsum-bearing strata, and this mineral is found in many places there. Usually worked in easily accessible quarries, selenite can be extracted in near perfect condition, meaning that, in spite of its fragility, it can reach the collector in an excellent state. Our examples reveal a fine, dense fibrous cluster, brilliant white and with pearly to silky sheen.



DID YOU KNOW?

- * Selenite is a type of gypsum and so its chemical name is calcium sulphate.
- * The term is also used to refer to a compound that contains selenium ions, although this should not be confused with the rock-forming mineral.
- * Selenite samples found in geodes are often coated with druze, a frosting of tiny crystals.
- * Crystal enthusiasts suggest that selenite stones should be kept in the corner of a room to calm the spirits.
- * Some believe that a selenite stone can help them make contact with angels.

Pyrite

Pyrite is the most abundant iron sulphide in nature. In addition to having a magnificent golden metallic sheen it crystallizes easily. One of the distinctive features of pyrite is the fact that it gives off sparks when struck with metal. This property is what gave rise to its name, which derives from the Greek word pyros meaning 'fire'.

POTENTIAL CONFUSION

When it occurs in amorphous masses or tiny crystals, pyrite looks very much like gold. This resemblance to the precious metal has given rise to a common name by which it is perhaps better known - 'fools' gold'. Pyrite's considerable

hardness (6-6.5 on the Mohs scale) compared with gold (2.5 - 3), and its absence of malleability, are two properties that may be used to tell it apart from gold.

Pyrite may also be confused with other iron sulphides, among them: pyronite, which, unlike pyrite, is magnetic; marcasite, a polymorphic crystal that crystallizes in the orthorhombic system and has less intense sheen than that of pyrite; and chalcopyrite, which is less hard (3.5 - 4 on the Mohs scale).

The pyrite in the sample comes from Peru, where this species is found in many deposits. The most important of these are located in the districts of Huanuco (Huanzalá Mine) and La Libertad (Quiruvilca Mine). The pyrite in the sample consists of a matrix of small crystals from which other well-formed crystals (with a mixture of cubic and octahedral forms or dodecahedra with pentagonal faces) project. In some examples the famous iron-cross agglomeration, formed from the inter-penetration of two pentagonal dodecahedra, may be seen. To check whether your sample has this it should be examined with a magnifying glass.

DID YOU KNOW?

- * Pyrite is a naturally-occurring form of iron sulphide, with the chemical formula FeS.
- * Its forms rather beautiful and striking cube-shaped crystals. These may be found individually or massed together.
- * Pyrite is better known to many people as fool's gold. Unlike true gold it is relatively hard.
- * The name pyrite comes from the Greek word pyros, meaning 'fire' - when struck with metal it gives off sparks.
- * It is thought by some to have healing powers, among them the ability to help uncover suppressed memories.



Fluorite

Like all fluorides, fluorite is a mineral of the halide group. It consists of calcium and fluorine, and tends to contain many impurities, which generate a wide range of colours.

USES OF FLUORITE

In addition to its ornamental use and, in its chlorophane form, its use as a gem, fluorite is very important in the chemical industry, as it is used in the production of hydrofluoric acid. It is also important in metallurgy, as a flux in the manufacture of steel and aluminium. On top of this, fluorite is used to make high-quality optical lenses, such as

those used in telescopes and microscopes.

LUMINESCENCE

Many samples of fluorite are luminescent when they are heated, crushed or exposed to radiation, especially ultraviolet light. The luminescence is generated by the presence of microscopic quantities of europium (which give a violet luminescence) or yttrium (which gives a yellow luminescence).

The fluorite sample comes from China, the main producer of this mineral for industrial use: China produces more than half of all the fluorite used worldwide. The deposits in the provinces of Zhejiang, Jiangxi and Hunan are famous, and some of the best examples for collecting also come from there. Fluorite is a fragile mineral with perfect exfoliation and hence great care must be taken when handling it: knocks and bumps must be avoided as the sample may break into fragments.



DID YOU KNOW?

- * Fluorite is composed of calcium fluoride and is usually found as large, well-formed crystals.
- * It occurs in a wide range of colours, with blue, green, yellow, purple or colourless crystals being most common.
- * Many samples glow in the dark, or fluoresce. The word fluorescence is derived from the word fluorite.
- * Clear samples of fluorite are sometimes used in places of glass to form the lenses of telescopes and camera equipment.
- * Fluorite is also used as a flux, to lower the melting point of the raw materials used in steel production and so aid to removal of impurities.

Red Jasper

Jasper is one of the many varieties of opaque microcrystalline quartz that form in sedimentary rocks. These are small, interlocking crystals of quartz with iron impurities that give them a characteristic reddish colour, which is sometimes extraordinarily homogeneous.

USES OF JASPER

The uses of red jasper, its relative abundance and the fact that it can be found naturally polished (by aeons of contact with rocks and other materials) in rivers and on

beaches, mean that it was considered a sacred stone by ancient cultures. Indeed, jasper was used as far back as the Stone Age to make jewels and other articles of adornment. Jewish legends say that Jerusalem was built on red jasper. For many native peoples of Venezuela's Great Savannah too, red jasper has a sacred significance. In ancient Egypt red jasper was placed in tombs to protect the dead, and it known by the ancient Egyptians as the 'blood of Isis'. Christians gave red jasper the name 'blood of Christ' and was associated with the heart and circulatory system.

The jasper in the sample comes from Brazil, a country which, together with India and the United States, has the best deposits of red jasper in the world. Brazil's most outstanding jasper deposits are those in the south-east region, in the states of Minas Gerais, Rio de Janeiro and São Paulo. In the United States, the best examples come from in the Petrified Forest in Arizona. The samples in this collection have undergone a polishing process to bring out the chromatic effect known as 'mottling'.



DID YOU KNOW?

- * Red jasper is a striking form of microcrystalline quartz, its blood-red colour resulting from iron inclusion.
- * A relative abundant but nevertheless prized stone, it has long been used for making jewellery and continues to be used for that purpose today.
- * Red jasper has been held sacred by some cultures in the past. It was known to the ancient Egyptians as the 'blood of Isis'.
- * Unusually for a mineral, it is mentioned specifically several times in the Bible.
- * Today it is believed by some people to be helpful in relieving stress, improving confidence and enhancing the sense of smell.

Iceland Spar

Iceland spar is a colourless, transparent, exfoliated variety of calcite (a natural form of calcium carbonate). It may be of sedimentary, metamorphic or igneous origin.

A BIREFRINGENT MINERAL

The main characteristic of this variety of calcite is that it exhibits an optical property known as birefringence or double refraction. If you write a word on a sheet of white paper and place the mineral on top, the letters of the word appear twice. If you then rotate the rhombohedron about its own axis you will see that one of the text remains motionless, whereas the other one circles the first. This

property can be observed in four of the six faces of the rhombohedron; in the other two (parallel to each other) there is no double refraction of light.

Calcite has always been used to make lime, but the Iceland spar variety is used to manufacture precision optical instruments, such as petrographic microscopes, as it polarizes white light.

The samples in the collection are exfoliated rhombohedra from Mexico. The best examples are birefringent calcite can be found in the Monterrey region, with examples from the Nuevo León Mine being famous around the world. As calcite is a mineral with perfect exfoliation, it should be protected from knocks and bumps, as it can be break into smaller rhomboedra. Furthermore, care should be taken to ensure that it is not scratched (it can be scratched with a knife but no a finger nail) and does not come into contact with acids, even mild ones such as vinegar or lemon juice. Scratches and acid stains on Iceland spar spoil its surfaces and make the phenomenon of birefringence difficult to observe.



DID YOU KNOW?

- * Iceland spar is a transparent form of calcite with unusual properties, among them the ability to polarize light.
- * As its name suggests, it was originally discovered in Iceland. Today, most Iceland spar comes from mines in Mexico and the United States.
- * Iceland spar was previously known as Iceland crystal.
- * It is used for making lenses and other parts of certain optical instruments.
- * Many people have speculated that Iceland spar was the original 'sunstone' used in navigation by the Vikings. It has recently been shown that Iceland spar can be used to located the position of the sun in the sky, even on overcast days.

Aragonite

An aragonite cluster consists of a grouping of hexagonal prismatic crystals that grow in a disorganized and unsystematic way from a common centre. Aragonite clusters range from being entirely colourless (the most transparent prisms) to a variety of brownish and greyish hues (those containing clay particles).

HOW ARAGONITE ORIGINATES

Aragonite is almost always of sedimentary origin and it forms at low temperatures near the Earth's surface. It is converted to calcite when the temperature is raised above 500°C. Aragonite is a fairly common mineral species: in Spain, for

example, there are more than 100 different sites where it can be found.

ARAGONITE AND CALCITE

Aragonite and calcite may be confused with one another when there is no definite crystallization. Meigen's test is used to distinguish the two: if a piece of calcite is crushed and placed in a test tube with distilled water and 10 to 15 drops of potassium nitrate solution, and the mixture is then boiled for two or three minutes, the calcite does not change colour. However, aragonite treated in this way takes on a violet or pinkish hue.

The aragonite cluster in the sample comes from Morocco, a country where countless good specimens can be found. Fine aragonite is particularly common around Sefrou, to the south-east of Fez, and Bou Azzer, to the south-east of Marrakesh. This mineral should be cleaned with the greatest of care as it is relatively soft. If a brush is used, it should be one with soft bristles, and if water is used, it must be distilled water; water with even small concentration of acids dissolves aragonite and spoils its natural glassy sheen.



DID YOU KNOW?

- * Aragonite is a common mineral. Like calcite, it is a naturally occurring form of calcium carbonate.
- * Aragonite is named after the region of Aragon in Spain, which yielded the first samples to be properly scientifically described.
- * This mineral occurs in a wide variety of colours and formations.
- * It is unstable at high temperatures and even at room temperature is rather soft and brittle.
- * According to some people, aragonite has certain healing properties, among them the ability to reduce stress and aid with the healing bones.

Azurite

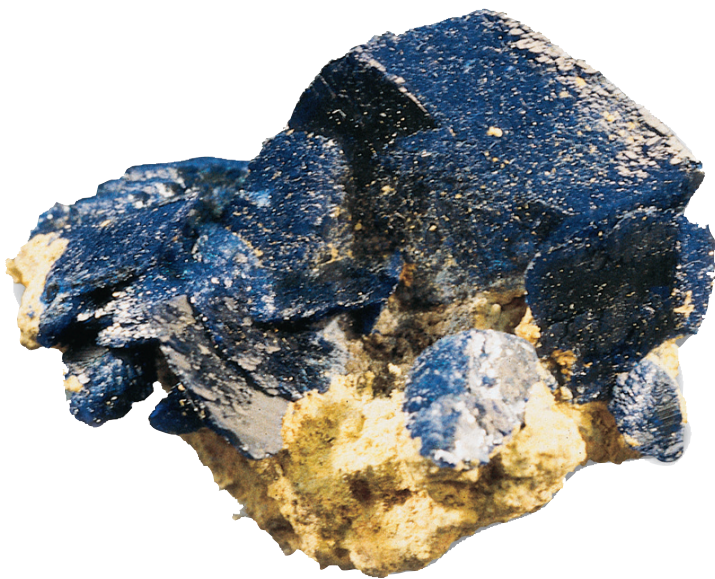
Azurite is a blue copper carbonate that occurs in oxidation zones of copper sulphide deposits. It is almost always associated with malachite, which is chemically similar but green in colour.

USES OF AZURITE

This mineral must be handled with extreme care owing to its low hardness and great fragility. Moreover, it decomposes when heated, giving off CO₂ and water to become an oxide of copper with a blackish and earthy appearance. Azurite has always been associated with art, as it is the source of a

beautiful blue pigment (mountain blue) that was used from the time of ancient Egypt (for example in the striking blue plumage of the geese adorning the walls of the Meidum Pyramid) right up until the Renaissance, when Michelangelo used it on the ceiling of the Sistine Chapel. The fact that this mineral oxidizes to become malachite (which is green) eventually led to its abandonment as a pigment.

The azurite in the sample comes from Morocco, a country where this mineral occurs in abundance. It is especially common near the towns of Kerrouchen, Oumjrane and Tafraout, and in the Touissit region in the north east, where very fine examples have been found. The examples in this collection consist of small azurite crystals associated with malachite: the crystals have a grainy appearance or form patinas on the malachite. In certain examples it may be possible to identify malachite crystals. These are identical in form to those of azurite (having originally been azurite, before they oxidized), but have a green colour.



DID YOU KNOW?

- * Azurite is a carbonate of copper. It is closely related to malachite and slowly oxidizes into malachite over time.
- * Azurite is sought after by jewellers and mineral collectors alike. Its beautiful, rich blue colour makes it a popular stone for making rings and pendants.
- * Azurite was once used to create a blue pigment used in painting. Problems caused by it oxidizing and changing colour led to its use eventually being abandoned.
- * Azurite is considered a minor ore of copper, since it occurs in association with other, more valuable copper ores. Some of the copper used in copper piping and other copper objects is ultimately derived from azurite.
- * Azurite is believed by some people to aid in meditation and also to reduce stress and induce calm.

Sahara Geode

Geodes are rocky cavities in the form of nodules that, on being opened up, reveal well-formed crystals. These are formed by the crystallisation of minerals within the cavity under low-pressure conditions.

A WIDE VARIETY

Geodes are formed in both sedimentary and magmatic rocks. In sedimentary rocks, geodes are formed by the precipitation of ions dissolved in water, and the most characteristic of this type is calcite. The geodes of the Sahara desert, however, are of volcanic origin, and so are formed by the cooling of magma. The most characteristic mineral found in these is quartz, which comes in several varieties. Other geodes of volcanic origin

include those containing agates, a variety of chalcedony, in which the central cavity may contain violet-coloured crystals of amethyst or dark, smoky quartz. In other examples, crystals of different mineral species may form on the quartz, and of these the most common are calcite, barite, gypsum and goethite.

BEWARE OF IMITATIONS

The geodes in this collection are naturally occurring examples, but caution must be exercised when these items are bought commercially, as it is not unknown for geodes to be coloured artificially to make them appear brighter. More often than not, geodes with exceptionally intense green or blue-coloured bands have been artificially enhanced.

This geode sample comes from the Moroccan Sahara desert. This type of geode is formed of transparent quartz crystals of the rock crystal variety. These cover the walls of caves, without being banded by agate – another variety of quartz often found in geodes. In some examples, a patina of small brown crystals can be observed, which are formed by minerals of the phosphate group.

DID YOU KNOW?

- * The Saharan desert has been the site of mineral extraction since antiquity, and the modern mining industry is very important to many of the countries in the region, including Morocco, where your sample comes from.
- * Geodes have been known to humankind for centuries, and have been the focus of local folklore around the world: for example, some Native American peoples believed they were eggs laid by the supernatural Thunderbird creature.



Obsidian

Obsidian is not a mineral but a volcanic glass formed by the rapid cooling of volcanic lava rich in silicon oxide; hence its disordered structure. The 'snowflake' variety is characterized by the presence of crystals of cristobalite, a polymorphous quartz mineral, within the amorphous glass.

USED SINCE PREHISTORIC TIMES

Obsidian is notable for its conchoidal fracture, thanks to which shapes with very sharp edges can be obtained. It was one of the principal materials used by Stone Age cultures to make knives, arrow heads, axes and other cutting or piercing tools, where it was available. Nowadays,

obsidian is mainly used in the production of glass wool. Fibres are created by melting the obsidian and forcing the resulting paste through very fine tubes in which it is allowed to cool. The filaments are then bundled together to make the glass wool. This material has many properties that make it very useful in the building industry, among them low electrical conductivity, high melting point, high acoustic absorption and great stability. It is also excellent at keeping in heat, making it perfect for thermal insulation. In its native form, 'snowflake' obsidian has been used to make jewellery since antiquity.

This sample comes from the USA, where there are important deposits of obsidian in the states of Arizona, Idaho and Utah. It contains cristobalite crystals, which may have colours ranging from white to grey. If a magnifying glass is used to look at the sample it can be seen that these crystals look similar to snowflakes, hence the name of this particular variety of volcanic glass – 'snowflake obsidian'. Care should be taken when handling the sample, as any sharp edges could cause cuts.



DID YOU KNOW?

- * This substance is not a true mineral but, rather, a very unusual type of rock.
- * It is also known as volcanic glass and has a fairly simple chemical formula.
- * Obsidian is produced when silicon rich magma cools rapidly in contact with air. It is found around dormant and active volcanoes; in some places its chunks almost cover the ground.
- * When struck, obsidian breaks easily, just like man-made glass. The fractures are smooth and often have very sharp edges.
- * Obsidian has been used since the Stone Age to make tools. Today, it is used to make scalpel blades.

Orthoclase

Also known as orthose, orthoclase is one of the most abundant minerals in the Earth's crust and forms part of many of the commonest crystalline and metamorphic rocks, such as granite, syenite, aplite, pegmatite and gneiss. Its name is a combination of two Greek words, *ortho* 'correct' and *klasis* 'breaking', in allusion to its perfect exfoliation in two directions.

GIANT CRYSTALS

Orthoclase is a tectosilicate of aluminium and potassium which crystallizes in the monoclinic system, unlike its cousin

microcline, which does so in the triclinic system. Both have the same chemical composition and a fairly similar structure, which makes it difficult to distinguish them at first glance. Well-formed crystals are the norm, some of which can weigh up to several tonnes. Its typical colour is a rather intense flesh-pink, but it may also be white, grey, reddish or, rarely, yellowish or slightly bluish. Also known is a colourless crystalline variety, translucent and with a vitreous sheen, much more intense than in ordinary orthoclase: this is adularia, typical of European Alpine massifs, although it has also been found in many other places around the world.

The examples in the collection come from crystalline rocks in Andalusian outcrops, in Cordoba province. The matrix is a granitic rock in which the crystallisation of orthoclase can be viewed to perfection, often in well-defined geometric shapes corresponding to isolated crystals. The mineral is typically a flesh-pink colour, very intense and contrasting with the surrounding quartz. Sections perpendicular to the crystal's principal axis occasionally exhibit a thin seam, diagonal or transverse, indicating Baveno or Manebach

DID YOU KNOW?

- * Orthoclase has been discovered in large amounts in the rocks on Mars.
- * The glittering moonstone variety of orthoclase is the state gem of Florida.
- * The largest crystal of orthoclase ever recorded was 10m long and weighed 100 tonnes.



Jadeite

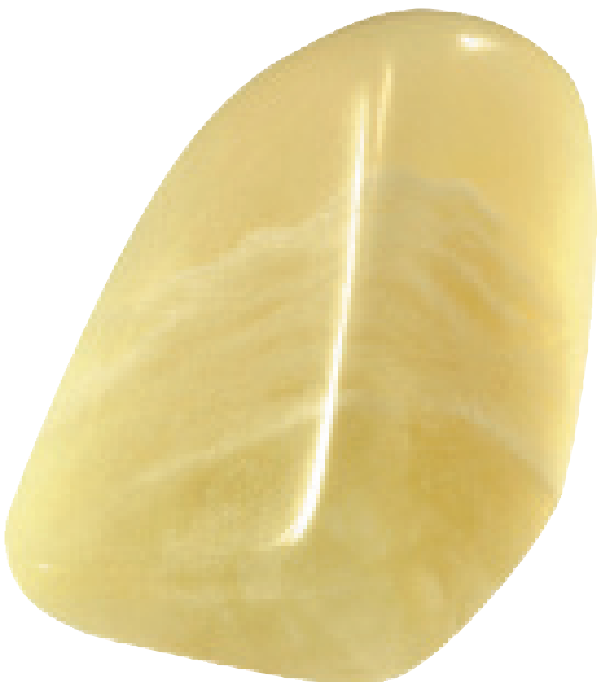
Jadeite is a silicate of aluminium and sodium, assigned to the inosilicate subclass and the pyroxene group.

A VALUABLE MATERIAL

Jadeite is a very hard, translucent mineral, which can be exfoliated only with great difficulty. It is the principal mineral of the material commonly known as jade: the other jade mineral is nephrite, a variety of another inosilicate, called actinolite. Jadeite may be mistaken for other silicates: it is distinguished from nephrite by the latter's higher melting point and greater hardness, and from diopside, omphacite

and augite by their hardness and optical properties – it requires microscopic analysis to tell them apart. The high price of the most attractive varieties of jadeite has encouraged imitation, using glass and synthetic materials. Jadeite has long been used to make jewels and beautiful objects. It was particularly important in the pre-Columbian civilizations of the Americas and in imperial China.

The samples in the collection come from China, the country with the largest number of deposits of this mineral. The best-known deposits are in Yunnan province and the Tibet region. Hong Kong is the main cutting centre for jade. In Chinese culture, jade represents the link between Heaven and Earth by which the emperors would communicate with the gods. It continues to be a mineral that is highly valued by the people of China. The samples are aggregates of rough jadeite, which have been polished to enhance the mineral's typical green colour and its glassy to mother-of-pearl sheen.



DID YOU KNOW?

- * Jadeite is one of the two minerals commonly known as jade.
- * It is quite hard and fine-grained, and usually green in colour. Occasionally it may be either violet or blue.
- * Along with nephrite, jadeite is polished and often carved to make jade jewels and other objects.
- * Today, it is most valued in China, where it was traditionally considered a representation of the link between Heaven and Earth.
- * Jadeite was once believed to cure kidney stones if rubbed against the body. Its name is derived from the Spanish phrase 'piedra de ijada', which means 'stone of the side'.