

## Bills Rocks and Minerals

# Geodes

I have always been fascinated by the beauty of geodes, and by writing this article I have been prompted to learn much more about them. Geodes are highly complicated, so a comprehensive description of all the different types and how they form would take up a tremendous amount of space. Therefore this article is a basic description of the how and where geodes occur together with a few illustrations.

The first thing to do is to explain the definition of a geode.

There are three major types of inclusions in sedimentary, and volcanic rocks. Concretions, Nodules, and Geodes.

In sedimentary rocks, concretions (**Fig. 1**) are what their name suggests, that is smaller sedimentary particles are cemented together by a mineral, usually calcite.

Nodules (**Fig. 2**) are solid masses of material which have a contrasting composition to the surrounding rock, for instance, flint in chalk deposits, pyrite in coal deposits, or chert in limestone.

Geodes (**Fig. 3**) have an internal cavity which is occupied by mineral crystals. The wall, or shell of the geode is more durable than the surrounding rock, probably due to strengthening by the cementing properties of another mineral.

In many publications there is a blurring of lines when describing concretions and nodules,

sometimes even describing a nodule as a type of concretion, but that is another story, so to continue on the subject of geodes.

Most geodes have a silica or quartz content, for instance amethyst geodes are the most striking example. and can often be seen in retail shops advertised as Cathedral geodes. (**Fig. 4**) These are probably recovered from basaltic lava tubes and voids. By its very nature a lava flow has the ability to cool quite quickly entrapping pockets of gas, and leaving

behind lava tubes. Over time the silica content of the lava migrates to the pockets and tubes depositing crystals on the walls. The specimen illustrated has been levelled at its base to give it stability when displayed.

One specimen, from my own collection (**Fig. 5**) poses the question, Is it a nodule or is it a geode? I think it is a geode, because it has a hollow interior. The walls are chalcedony, and the interior deposit is botryoidal chalcedony.

**Fig. 6** is another geode from my collection. The walls of this geode are very thin, and almost non-existent in places. The crystals are the mineral celestine, old name celestite, which is a strontium sulphate. Among the worlds largest geodes is a celestine geode about 10 metres in diameter, located at Put-in-Bay, South Bass island, Lake Erie, Canada.

Geodes are not random occurrences, but mostly found in particular geochemical environments in sedimentary or volcanic stratified deposits. The most sought after geodes are found in volcanic



Fig. 1

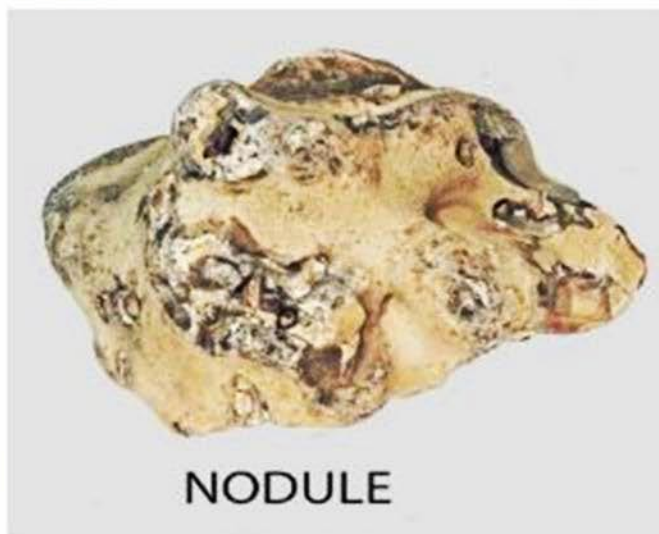


Fig. 2



Fig. 3



**Fig. 4** Amethyst geode ©Rob Lavinsky  
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rocks, because volcanic lava flows provide an environment rich in dissolved gases and minerals, especially silica. Trapped gases in the rapidly cooling lava create cavities, and even larger cavities are left behind as lava tubes empty. Lava tubes can be very branch like in their formation, many meters long, and up to a meter in diameter. When the lava has cooled, groundwater, and hydrothermal activity, transport minerals into the cavities, where they are deposited, and form geodes. Lava tubes can provide very elongated geodes, and smaller truncated branches off the main lava tube can produce the most sought after "Cathedral" geodes.

As an illustration of scale see **Fig. 7**, note the shadows of spectators standing around this collapsed lava tube in Iceland. I walked across a part of the roof that was concealed by ice and snow. The roof suddenly collapsed, and I started to disappear, before the quick thinking of one of our group saved me by grabbing my rucksack. I was pulled out, and saved from falling about ten feet onto the rocky floor below. There are no minerals lining this tube, because it was only formed a short time ago. As time passes minerals will probably be deposited.



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**Fig. 5**



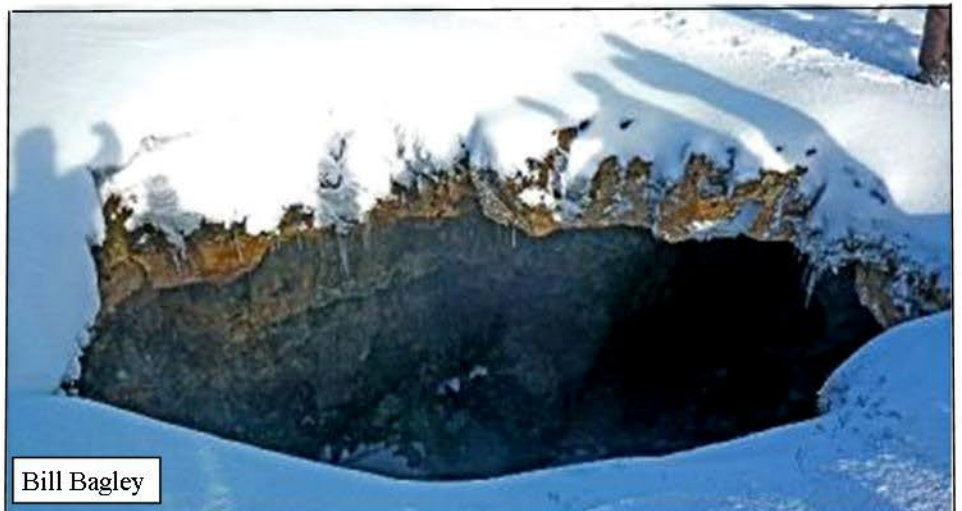
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**Fig. 6**

There are locations around the world that are renowned for the abundance of geodes, and many of these locations are noted for the type of geode which are found there. So much so that nicknames are assigned to their peculiarities, and their location. Many localities have a different set of "ingredients" to other localities, so there is a wide variance in geode appearance.

The U.S.A. has some interesting geodes, for instance Dugway geodes. These were flushed from geode bearing rhyolite flows, by wave action on the shores of a lake which once covered most of western Utah. They eventually accumulated in lake sediments which are now known as the Dugway Geode Beds. The geodes are mostly filled with agates, quartz crystals, and chalcedony, but some Dugway geodes are renowned for trace amounts of uranium in their filling which causes them to fluoresce under U.V. light.

Another type of geode also comes from the U.S.A. They are found near the intersection of three states, Iowa, Missouri, and Illinois, in an area surrounding Keokuk, a community in Iowa (**Fig. 8**). The Keokuk geodes are so plentiful that this is regarded as one of the best sites in the world. The geodes have weathered out of the limestones and dolomites of



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**Fig. 7**



Fig. 8 Keokuk geode ©Astynax/Wiki commons

Mississippian (Early carboniferous) age. The geodes are mostly composed of quartz crystals inside a chalcedony shell, but there are a few have been found that contain other minerals, such as kaolinite, calcite, pyrite, sphalerite, aragonite, and a few others. The geodes are so plentiful that a search on online retailers will come up with many adverts selling them by the dozen or more, to be broken open by the buyer.

Geodes are found in the U.K. but obviously not on the scale that they are found in the U.S.A. Kenfig sands, at Porthcawl, in south Wales is a possible hunting ground. Geodes found on the beach are thought to be washed in from offshore.

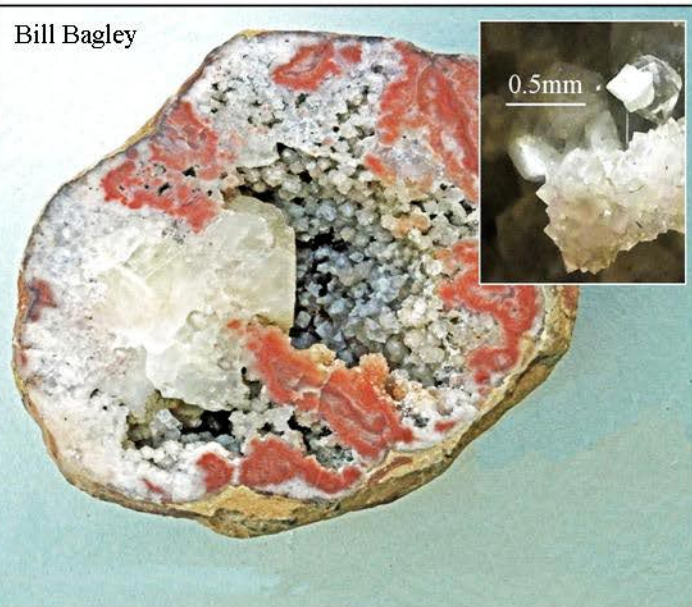


Fig. 9

The geode above in Fig.9 is from Dulcote hill quarry in the Mendip hills. The geode is a mixture of agate and chalcedony with a large crystal of calcite taking up about one third of the interior space. The reddish colour is probably from trace amounts of iron.



Fig. 10

The specimen in Fig. 10 is an anomaly to me. Is it a concretion, a nodule, or a geode? Whichever description is attributed, it is a beautiful specimen. It is from Hefmanov in the Czech republic, and unsurprisingly it's nickname is a "Hefmanov ball". It is about 5 cm. across and has a centre of phlogopite mica surrounded by a fibrous aggregate of anthophyllite.

Fig. 11 shows a geode that I discovered on a building site excavation when passing through Bridgenorth in Shropshire. The area is predominately sandstone, and this geode is calcitic, with a centre of dirty brown calcite crystals.



Fig. 11

In conclusion, geodes are so varied and so colourful, that it is hardly surprising that there are dedicated collectors of geodes. I have quite a number, and for me the most interesting part is to examine the pristine central crystals under the microscope.

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