

## October 2001 Mineral of the Month: Jasper

At certain points while putting together this write-up, we were seriously tempted to extend it until it was book length, so that we could examine all the delightful and diverse varieties of jasper found all around the world. Of course, had we written such a book a few years ago, it would now need to be rewritten, with a chapter devoted just to the spectacular orbicular jasper rediscovered in Madagascar in 1999!

### PHYSICAL PROPERTIES

Chemistry: SiO<sub>2</sub> Impure, Opaque Colored Quartz in Granular Masses  
Class: Silicates Subclass: Tektosilicates  
Dana's: Si Tetrahedral Frameworks  
Crystal System: Crystals too small to be seen with unaided eye  
Crystal Habits: Granular masses with Impurities  
Color: Red, green, brown, white, other colors  
Luster: Waxy to vitreous to dull  
Transparency: Subtranslucent to opaque  
Cleavage: None  
Fracture: Conchoidal  
Hardness: 7  
Specific Gravity: 2.6-2.9  
Luminescence: None, unless caused by admixed impurities  
Distinctive Features and Tests: Hardness; Opaque; Difficult to distinguish from other microcrystalline quartz varieties  
Dana Classification Number: 75.1.3.1

### NAME

The name jasper comes from the Greek *iaspis*, the name of a green-colored precious stone. Any further significance to the name is now known. Chert comes from the Irish *ceart*, meaning "stone," while flint is an Anglo Saxon for a certain kind of chert, as explained further in the write-up.

### COMPOSITION

Quartz is the second most common of minerals on earth. (Feldspar, a group with sixteen end-members, including albite, microcline, orthoclase, and the gem varieties labradorite, sunstone, moonstone is the most common.) This is not surprising when we consider that silicon and oxygen are far and away the most common elements in the crust of the earth, by weight, the crust is 47% oxygen and 28% silicon. (By volume, oxygen makes up about 93% of the crust, while silicon and the next six most common elements, aluminum [Al], iron [Fe], calcium [Ca], sodium [Na], potassium [K], and magnesium [Mg], make up about 5%, and the other elements combined make up the rest.) Silicon and oxygen readily combine as silicon dioxide (SiO<sub>2</sub>), in the form of quartz, obsidian, and many kinds of minerals and rocks. Silicon dioxide (SiO<sub>2</sub>) is commonly called silica.

Since all quartz is basically silicon dioxide, what accounts for the colors seen in amethyst, citrine, agate, and jasper, to name a few? Simply put, imperfections in the form of other elements and compounds being caught up in the growing crystal. The enclosed "Quartz Varieties Chart" lists many of the causes of color in quartz. Quartz is divided into two kinds based on crystal size, as detailed in the chart: Crystalline quartz includes all varieties with crystals large enough to be seen with the unaided eye, while

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microcrystalline or cryptocrystalline includes varieties in which microscopic crystals form fibrous aggregates or granular masses. This second kind is subdivided into two groups based on the aggregation of the microscopic crystals. The first group is those consisting of fibrous aggregates of submicroscopic rod-like crystals that are interlocked or in parallel position, and includes agate, carnelian, onyx, and chrysoprase, among others. Chalcedony (pronounced kal sed' o nee) is the general term for the fibrous varieties. The other group, composed of masses of microscopic grains, includes jasper, flint, and chert.

The composition we find most often for jasper is that noted above: impure, opaque colored quartz in granular masses, containing much finely-divided mineral matter such as clay, iron oxides, etc. It is the mixing in of these other minerals that give jasper its unique colors and patterns. Some of the mineral and elements commonly admixed with jasper include hematite, goethite (our March 1998 featured mineral), chlorite, manganese, hornblende, carbon, and clay.

The other varieties of granular quartz are chert and flint, and as we will note, some common jaspers are actually chert. What is the difference? Authorities disagree, to put it mildly. Chert is described as being usually white or light gray in color, while flint is grey, brown, or black chert. Though both often form as nodules (small rounded masses or lumps of a mineral or mineral aggregate that contrasts in composition with the rock matrix it has formed in), flint is more commonly thought of as being in found this way. Geologists today use the terms jasper, chert and flint almost interchangeably, so the main distinction seems to be based on color: white or light gray granular quartz is called chert, dark grey, brown, or black is flint, and red, green, and other colorful material is jasper.

How is this trio most commonly formed? Rivers carry grains of weathered silica (from rocks such as granite and many others) to oceans, while the skeletons of ocean creatures (such as some sponges and amoebas with intricate exoskeletons) made of silica collect on the sea floor. Water at sea bottoms becomes supersaturated with silica, which precipitates out as an ultra-fine silica ooze. If no other sediments surround this ooze, it hardens as chert; or if iron oxide or other minerals are present to be mixed with it, as jasper in one of its common colors. The movement of continental plates gradually folds and lifts the layers above water level.

Jasper and other microcrystalline quartz are also deposited in openings in rocks by percolating silica-rich groundwater, or may be formed by the conversion of existing rock by an infusion of silica, a process known as **silication** or **silicification**. Also, algae are often replaced by jasper via an infusion of silica, leaving behind cell patterns and other fascinating forms in different colors, and jasper is a common replacement material in petrified wood.

### *COLLECTING LOCALITIES*

There are hundreds of jasper occurrences all over the world. In addition to localities mentioned in the box on the next page, worldwide localities include Orsk, Ural Mountains, Russia; the agate and amethyst producing region of southern Brazil; the Deccan basalt flows of India described in our January 1998 Okenite write-up; and Mexico, Sicily, Germany, and the United States. The areas mentioned in the box are a small sampling of the most outstanding jaspers. The Madagascan locality for Ocean Jasper will be discussed in *About Our Specimens*.

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<b>Jasper Name</b>	<b>Locality</b>	<b>Unusual colors, patterns</b>
Biggs Jasper	Idaho, Oregon, Washington	Scenic jasper showing mountains and the like in warm shades of beige, tan, cocoa browns, among other colors
Bruneau Jasper	Eastern Idaho	Cream, tan, several shades of brown forming circles, ovals, etc.
Desert Rose Jasper	Idaho, Oregon	Picture jasper in bright rose, tan and gray with lacy gray dendrites
Mary Ellen Jasper	No. Minnesota	Red and blue-gray with steel-colored streaks of hematite
Mookaite Jasper	Mooka Station, West Australia	Patches, swirls, and spots in yellow, brick red and purple. One reference calls this chert rather than jasper
Morrisonite Jasper, Owyhee Jasper	Owyhee River Canyon, Oregon, western Idaho	Blue, green, red, yellow, orange, brown, with scenes, bands, swirls, and more
Morgan Hill Poppy Jasper	Morgan Hill, Santa Clara Co., California	Red, yellow, and green, reminiscent of a poppy field
Wild Horse Jasper	Idaho, Oregon	Scenic jasper with canyons, streams, etc., in earth tones and blue-gray with dendrites

### *JEWELRY & DECORATIVE USES*

It is easy to see why jasper is the stone of choice for many hobbyist and professional cutters. It is plentiful, affordable, comes in all manner of wonderful shades and patterns, and in many places, you can collect it yourself! Plus, at 7 on the hardness scale, it takes an excellent polish, and is tough and durable.

If you were to prospect and find your own jasper deposit, naturally you would want to get the greatest yield from it. You might find pieces that resemble natural scenery, such as mountains, shores, canyons, and the like. This you might call "scenic jasper." Or, if you could see outlines of faces, animals, or other things, you would call it "picture jasper." If the colors resemble flowers or spots on a dog, you might call your new find "poppy jasper" or "dalmation jasper" or something else that seemed appropriate. Or you might name it according to where you found it, or in someone's honor. But don't put an "ite" on the end, for this suffix should only be applied to minerals, and will only serve to confuse new collectors and anger seasoned collectors! (A fitting example: about one hundred years ago, a pretty pastel green stone was found near Happy Creek, Siskiyou County, California. It was a mixture of vesuvianite and grossular garnet, and was given the unofficial name "Californite." It is a good enough name of course, except for the "ite" ending that might lead novices to believe it is a mineral, not a mixture of two. However, now that the name "Californite" is identified with this stone, the Commission on New Minerals and Mineral Names will not permit a new mineral to be named in honor of the state of California, as it might cause confusion.)

Now that you have named it, what's next? Selling it, of course! The most stunning pieces, perhaps with the most striking colors and patterns, you will no doubt ask high prices for, and sell to jewelry designers and others looking for one-of-a-kind stones. You'll sort through the medium grade material, perhaps

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experimenting with it to see in what forms it looks best: as cabochons, beads, eggs, spheres, or other decorative items. If you have a large deposit, you can sell tons of the rough to factories in China and elsewhere who will use it for the mass production of cabochons, animal carvings, beads, hearts, eggs, spheres, and countless other items. And, of course, you can offer it to dealers who will then sell it at gem and mineral shows around the country to hobbyists. Have we left anything out?

Part of the tremendous variety of jasper is that it can be found in a mix with other minerals. Agate and chalcedony are commonly intergrown with jasper, so much so that some kinds are called jasp-agate. Bloodstone is a good example of a lovely mixture: it is often formed of translucent green chalcedony with bright red spots of jasper! When jasper forms with alternating color bands, it is often called riband jasper.

Sometimes, eons after formation, a bed of jasper may be broken apart by natural forces. Later, silica-rich groundwater may deposit more jasper (or other microcrystalline quartz) in the openings, in effect naturally cementing the broken pieces together! This can give a striking, almost mosaic effect to the stone! Yes, the variations in jasper are really too numerous to list— they really need to be experienced!

### *HISTORY & LORE*

Jasper is mentioned in several places in the Bible. The oldest reference is to a jasper stone set in the last position in the second row of stones on Aaron's "breastpiece of judgement," as described at Exodus 28:15-21. Each of the twelve stones on the breastpiece represented one of Israel's tribes, although the Bible does not tell us which. In Revelation, the apostle John was given a vision of God's heavenly throne of splendor. He described the One seated upon it as appearing "like a jasper stone and a precious red-colored stone," most likely a sard. And again in Revelation, the holy city, New Jerusalem, is described: "Its radiance was like a most precious stone, as a jasper stone shining crystal-clear." The structure of this heavenly city's wall was jasper, and the first foundation stone was jasper. Because jasper is used in the depiction of such heavenly glories in the Scriptures, some Bible scholars have suggested that the stone known as jasper in Bible times may have been a more brilliant, translucent stone than the opaque stone we today call jasper. Some scholars have even suggested that the Greek term used in Revelation refers to the diamond.

Jasper, of course, was popular among other ancient peoples. The oldest jasper adornments date back to Stone Age man. In Harappa, one of the oldest cities of the Indus civilization, extraordinary examples of agate and jasper jewelry have been found. Egyptian artists used jasper and other forms of quartz for their carved cylinders, seals, diadems, collars, bracelets, and signet rings. The Mesopotamians also used jasper for their cylinder seals, while the ancient Indians of Mexico made beads from green jasper and other stones. In Roman times, jasper, agate and other stones were dug near the German cities of Idar and Oberstein for use in jewelry. Red jasper helped the city of Efon Alaiye in the southern Nigeria become a prominent center for crafted beads. Amulets called *magatama*, meaning "crooked stone," made of jasper, chrysoprase, and other stones, have been found in ancient Japanese graves.

A number of superstitious beliefs were attached to jasper over the centuries as well. In various time periods, it was thought to have the power to stop bleeding, to bring rain, to drive away wicked spirits, and to cure snake bites, while a lion or an archer carved on a jasper stone was said to guard against poison and to cure fevers!

In modern day lore, jasper is known as the "supreme nurturer," with the power to remind one to bring joy and substance to others and to protect against negativity. Orbicular jasper is said to help one to accept responsibility and to increase the attribute of patience.

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### *TECHNOLOGICAL USES*

Though jasper has been quarried for use in decorative purposes, we found no information as far as industrial applications. Chert and flint, of course, were among the first materials used to make tools and weapons. The conchoidal fracture common to quartz is also seen in these massive varieties, so that early man could break pieces that would have naturally sharp edges, ideal for use in adzes, sickles, and other tools, as well as daggers, arrowheads and spearheads. Many such items are found as artifacts.

The city of Brandon, England, has been called "the town built of flint and by flint." The townspeople worked making tinderboxes (metal boxes containing tinder, flint, and steel for starting fires), before matches became commonplace, then turned to making gun flints. Much flint and chert has been found in Great Britain, France, and Germany, and other parts of western Europe. In fact, the term flint seems to have come from western Europe, where it was used to describe workable nodules of chert found in the chalk there.

### *ABOUT OUR SPECIMENS*

All the books describing beautiful jaspers are now in need of updating! Ocean Jasper may well take first place on updated lists of the world's most beautiful jaspers, and rank near the top of the world's most beautiful opaque stones. How could such a beauty remain hidden for so long?

First of all, it is always good to keep in mind that when we trace the history of a mineral find, we are really tracing its written history. The written history of Ocean Jasper starts in 1922, as we will see, but who can say for an absolute certainty that natives of Madagascar did not find and then lose the deposit centuries or more ago? Perhaps decorative items were made, then lost, and will turn up in archaeological diggings in the future. This is not to say they will, but merely to suggest that some finds may have a longer history than current written records may suggest.

That said, sometime before 1922, a French mineral collector named Col. Vesigneié, who had put together one of the finest private mineral collections in France, had obtained a wonderful piece of orbicular jasper from Madagascar. This pretty piece came to the attention of French mineralogist Alfred Lacroix, Professor of Mineralogy at the National Museum of Natural History, who included information about this deposit of marvelously colorful jasper in his monumental masterpiece *Mineralogy of France and Madagascar*, published in three volumes between 1893 and 1922.

The few other mentions made of orbicular jasper from Madagascar include a photo in the 1977 Czech *Encyclopedia of Minerals and Rocks*, published in English in 1992 as the *Illustrated Encyclopedia of Minerals and Rocks*. The 1997 Mineralogical Encyclopaedia also contained a photo of this long-lost jasper. In the Staatsmuseum in Munich, Germany, is a lovely piece of Ocean Jasper, called in German *Augenachat*, meaning "Eye Agate." It shows a locality by the name of Katamby, while other pieces on display in France had similar names. Unfortunately, however, French dealers hoping to find the deposit could not find any towns called Katamby or any of its various spellings, because small villages in remote areas of Madagascar are regularly built and abandoned as nearby farming land is worked out.

Back in the 1950's, a prospector in Madagascar brought a few pieces to the attention of a couple of French collectors/dealers. They wanted more, much more, but the prospector could not recall the location! (Imagine if he had . . .) Years passed, but one of the Frenchmen, now living in Madagascar and dealing in rocks and minerals, could not shake the image of this marvelous mystery jasper from his mind. Could he hope to find the deposit?

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In the late 1990's, or should we say, the end of the last century, he narrowed his search to the northwest coast of Madagascar. Since there are no roads, a search by boat was conducted along the craggy shoreline. The searchers stopped by every local village to inquire about the mystery stone. The first team gave up, empty-handed. A second group was organized in late 1999, and after a month and a half of examining every square inch of shoreline, their hunt was over! Fortunately, they happened by at low tide, or else they might have sailed on past, as the boulders and cobbles were only visible when the ocean receded. The long-lost deposit of orbicular jasper was spread along an area about fifty yards by thirty yards, with barnacles attached to many of the pieces!

In short order, a permit was obtained from the authorities, the boat was loaded to full capacity, and the first bits of material were brought to the dealer's lapidary shop. Imagine the excitement as the first pieces were cut and polished and the full glory of Ocean Jasper was revealed! In no time, an operation was in place to recover the material and work it up into polished slabs, spheres, and eggs, to be introduced at the Tucson Gem & Mineral shows in 2000.



Huge Ocean Jasper boulder on beach



Boatload of orbicular jasper awaits high tide to sail

You can imagine the excitement caused by the relatively small amount brought to Tucson last year. Both Lapidary Journal and Gems & Gemology highlighted the major new find in their Tucson reports, the former calling it "the buzz of the show among cabochon, carving, or bead materials." This new material was outstanding several ways: the pretty pastel pink and blue colors mixed in with the solid white, green, yellow and red; the small vugs with drusy quartz and prase (green quartz) crystals, and the seemingly infinite numbers of spherical nodules or orbs,

(round inclusions of contrasting color and composition.) Words really fail to adequately describe the marvelous beauty of this new find!

It was this last feature that led it to be called "Orbicular Jasper" in the aforementioned magazine reports. The miner gave it the name "Ocean Jasper," most fitting in light of its emplacement at the shoreline, and we called our material by this latter name. A large importer was later calling it "Moon Jewel Jasper," a name we hope will not stick.



Workers with hand tools breaking rock at Ocean Jasper collecting site

As you examine the orbs in your specimen, keep in mind that they are found in several colors and in sizes from 1 mm to 1 cm in Ocean Jasper. But how did they get there? Si & Ann Frazier explain it best in Lapidary Journal: "Each spherulite appears to have spontaneously nucleated in a plastic medium and then grown in concentric layers that show different colors probably due to iron compounds." They go on to add, "How orbicular jasper forms is still a scientific mystery, although a graduate geology student at the University of California at Berkeley is now putting advance technology to work on this problem." (For a discussion of the formation of multicolor bands in microcrystalline quartz in a plastic state, see our November 1998 write-up on agate.) The polished pieces sent to Club members are of the highest quality Ocean Jasper found, chosen from the rough pieces set aside for the making of spheres.

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What does the future hold for Ocean Jasper? Further investigation in the area has found it to have the potential of being a major deposit, perhaps occurring over a hundred-mile zone. Of course, only a small percentage of the material will have the striking colors and orbs we have come to love in our specimens. And now that a major new find has been made, as is the unfortunate tendency among humans, greed has entered the picture, and several individuals are making claims regarding ownership of the deposit, and the whole matter is likely to end up in the courts in Madagascar.



Pile of Ocean Jasper blocks waiting to be sent to the factory for cutting and polishing. Can you see your piece somewhere in there?

In the meantime, we have enjoyed viewing Ocean Jasper most in the form of large spheres and large polished slabs. Smaller eggs and spheres, of course, also highlight the beauty, but larger pieces obviously have a greater impact. Ocean jasper rough is being made into cabochons that are very pretty, but not as overwhelmingly beautiful as larger pieces. We have yet to see Ocean Jasper beads, but it is probably just a matter of time until we do. Yes, how exciting it is to be able to watch the unfolding of what may very well be one of the world's major jasper deposits! And to appreciate the seemingly endless variety of colors and patterns found in quartz and all its varieties, including jasper!

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