Agate formation theory, 3 threads

Mindat forum 8-7-2017 download

Forum thread with responses by Donald Kasper

The purpose of science is to develop conceptual models that explains all the data for a component of nature under study that then allows us to predict future behavior.

When models cannot achieve this goal, people typically select pieces of data that fit their model, and exclude data that does not. This produces inferior models which are readily discredited by others. When models are consistently proposed that can be discredited, the problem is not the models, the problem is that the fundamental underlying science is insufficient to allow us to come to a conclusion with a good model.

Volcanology, geochemistry, mineralogy, and infrared spectroscopy all suffer from insufficient research funding and are underdeveloped, not allowing us to explain accurately how volcanoes work, how infrared works, and therefore how agates form and how to even study them. Research papers should therefore be used as a source of data that may be incorrect at times, not as a set of publications explaining how things may actually work. I use published research as a source of data to construct my own geologic models, and from that my own agate genesis models.

In order to explain how agates form you have to know what you are seeing. This takes a method of spectroscopy. I use infrared spectroscopy. Then I made about 20 scientific discoveries in infrared and shared those with world scientists in infrared, most notably with Caltech University, Pasadena, CA group on remote sensing and mineralogy. Sometimes I shared data with organizations such as the U.S. Geological Survey. Then from that, knowing what various mineral phases are, I surveyed the host lavas of agate systems, making more discoveries, and from all that, studied the composition of agates themselves in this geologic context. You cannot sum up current science and discern how agates form as the research is incomplete and inaccurate. That is, you do not figure out how agates form in a few weekends of reading, it takes about 10 years of research. That research summary comprises a series of some 20 books I have written on geology, infrared, and agate systems.

Agates contain alpha and beta-quartz, alpha- and beta-moganite, five species of opal (opal-C, opal-CT, opal-Q, opal-BC, and opal-BQ), never opal-A, carbonates from calcite to dolomite, clays such as montmorillonite (bentonite), celadonite, kaolinite and halloysite, iron compounds such as goethite, minerals from copper, copper oxides, to rutile, and from all that, we get told the 150 year old urban myth that agates are varietal quartz and the fan structures in them are zeolites. However, no zeolites are found in agate structures using a method of spectroscopy instead of guessing. If you cannot understand what something actually is, you cannot discern how it formed.

Donald Kasper

Posted by Larry Maltby

Larry Maltby  **April 26, 2017 12:54PM**

During September 10 – 13, 2005 a Symposium on Agate and Cryptocrystalline Quartz was held at the Green Center, Colorado School of Mines, Golden, Colorado.

The symposium was sponsored by Friends of Mineralogy, Colorado Chapter; Colorado School of Mines Geology Museum; and U.S. Geological Survey.

There were 33 professional papers presented by well-known researchers on various subjects related to theories on agate formation. Each of the presentations were summarized and compiled into a 144 page report providing a very readable account of agate formation theories currently under investigation.

Rock Currier was one of the presenters. Here is the link: http://friendsofmineralogycolorado.org/wp-content/uploads/2016/10/2005_FMCC_Agate_Symposium.pdf

Response: No it was not a presentation of all agate formation theories in circulation. Dr. Pabian gave a nice paper discussing a number of the outstanding problems, which I have addressed in my series of books.

Alfredo Petrov **April 26, 2017 01:55PM**

I was at that symposium, Larry; it was most interesting. One researcher from Spain, Dr Enrique Merino, proposed that agates (at least those he'd studied from Rio Grande do Sul) had formed at red-hot temperatures when hot basalt flowed over mud puddles and incorporated them as steam-bubble-derived silica gel pods (at those high temperatures). So there was someone providing evidence that agate formed at temperatures around the melting point of basalt, and other researchers who showed evidence that agates essentially formed at room temperature. And I thought at the time, after 150 years of studying them, we still don't know for certain how they form. (Well, there are people who claim they know, but the evidence presented so far is not yet entirely convincing.)

Response: The first myth to tackle is that agates form one way.

Larry Maltby  April 26, 2017 05:45PM

That must have been an interesting couple of days, Alfredo, having all of those guy's in one room at the same time. I wonder if any arguments broke out. It seems sometimes that there is a competition to finally solve the problem. I started looking at Merino"s (Professor Emeritus, Geochemistry, Indiana University Bloomington) theories a couple of years ago and I have to admit that I struggle. As you point out he focuses on the amethyst geodes that are found on the Rio Grande do Sul border with Uruguay. These geodes are huge and represent a unique occurrence in the world yet he states in one of his papers "Both requirements point toward agate crystallization from a blob of silica gel (Wang & Merino, GCA 1990, AJS 1995), and precludes crystallization of agate (one with repetitive textures) from aqueous silica solutions at any T,P." It is the word preclude that causes me to struggle.

I recently came across another professional paper "The genesis of the amethyst geodes at Artigas (Uruguay) and the paleohydrology of the Guaraní aquifer: structural, geochemical, oxygen, carbon, strontium isotope and fluid inclusion study, June 2010".

The first time I accessed this paper I was able to read the entire work. Now I can only access the abstract. (see below)

"The amethyst-bearing geodes found in the flood basalts of the Arapey formation at Artigas (Uruguay) were formed as protogeodes by bubbles of CO2-rich basalt-derived fluids. The formation of the celadonite rim and the lining of the geodes by agate followed by quartz and amethyst were driven by the artesian water of the Guaraní aquifer percolating the basalts from below. The temperature of the amethyst formation is estimated from fluid inclusion data to be between 50° and 120°C. Oxygen stable isotope data suggest a crystallization temperature of calcite of about only 24°C. The actual wellhead temperature of the water produced from the Guaraní aquifer in the study area is around 29°C."

Significantly different than Merino"s theory.

Coincidently Bill Coruda wrote a summary of this theory. I lean heavily toward Bill's version.

file:///C:/Users/Owner/Downloads/AmethystCathedral.pdf

Response: Oxygen-18 to 16 ratio data shows the whole earth formed at 29 C and this is the temperature basalt erupts at. That is, say whatever you want with this method, as it is bunk. However, if beta-moganite is confirmed in agate, then its formation cannot be less that 354 C, and I do believe I have found it in infrared spectroscopy. There are two moganite populations, one only found in pyroclastic rocks.

Edited 1 time(s). Last edit at 04/28/2017 11:43AM by Larry Maltby.

Wayne Corwin  April 26, 2017 11:35PM

Larry
That link will only work on your own computer,,,, not here!

Larry Maltby  April 27, 2017 05:21AM

Thanks Wayne,

Bill's summary can be down loaded from this site.

https://minds.wisconsin.edu/handle/1793/11535?show=full

This provides an alternative to Merino"s theory that makes a lot more sense to me.

Edited 1 time(s). Last edit at 04/27/2017 05:27AM by Larry Maltby.

Paul Brandes  April 27, 2017 12:38PM

Interesting read Larry; thanks for sharing.
I believe Bill just might be on to something with this hypothesis, at least for the Brazilian geodes.
Response: A geode is an agate structure with a lava shell. An amygdule is formed without a lava shell. As such, there are no Brazilian geodes. They are all amygdules.

Ralph Bottrill April 28, 2017 05:17AM

I think Bill's explanation is in accord with most geological research on the subject.

Response: Yeah, except for that research paper on Brazilian amygdules proposed they formed at flow bases in supercritical fluid conditions, conditions over 374 C.

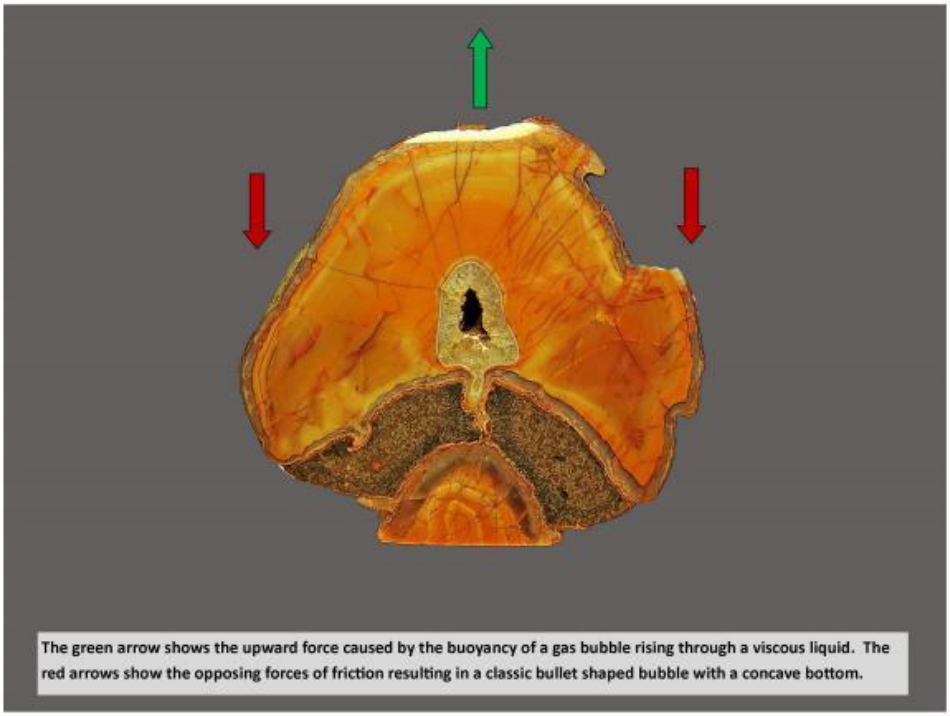
Larry Maltby  May 15, 2017 03:39PM

The hydrodynamics of bubble shape in viscous liquids reveals an important feature of the shape of amethyst cathedrals. As a gas bubble rises in a viscous liquid it assumes a bullet like shape with a concave bottom. As more gas bubbles coalesce the bubble increases in size and significantly grows in vertical length.

See: https://www.intechopen.com/books/ionic-liquids-new-aspects-for-the-future/hydrodynamics-of-ionic-liquids-in-bubble-columns#article-front

If you do a Google search on “amethyst cathedrals” and then click on images you will see many photos that show some version of the classic bullet shape.

The photo below shows an agate (5.0 x 3.8 cm) that I collected In-situ from the basalt of the Lake Shore Traps of Keweenaw County, Michigan. If you imagine the “bubble” prior to the deposition of the microcrystalline quartz, the vesicle has a classic bullet shape. From below another “bubble” is starting to coalesce and a connection to the larger bubble above had been established at the time that the lava froze sufficiently to stop the action. This does not appear to be the result of a steam explosion caused by the lava flowing over a puddle of water.



Publication1.jpg

Response: Brazilian cathedral agates have shells of celadonite clay. This is found in volcanic rocks and no others and does not form from weathering. The agate does not contain water in the core nor humic acid, two key indicators of groundwater circulation. So there is no groundwater evidence to find.

Edited 2 time(s). Last edit at 06/02/2017 02:59PM by Larry Maltby.

Daniel Bennett May 15, 2017 04:12PM

"If you imagine the “bubble” prior to the deposition of the microcrystalline quartz" it seems like in order to have that shape it must have formed at the same time as the chalcedony. the chalcedony must have been viscous.

Daniel Bennett May 15, 2017 06:03PM

that's also an interesting idea of geodes forming from puddles being covered with lava. its almost like saying that quartz replaces water or that quartz crystals come from water.

Response: That would be correct. It is called supercritical fluid. 4000 times the solubility of silica in water. Diffusion of a gas. Solubility of a liquid. No surface tension. Provides vapor deposition on void walls that dripping water has no known physics to explain. Using spooky physics like dripping water for agates puts you in a bad place.

Alfredo Petrov May 15, 2017 07:20PM

"the chalcedony must have been viscous." "... its almost like saying that quartz replaces water or that quartz crystals come from water."

That was indeed the general idea, Daniel, but rather than water think of a liquid silica gel.

Michael Harwell May 16, 2017 01:26AM

great timing. I was pondering this yesterday. Perhaps this is an example. I found this at the beach. Nothing special. But, I Like to collect the ugly ones so I can compare and learn...maybe cut later down the road or make a stream? Anyway, I was pondering this last night. Was the banding vertical when in a liquid state? Making its way up? When I find them they usually lay flat or horizontal.

IMG_7963.JPG

Response: Vein agates only form vertically or nearly so, from late stage volcanic venting. There are zero horizontal agate veins as agates do not form from weathering in any void orientation.

IMG_7962.JPG

IMG_7957.JPG

Edited 3 time(s). Last edit at 05/16/2017 01:58PM by Michael Harwell.

Daniel Bennett May 16, 2017 05:48PM

"If you imagine the “bubble” prior to the deposition of the microcrystalline quartz, the vesicle has a classic bullet shape." is the bullet shape not proof that they occur together? how could there be a bubble prior to deposition of quartz? the silica gel must have been there to help create that bubble.

Larry Maltby  May 17, 2017 02:50PM

“how could there be a bubble prior to deposition of quartz? the silica gel must have been there to help create that bubble.”

Daniel, vesicles in basalt are caused by gases that are released in molten lava as the result of a significant reduction in pressure due to a volcanic eruption. If you do a Google search on the key words “vesicular basalt” and then click on images at the top of the page you will see many photos of basalt with empty vesicles. The presence of a silica gel is not required to produce a “bullet shaped” vesicle. The mineralization within these empty vesicles usually occurs after the lava solidifies including the deposition of quartz in the form of agate. The agate that you now see in a sample of basalt is the end result of a long sequence of processes occurring over geological time. They may include the crystallization of both macro quartz and micro quartz, color changes due to natural dying processes, the dissolution and recrystallization of the quartz, and the crystallization of various mineral inclusions.

See here for the variety of mineralization in vesicles all from a single locality.
https://www.mindat.org/article.php/1801/+St.+Louis+Mine%2C+Houghton+Co.+Michigan

Remember the statement that Alfredo made at the beginning of this thread. “And I thought at the time, after 150 years of studying them (agates), we still don't know for certain how they form.”

Response: We know exactly how they form. The formation depends on the type of lava. Rhyolite geodes have lava shells that captured the host volcanic rock the agate cores formed with, so the concept that there are voids around and silica flows in when the lava is also

detached from the host rock as one structure, disproves weathering. You can only get agate geodes with lava shells by magmatic vesiculation.

Daniel Bennett May 17, 2017 05:45PM

thank you Larry. I realize theres no certainty about it which makes it fun to ponder...I didn't think we were looking at a bullet shaped vesicle in basalt I thought we were looking at a bullet shaped vesicle in agate...if so that should prove that the silica gel was present and viscous when that bullet shaped vesicle occurred. right?

Gregg Little  May 17, 2017 08:15PM

To follow Larry's thread and his quote of Alfredo's, I'll add the following.

Often somewhat simple or "straight line" arguments are used for the geological processes based on the final form observed in a specimen, say an agate nodule. Agate, chalcedony or quartz is particularly complex as its formation can occur 1) in a wide range of temperatures, 2) at various pressures deep in a rock succession to as little as one atmosphere in surface deposits, 3) in most geological settings and, 4) over geologically instantaneous events to almost unfathomable long time periods. Other debates surround silica sources, crystallization sequences, closed and open systems, hydrothermal verses silica gel, episodic events, etc.

Although researchers are usually able to tease out most details on the first three points, they will grudgingly admit that inconclusive studies can suffer due to the time component. Both money and human resources are not able to duplicate this most critical element. Not often is it easy to demonstrate the sequence from extrusive event to the final specimen in hand as often intermediate steps of deposition, solution, replacement and re-crystallization, to name a few, occur.

Response: Geologic time scale for agate formation is called microscopic marine sediments. You want an agate you can see bigger than 200 microns, you have to go to the volcanic rocks. Those formed fast on the order of thousands of years. Since weathering occurs everywhere, those proposing weathering for agate formation have to explain why granite has zero agates and geodes have rhyolite and dacite and andesite lava shells, but never granite shells.

Daniel Bennett May 17, 2017 09:39PM

well I reread Larry`s post from may 15. now I realize that he is talking the shape of the entire agate. but when I read it then I thought he was describing the vesicle inside the agate. which also has the same bullet shape.with that little tail pointing down...the vesicle in the agate has its own bullet shape in stead of really following the outermost banding of the agate itself which isn't really all that bullet shaped but the original vesicle may have been...I guess theres always at least two ways of interpreting things. Its a good picture for contemplating.

Gregg Little  May 18, 2017 01:13AM

There is an very interesting aspect to the agate's void that Daniel is referring to in the picture seen in Larry's entry (Publication1.jpg). The silica gel deposition theory by Moxon has to account for an approximate volume loss of about 20% upon crystallization. The void plus the macro-crystalline clear quartz could be evidence of the 20% volume loss thus supporting the silica gel hypothesis of deposition.

Larry Maltby  May 19, 2017 01:31PM

"Was the banding vertical when in a liquid state?"

Michael, I assume that you are talking about the "chevron" pattern in the banding. Your sample looks like a vein deposit of high quality chalcedony. I don't think that the pattern necessarily points upward. It is most likely just the pinching off of the pattern due to running out of space to form.

Response: Chevron agate is agate whose bands meet at acute angles to the void walls. These are not concentrically formed agates. They represent late stage fluid flow in voids during gel setup.

Michael Harwell May 19, 2017 01:39PM

Thank you Larry. Very interesting topic.

Larry Maltby  May 19, 2017 05:35PM

"That's also an interesting idea of geodes forming from puddles being covered with lava."

Geologists have studied this subject and have provided some interesting information. Based on a wide variety of conditions the hot lava reacts with the water and a steam explosion occurs at the contact with the wet substrate at the bottom of the flow. Evidence of the explosion into the lava can be seen in the basalt after the lava solidifies. The formations are called "spiracles".

In the U.S. one of the best places to see spiracles in basalt is in the massive flows of the Columbia River Basalt Group in Washington State. Here is a photo from a paper on hydrology produced by the State of Washington.

Figure 15. Two spiracles in the upper Frenchman Springs Member. Arrows point to the edges of the spiracles.

IMG_1045.JPG

Response: Looks like lava that consumed some trees to me. I have seen a lot of lava, and never seen these structures. Further, their shape has nothing to do with amygdules shapes except for Brazilian cathedral amygdules.

Ref, T. Tolan et-al, 2009, Hydrology of the Columbia River Basalt Aquifer System, Columbia Basin Ground Water Management, State of Washington.

The spiracle is full of explosive debris including Hyaloclastite, a tuff like breccia rich in black volcanic glass. In this case there are no open vugs or vesicles.

Below is a drawing shown in another professional paper.

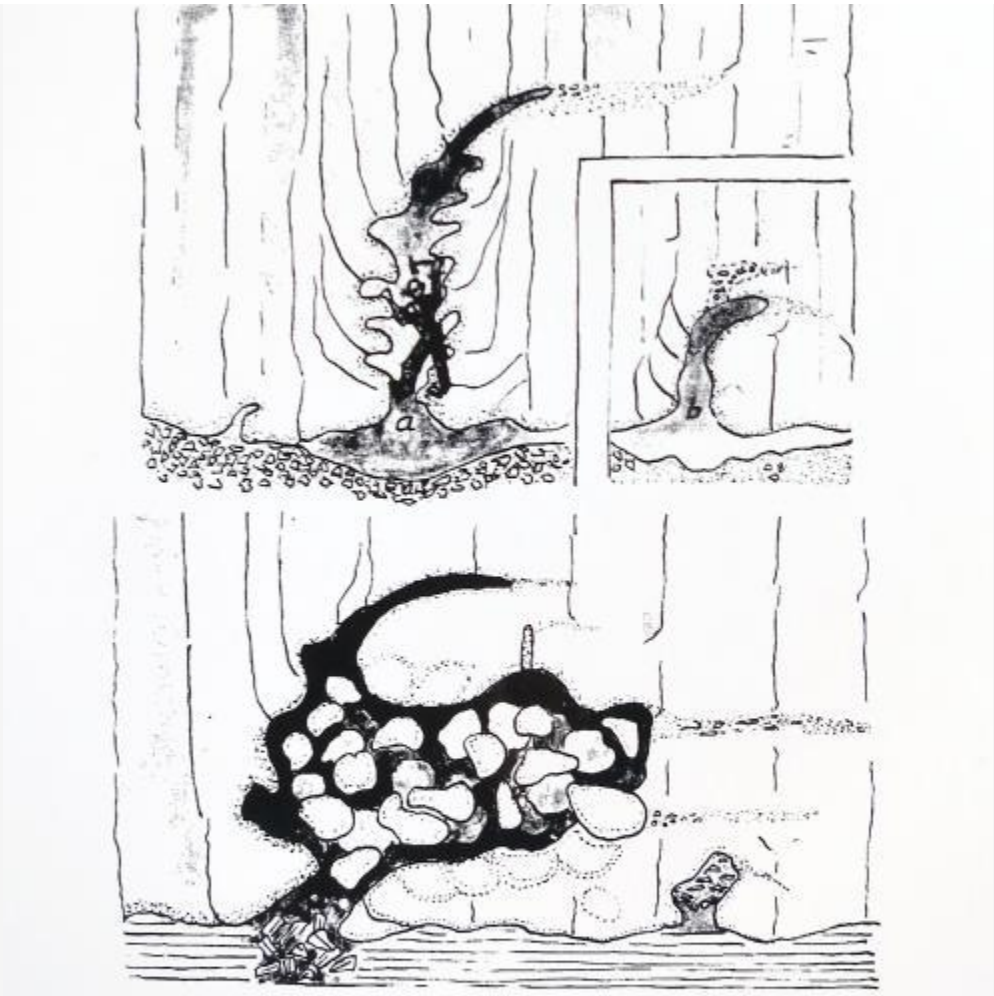


Fig. 3. Large spiracles in the Columbia River basalt. In each example the direction of flow is to the right. a). Large spiracle with lobate walls rising from a thick mass of aa clinker. Moses Coulee, Washington. b). Spiracle, with tongue-like clusters of vesicles, rising from a pit in the underlying pahoehoe flow top. Near Olex, Oregon. c). Large spiracle rising from beds of water-laid tuff, and expanding into a cavity filled with pillows. Note smaller spiracles, vesicle clusters, and vesicle cylinders extending from the edges of the cavity. Clackamas River, Oregon.

IMG_1047.JPG

Ref, A. C. Waters, 1960, Determining Direction of Flow in Basalts, Johns Hopkins University, Baltimore, Maryland.

The top drawing (a.) shows a large open spiracle with corrugations caused by the molten lave trying to collapse into the space but being held back by the pressure of the steam in the vug. The lower drawing (c.) shows a large spiracle filled with pillow basalt due to a larger amount of available water.

None of these examples indicate the presence of silica gel, agate or any other secondary deposits.

Response: You have to bother to understand the whole geology. Lava over granite or lava over limestone versus lava over 0.5 micron volcanic ash to volatilize its silica in the water instantly are different things.

Edited 1 time(s). Last edit at 05/19/2017 05:50PM by Larry Maltby.

Gregg Little  May 20, 2017 08:35PM

One of the more bizarre examples of this spiracle formation, along with associated pillow lava and vessicle tubes is found at the Blue Lake Rhino site in Washington State. Here the water supply was the rhino's body as well as the surrounding environment.

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Response: Explain why there are round topped Brazilian amygdules with flat and pitted bottoms. Waterlines show the flat part is the bottom. Correct, that was contact with the ground. Again, you suffer from one way the world formed theory prognosis.

Ralph Bottrill May 20, 2017 11:46PM

I have seen these spiracles filled with zeolites and calcite, along with amygdules of the same. Another argument against agates forming as molten silica balls, it's hard to do that with calcite and zeolites.

Edited 1 time(s). Last edit at 05/21/2017 12:02AM by Ralph Bottrill.

Gregg Little  May 21, 2017 06:41PM

I am not one to accept a blanket theory of formation, especially for as complex a mineral as quartz. The theory of hydrated hot silica gel balls are conceivably quartz formation under a very specific set of conditions; confining pressure, temperature, amount of available water, rate of cooling, localized relatively open or closed system for the amygdule, etc. The examples in this thread support the possibility of both theories existing without contradictions.

Larry Maltby  May 22, 2017 07:36PM

I agree, Gregg, it is always a good idea to keep an open mind. As we have said before, just about the time that we think that we understand a mineralogical or geological principal, a specimen shows up that blows the idea out of the water. However, regarding the comparison of two diverse agate formation theories, I have in the past made judgments based on probability.

One theory is based on the idea that agate forms as a **secondary deposit**. This is the conventional theory and is based on a large body of evidence and also fits the observations that I have personally made during field collecting. If you consider that agate forms in vesicles in basalt, in sediments, in veins, in wood, in bone, in casts of wood, in casts of fossils, as replacements in other minerals, this theory is highly probable.

The other theory put forth by Merino is that agate forms as a **primary constituent** of basalt crystalizing in unison with the basalt. Below is a brief quote from his paper.

“The basalt flow stops moving and starts cooling down. As the 1000-degree isotherm sweeps inward through the flow, the basalt crystallizes fast. Each glob of silica gel, as a closed system, quickly crystallizes into an agate too, just as fast as the surrounding basalt, and at a similar, very high temperature.”

This would be a very easy theory to prove but I have spent many hours looking for verification to no avail. It seems to me that all that would be required, would be for a researcher to go to a recent flow less than a year old and find fully developed agates in recent basalt. I have never found a reference like this. For this reason it seems to me that Merino’s theory has very low

probability to have occurred in nature. On the other hand if fully developed agates were found in year old (or less) basalt the theory would have more credibility.

Edited 2 time(s). Last edit at 05/23/2017 04:27AM by Larry Maltby.

Response: Okay, show an agate formed in coal, schist, granite, olivine basalt, pumice, sand and sandstone, clay, or tephra from weathering. You cannot. So your weathering model is dead. The primary component of groundwater is calcite, not silica. Therefore you claim you find only calcite nodules. This is not observed. So what water has no calcite? Magmatic water. That is the only one.

Uwe Kolitsch  May 23, 2017 08:58AM

Recommended reading:

Numerical simulations of amethyst geode cavity formation by ballooning of altered Paraná volcanic rocks, South America
L. A. HARTMANN, J. T. N. MEDEIROS and L. T. PETRUZZELLIS
Journal: Geofluids, 2012, Volume 12, Number 2, Page 133
Numerical modelling by finite element methods provides two significant insights into the formation of the giant amethyst geodes of the Paraná volcanic province: the conditions needed to open the cavities and the conditions that control their size and shape. Giant amethyst geodes were formed in the Cretaceous (135 Ma) in altered volcanic rocks by water vapour pressure (Δp) at about 0.5 MPa under an altered basalt cover of 5–20 m. Only rocks with Young's modulus values (E) in the range 1–2 GPa can sustain ballooning, which is the growth of a cavity in a ductile medium by the pressure of water and its vapour. The size of the proto-geode is dependent on the water vapour pressure, which is directly related to thickness of the overlying basalt. Varying the yield points causes the formation of either prolate or oblate cavities. A low transition point (smaller than 0.18 MPa) generates a prolate-shaped cavity, whereas a high transition point (larger than 0.18 MPa) generates oblate proto-geodes. Proto-geodes are smaller when Young's modulus is higher (rock is less altered) or when water vapour pressure is lower (because of thinner overburden of basalt). The calculations are an indication that the processes operative in the altered basalts led to the opening of giant cavities by ballooning.

Stable isotope and mineralogical investigation of the genesis of amethyst geodes in the Los

Catalanes gemological district, Uruguay, southernmost Paraná volcanic province
Lauren C. Duarte, Leo A. Hartmann, Luiz H. Ronchi, Zsolt Berner, Thomas Theye and Hans J. Massonne
Journal: Mineralium Deposita, 2011, Volume 46, Number 3, Page 239
Stable isotopes (C, O, S) and mineralogical studies of the world-class amethyst-geode deposits of the Los Catalanes gemological district, Uruguay, constrain processes operative during mineral deposition. The mineralized basaltic andesites from the Cretaceous Paraná volcanic province are intensely altered to zeolites (clinoptilolite) and clay minerals. Variations in the δ18O values of silica minerals in geodes (chalcedony, quartz, and amethyst) are much larger and the values generally somewhat lower (21.2–31.5‰) in the Uruguayan deposits than in the Ametista do Sul area of southern Brazil. The range of δ34S values (−15.0 to −0.3‰) of altered basaltic rocks requires (in addition to sulfur of magmatic origin) the involvement of 34S-depleted sedimentary sulfur from bacterial sulfate reduction. The results delimit the mineralizing processes to a post-eruption environment characterized by low temperature and strong interaction of the lava flows with meteoric water.

Sequential opening and filling of cavities forming vesicles, amygdales and giant amethyst geodes in lavas from the southern Paraná volcanic province, Brazil and Uruguay
Léo Afraneo Hartmann, Lauren da Cunha Duarte, Hans-Joachim Massonne, Cassiana Michelin, Leonardo Manara Rosenstengel, Magda Bergmann, Thomas Theye, Juliana Pertille, Karine Rosa Arena, Sandro Kucera Duarte, Viter Magalhães Pinto, Eduardo Guimarães Barboza, Maria Luiza C.C. Rosa and Wilson Wildner
Journal: International Geology Review, 2012, Volume 54, Number 1, Page 1
The opening and filling of cavities in rocks are the major processes related to the generation and sealing of porosity in ore deposits. This study documents three stages of opening and filling of vesicles and geodes in the basalts and rhyodacites of the southern Paraná volcanic province. Each step detailed here is actually part of a sequence of minor hydrothermal events. First, lava degassing at high temperature (1150°C) formed small (<4 cm) vesicles in the crusts of flow units. In sequence, these vesicles were partly to fully filled at low temperature (30–150°C) by hydrothermal minerals, particularly clays and zeolites; this process also sealed the porosity of the lava. Second, the injection of fluidized sand generated new cavities, which were partly filled with sand; the newly formed porosity was sealed by the low-temperature fluid. Third, intense alteration of the basalt or rhyodacite core into a claystone favoured the opening of small to giant protogeodes (0.1 mm to 4 m) by dissolution; cooling of the fluid led to the precipitation of hydrothermal minerals, particularly the spectacular amethyst, calcite, and gypsum-bearing geodes.

Controls on prolate and oblate geode geometries in the Veia Alta basalt flow, largest world producer of amethyst, Paraná volcanic province, Brazil
L.A. Hartmann, J.T.N. Medeiros, S.B. Baggio and L.M. Antunes
Journal: Ore Geology Reviews, 2015, Volume 66, Page 243
Variable intensity of hydrothermal alteration of the Veia Alta basalt flow, Ametista do Sul, Brazil, exerted the fundamental control on the shape and size of the amethyst geodes. The loss on ignition (LOI) of the host basalt is used as a proxy for intensity of alteration and has direct relationship with the height of the geodes (up to 150 cm in the three study mines) and with the prolaticity of geodes. All rocks with LOI > 5 wt.% host prolate geodes and all oblate geodes are hosted in rocks with LOI < 5 wt.%. An additional observation is the extensive mobility of several elements during hydrothermal alteration (variable LOI), including SiO2, K2O and Rb. The hydrothermal origin of the geodic cavities is thus established and their shapes explained by the empirical observation of the results from a previous numerical simulation experiment.

Gregg Little  May 23, 2017 06:35PM

Greetings Larry and Uwe;

Much as yourselves, I favour the hydrothermal theory of the formation of agate, chalcedony and quartz associated with volcanogenic terrain but research argues that it is far from established as the only theory. I would recommend reviewing an excellent summary which for even the less scientifically incline who follow this blog would find informative; Agates: a literature review and Electron Backscatter Diffraction study of Lake Superior agates, Timothy J. Beaster Senior Integrative Exercise March 9, 2005, Submitted in partial fulfillment of the requirements for a Bachelor of Arts degree from Carleton College, Northfield, Minnesota.

Response: The technique did not work and he concluded nothing.

A brief of the Summary section is that there is much research supporting multiple theories. This situation has resulted from many authors' research into the various silica sources, the methods of agate deposition in the amygdule, the range of formation temperatures and the significance of age on agates. Although the structure of agate has been well researched, as of this 2005 review, the replication of agate-like pattern generation in the laboratory has eluded researchers resulting in further inconclusiveness.

Response: False. Russian scientists made banded silica structures by using platinum vessels, silica sand, and heating it to supercritical for several weeks. If they used volcanic ash, it would have been instantaneous. The agate formed at the fluid base/void top meniscus. This is the contact where the fluid collapsed to the floor of the vessel when it went subcritical.

The amethyst geode cavity formation by ballooning of altered Paraná volcanic rocks, in South America is a very interesting and specific case that supports the hydrothermal depositional theory. Although impressive, this unique deposit should not be extrapolated to explaining all agate deposition but rather clearly demonstrating a hydrothermal mechanism in this setting.

Larry Maltby  May 24, 2017 04:25PM

Uwe,

Thanks for the information. I was able to obtain the complete paper on your first reference about the ballooning of vesicles in altered basalt. It is especially interesting to me because I have collected extensively in soft, altered or decomposing basalt containing agate nodules up to 20 cm in length and this paper gives me some insight into the possible physical properties of the matrix. I am just starting to dig into this and will likely have more comments later.

Another point of interest is that I worked for about 40 years designing sheet metal panels and structures in the auto industry. We used finite element analysis extensively in this process and now I find out that this science was also used to investigate the ballooning of vesicles in basalt.

Alfred L. Ostrander May 24, 2017 08:18PM

Uwe, thanks for the references.

Several recent articles I have found on the amethyst geodes in the Serra Geral flood basalts near Ametista do Sul present a two stage process for the geodes. The proto-geode cavities formed during cooling with dates averaging out to about 135 Ma. This would include the ballooning mentioned previously.

The second stage was the formation of the geodes themselves. That is considered to be from mineralized meteoric waters. The sources for the mineralization are considered to be the interstitial glass fractions of the basalts and possibly also from the underlying arenaceous

Botucato sandstones. It seems this is mostly hydrothermal waters rising from an aquifer in the Botucato sandstones. Formation of the geodes appears to be dated from 65 Ma to about 80 Ma. That is quite a gap in time from the original basalt flows but those are the figures presented. Keeping track of hydrothermal events through this extended period of time has been a bit of a problem only in that I am trying to put together as coherent a time line as I can.

Response: Yeah, but there are voids all over those Brazilian flows, and fractures everywhere. Everything was exposed to weathering and water, particularly the top. So why are agates only at the flow base where the temperature of the fluid water under pressure from overburden rock has the agate? You act like those are the only voids in the flow, which is false. If all it takes is voids and water, show me a scoria vent with agate. You cannot. Degassing systems do not have agates. Fumaroles and hot springs and geysers do not have agates. Hydrothermal venting of water at the surface has no agates. This puts a big dent in your hydrothermal model. You get micron banding and micron agates in these systems but no agates over a few millimeters. This is a problem.

Response: If any silica will do to make agate show agates in sandstones, granites, schists, coesite, clays, shales, and at world beaches. You cannot. There must be magmatic silica or silica as volcanic ash.

I found a lot of this information just googling Brazilian agate formation. Still lots of reading to do especially in regards to the tectonic movement and shifting environmental factors up to the period of time about 70Ma when the geodes were forming.

Just an interesting note: These flood basalts are considered to be related to the Walvis hot spot appearing about 135 Ma. Of course, this was the beginning of rifting between Africa and South America. Part of the Serra Geral lavas are still sitting along the African margin. In Namibia they are referred to as the Etendeka flood basalts. The combined basalts of the Parana Flood Basalt Province are thought to be the largest in the world.

Gregg Little  May 26, 2017 02:25PM

Alfred; You wrote "That is quite a gap in time from the original basalt flows but those are the figures presented. Keeping track of hydrothermal events through this extended period of time has been a bit of a problem only in that I am trying to put together as coherent a time line as I can."

Are you trying to equate tectonic events to the periods of hydrothermal activity for the quartz mineralization? I was poking around the literature and the opening of the South Atlantic was episodic both in time and spatially (fixed North African block causing opening from both the north and south ends of the South Atlantic rift zone). I am not sure if there were "failed" subduction zones during early rifting adjacent to the Parana Basin as this could be a possible heat source to drive the hydrothermal plumbing that caused the later mineralization. Early rifting predates the mineralization but much tectonic activity and vulcanism extends well into the late Cretaceous (100 to 65.5 mya).
Regards,
Gregg

Daniel Bennett July 23, 2017 06:50PM

i had brought this up in an earlier less appropriate topic. but I still am not sure what to make of it. this time I cut an amygdaloidal piece of basalt for a better picture. its puzzling to me why some vesicles are empty some are partially filled and some are completely filled. when I look at it and imagine that its still liquid it looks like gas bubbles and water drops side by side and in some cases they have merged together causing partial fillings. I want to acknowledge the dubious none scientific nature of this inquiry. I know its debatable and I don't want to start a major debate.im just curious what the other explanations might be.

pics015.JPG

picts003.JPG

Response: Weathering and 135 million years of tropical rain was enough to fill every last void except there are no fractures where the water could have entered in any of them. Water does not go through solid rock by diffusion without extreme temperature and pressure. However, degassing systems with gas and fluid nucleating and migrating, sometimes merging explains this. Why gas voids are in certain places is like why agate fills certain places. It is a matter of nucleation upon degassing with some channelways that later collapsed.

Daniel Bennett July 23, 2017 06:53PM

here is another picture that I have no clue about. it looks like a bubble formed between the micro and macro crystalline quart.

pics018.JPG

Ralph Bottrill July 24, 2017 01:13PM

In zeolitised vesicular basalts, it's quite typical to get highly varied mineral assemblages in adjacent vesicles. Some I have seen have vesicles that can contain just natrolite, others only analcime, some filled with smectite and some have calcite, all within a few square cm. I presume it must have something to do with changes in the fluid chemistry and temperature over time, with the permeability also varying with micro cracks constantly forming and revealing by filling with secondary minerals. The second image suggests the previous presence of a calcite botryoid, not uncommon in these assemblages.

Response: Using infrared spectroscopy, there are zero zeolites in agates with the exception of clinoptilolite found in some with implosion breach structures. Zero plumes, sagenites, blades, and other crystal forms of mineralization in agates are zeolites. As zeolites can form in flows and weathering later, you must find zeolites in agates in these lava flows. Show me one. Just one. You cannot. So weathering is not related to agate formation. Also, zeolites are not soluble in groundwater, so when water would intrude, the zeolites are not dissolved out.

Daniel Bennett July 24, 2017 10:39PM

Ralph I appreciate your feedback. I suppose a microscope would be necessary to see these micro cracks. have you ever seen these kind of cracks in a thin slice? is it obvious that filled vesicles have cracks leading to them and the empty ones don't?

Response: There are no microcracks. Furthermore, surface tension would prevent fluid migration on such a small scale. Note the refusal to use a microscope to study one rock by this individual, a true minimalist.

Paul Brandes  July 25, 2017 01:55AM

Agree Ralph.
The vesicular basalts of the Keweenaw Peninsula in Michigan are an education in paragenetic sequences when it comes to mineral assemblages. In the Keweenaw, there were at least three different stages of mineralisation, each with their own chemistry which produced many different minerals, including the famous native copper deposits we see today.

Ralph Bottrill July 26, 2017 04:18AM

If you cut a thin section of these vesicular basalts you can usually see such microfractures, but not always obvious as you only get a 2D image of a 3D object.

Response: This is disinformation and evasive talking. You get a fracture channelway, it will be lined with agate just like the other voids. Silica cannot tell the type of void. So as silica migrates in the channel, it is being closed by silica deposition. You found zero channelways with silica. There are zero basalt breccias of the Keweenaw with silica filled channelways.

Daniel Bennett July 26, 2017 04:50PM

that makes sense.

David Baldwin July 26, 2017 09:00PM

Interesting reading. I picked this up on my local beach, and it originates from a Cretaceous chert formation. The void in the chert was most likely there due to a fossilised echinoid. I have found quartz crystals up to 1cm and botryoidal chalcedony before in chert but never anything resembling agate.

Agate.jpg

Geologic origins and diversification of agates

Mindat forum 8-7-2017 download

Forum thread with responses by Donald Kasper

Posted by Ashley Wise

Ashley Wise July 17, 2017 04:43AM

I apologize if this is the wrong forum for this type of question, I just joined today.

I've been collecting rocks/agates/minerals my whole life, and am extremely interested in

geology.

My inner curiousity has been storming over trying to understand the true origin locations of lake superior agates.

Being from Minnesota, I've been finding them everywhere my whole life, and visit the north shore bedrock yearly and look for signs of lava flows and basalt vesicles.

I've never found obvious signs of the origins of the lake superior agates. There's plenty of basalt and vesicles, but the ones i see in bedrock are always filled with quartz, feldspar, or other minerals, but not true lakers.

I've seen pictures and heard stories of agate veins found underwater. Though those have seemed to be more like the paradise beach variety (opaque pinks and peaches), and not the translucent red and white lakers.

I'm assuming that hundreds of feet or maybe miles of mountain tops have already been eroded away over millions of years from the north shore, and wondering if the true lakers might be primarily in those long ago eroded mountains.

Are the lakers found in the river beaches actually eroded from basalt upstream? If so we should be able to find the beds, the rivers tend to lose power and volume several miles inland. Or are they just moving glacial sediments?

Then I wonder if the lakers actually originated farther north, and are only over lake superior from glacier activity?

I have found a couple laker-like agates as far west as central north dakota (which typically only sees north dakota moss agates, which are a snot-colored nodule easily distinguishable but seemingly related to montana moss agates), which could only have arrived via glacier, and those glaciers only came from Canada, not the superior region.

I have found several areas of thompsonite in the basalt bedrock of the north shore. The keweenaw peninsula has several sources of the keweenaw agate in bedrock basalt.

All of these, the thompsonites, paradise beach, and keweenaw agates are all opaque pink-ish

material. So this always brings me back to the question, where is the source bedrock for the bright translucent red lakers?

There's some other types of agate and geodes around. The shore of gooseberry has a lot of quarts geodes in the basalt vesicles. And when I was younger I used to find these small bluish-clear vein agates all over the beaches. Though I haven't found any of thos in a while.

At agate days I just picked up a collection of lake superior agates of a variety and coloration I'd never seen before. Similar to paradise beach but with some aspects of lakers.

I'm sure I'm rambling. But I'm just curious if anyone has any geological insight as to where the source bedrock for these different lake superior agates is or was. And also ideas for the diversification, which bedrock layers are originating which of the many types of lake superior agates.

It seems if a particular bedrock layer contains a particular type of agate, you should be able to trace that layer in 3 dimensions as it traverses through the north shore and possibly under lake superior. All of those deep gorges cutting through mountains should be cutting through these different lava flows and exposing the different bedrock sources of the different agates.

For instance, it seems that somewhere in the cascade river gorge, it should have cut through the thompsonite basalt and exposed it.

Does the keweenaw flow reappear up on the north shore of mn?

So many questions, so much curiosity!

Doug Daniels July 17, 2017 04:48AM

Just saw this post, welcome to mindat Ashley! You have a number of good observations, as well as questions. I'm no expert on that area, but there are some here that know quite a bit about up there. You should be getting some interesting conversations soon (ok, maybe tomorrow, or the next day, or...). Give the "knowbies" some time to see your post, and respond. Again, welcome!

Response: A rather crass introduction that does not invite discussion.

Larry Maltby  July 17, 2017 12:26PM

Ashley,

The Keweenawan rocks that contain agates outcrop along the Keweenaw Peninsula of Michigan. They dip under Lake Superior and then also outcrop on Isle Royal. The glacial lobe that scoured the bottom of Lake Superior moved toward Duluth and during the melting of the ice a flood of water washed gravel and agates down the Mississippi flood plain. The formation that contains abundant agates has been named the Lake Shore Traps. The traps outcrop along the shore at Keweenaw Point, Copper Harbor and Agate Harbor in Keweenaw County, Michigan. Other than that they run parallel to the Lake Superior shore but are inland and covered by forest. It is likely that the red and white “candy stripers” that you find in the gravel originated in basalts that are now under Lake Superior.

See: https://www.mindat.org/article.php/1593/Keweenaw+%28Part+1%29++Keweenaw+Point+

John Truax July 17, 2017 03:11PM

South of the Twin Cities in Dakota County, Minnesota there are areas of glacial till that contain lava from the Keweenaw, thomsonites and agates sometimes large and undamaged. I like to imagine frozen masses of till being pushed along by the glacier and coming to rest at my favorite agate hunting fields.

DSC01380.JPG

Glacial till resting on bedrock of sandstone.

Response: Looks like glacial till over volcanic ash to me.

Ashley Wise July 21, 2017 07:44PM

Yeah, the Keweenawan traps seem to be understood the most, as you can trace that layer of basalt under superior and surfacing again at isle royal. But it's definitely different from the traditional red and white lakers.

I had always assumed that the rivers on the MN north shore were carving the agates out of the rock layers as they dug through their gorges, and thus somewhere upstream there would be the agate sources. Like following gold flakes in a stream until you find the quartz veins up in the mountains.

It seems more likely that all of them were carved out of the bottom of lake superior by glaciers, shoved up on land, and the streams are just moving them back into lake superior from upland. And also explains why there seems to be 10 or 100 times as many agates found in outwash fields by minneapolis as there actually is around superior.

My parents have a simple 15 acre field south of princeton, and in 20 years we've collected a dozen gallon buckets of lakers just from that small field alone, all from tractors mixing up just the top few inches of soil every year (and I know the difference between chalcedony, jasper, and agate).

Not to mention the landscape river rock from maple grove/rogers.

I just wonder if there's still laker basalt traps hidden in the bottom of lake superior, or exposed in the hills of the north shore somewhere. Or if it's all long eroded.

My big question was just general location. Is it in fact from lake superior region, or were the red/white lakers actually pushed down from canada somewhere?

Paul Brandes  July 23, 2017 03:52AM

Hi Ashley, and welcome to Mindat!!!

Forgive me, but I'm having a hard time following what you are actually asking about. Are you asking about the specific source of the "candy stripe" agates, or agates in general? I commend your efforts to learn more about Lakers and their formation, but you'll soon find out that it is a question that has been debated for years, with no end in sight. I will attempt to shed a little light on your quandary.

The Lakers you find in the prairies of Minnesota were carried to that location by the glaciers from the basalts in current Lake Superior basin. They are likely not from further north in Canada because those rocks are mostly made up of Canadian Shield material which are, for the most part, igneous intrusives; rocks that are not conducive to agate development. Undoubtedly, there are still basalts that hold agates in Lake Superior today. Otherwise, how would we continually get agates washing up on the shores of the Keweenaw and the eastern Upper Peninsula of Michigan? Larry is very correct in that the Lake Shore traps hold a lot of agates, and one can still find plenty if you're patient. However, you can also find agates far away from Lake Superior in some of the mine tailing piles around the Calumet, Michigan area, some even with copper replacing the bands (those are a whole other animal altogether). These agates are from basalts that are further down section than the traps and even under the Greenstone Flow, the

major basalt flow of the Keweenaw (this is actually the flow that can be traced from the Keweenaw under Lake Superior and to Isle Royale).

Response: This would be false. Several volcanic sites are on the North Lake Superior shore as potential agate sources.

So to answer what I believe is your original question of where do the candy stripers come from; while it is very well understood where the agates come from (the rift filling basalt flows of the Lake Superior region), I don't believe anyone knows the exact answer of whether a particular flow produces a particular type of agate. That sounds like it would be a fascinating research study for someone to take on…..

Response: It would all be one agate source, but kaolinite intrusion occurred in some agates. It can only intrude into the fiber banding layers, not the quartz crystal layers.

Ashley Wise July 25, 2017 01:30PM

Thank you for all the responses.

Yes, my main question is "Exactly where is the source bedrock for the (specifically) red&white lakers". However my interest in where minerals meet geology is broad.

I just find it fascinating that you can find the thompsonites and the keweenaw agates in the source basalt on the shorts, but the red & white lakers are much more elusive.

Response: There are no agates with the thompsonites.

And I'm fascinated with the idea that these tilted lava flows should be reappearing in the river gorges. I always wonder where is the equivalent lava flow between one river gorge and another. Or will it reappear on the back side of a cliff.

Why is there a thick layer of red sandstone between basalt layers on that road cut by cutface creek?

Etc!

I had the same experience at my in-laws place in Gold Canyon, Arizona. The desert rubble

contains numerous examples of jaspers, granites, schists, a multitude of colorful stones. But I've climbed up in the superstition mountains and all the rock is just tuff, dacite, and basalt. Where did all that other rock erode from? It just seems the relative concentrations are out of wack

Response: The jasper and agates in tuff would be at the basalt contacts where temperature went supercritical. This is a 3 inch zone. Everywhere else with weathering has nothing.

Same with the lake superior beaches. Some of them are all blue basalt and red rhyolite, and that makes sense. But some beaches are full of a variety of rocks that just doesn't match the surroundings. No doubt the erratics were pushed from glaciers, but it just seems the relative concentrations are off.

Indonesian purple chalcedony

Mindat forum 8-7-2017 download

Forum thread with responses by Donald Kasper

Posted by Peter Slootweg

Peter Slootweg June 08, 2016 10:57AM

Lately i have seen a lot of specimens from Indonesia in the form of clusters composed of small spheres claiming to be chalcedony. I come's in purple, green, white and black hue's. I find it suspicious but beautiful material and there seems to be al lot of it. It is sold on the internet as grape agate/chalcedony. My question is if anybody can confirm this as natural, as all the specimens i have seen to date are without any matrix.

Peter

1jFdB4L.jpg

Response: Infrared shows quartz.

Keith Compton June 08, 2016 11:27AM

Hi Peter

They certainly look real to me, or at least the two that I have viewed up close.
Very nice under a scope too.

The "nodules" average around 1-4 mm in size. I would consider them too small to be artificially produced or carved like those Chinese "grapes" which are either quartz or fluorite and rounded with some form of sphere machine - basically all half spheres ground out of a solid mass. Many look very good admittedly but most have crude polishing around the base and they are obviously fake.

These from Indonesia look totally different.
Whether they are chalcedony or whether they could be called Amethyst - I am not sure but I think Chalcedony is correct
It would be good to have them analysed to ensure that they are not another mineral altogether. As more are appearing, I'm sure someone will do a definitive test. I see that some are described as Suiseki Chalcedony (those who grow Bonsai will be familiar with the term).

They are very nice.

I would certainly like to see more literature on the location.

Cheers
Keith

Edited 1 time(s). Last edit at 06/08/2016 11:39AM by Keith Compton.

Response: Fossil radiolarite chalcedony.

David Von Bargen  June 08, 2016 01:35PM

I saw one recently at a show and it was over a foot in size. These are definitely not carved. Most of the material is fibrous (radiating balls - therefore chalcedony), but there are some areas that have extremely small crystals growing on the surface so probably could be called amethyst.

Alfredo Petrov June 08, 2016 01:56PM

I have the same observations as David. A few of the tiny crystals were twisted.... micro amethyst gwindels? :-S

And I wonder whether chalcedony can be colored by the same mechanism that colors amethyst? And then what would we call it?

Some parts of the deposit yield green balls rather than violet ones. Haven't had a chance to look at it under high power yet, so idk whether the green is intrinsic to the silica or due to an admixed substance like celadonite.

Some sellers at the Tokyo show had it labelled as being from Sulawesi, but none had visited the deposit. Eventually an exact locality will be found out, as usual, I suppose. Patience.....

Amir C. Akhavan June 08, 2016 03:07PM

Quartzine (length-slow chalcedony) can grade into macrocrystalline quartz in botryoidal aggregates, as it does in amethyst specimen from Nyíri
http://www.mindat.org/loc-125579.html

The same probably happens here, too.
I could not think of anything that would generally preclude chalcedony (length-fast or length-slow) from possessing amethyst color centers. Of course, too many impurities could destabilize color centers and prevent their formation.
I think I've seen similar specimens from another locality, but can't remember from where.

You can heat a small piece to 300-350deg C and see what happens to the color. If you are very patient (several months), try to bleach one in the sun or UV.

Response: No moganite (length-slow silica) found. Just length-fast, regular quartz.

Riccardo Modanesi June 08, 2016 03:46PM

Hi to everybody!
What you call "chalcedony" is truly amethyst. Amir is right: in Hungary some good specimens of this quartz, crystalized this way, are found. Therefore I fully agree with Alfredo. I think the specimen represented in the photo is real and natural.
Greetings from Italy by Riccardo.

Łukasz Kruszewski June 08, 2016 09:48PM

Beautiful, nevertheless (tu)

Peter Slootweg June 09, 2016 10:48AM

Thanks for the comments guys!:-)

Travis Hetsler  June 09, 2016 07:16PM

I have seen it called "Manakarra grape agate" and have a nice 4kg piece in my collection, purchased in Tuscon. Under magnification I see no signs of tool marks, etc indicating a man made carving. When broken open I see a radial structure, a nucleus, and the color is even throughout each orb with the nucleus just a tad darker than the rest.

Alfred L. Ostrander June 11, 2016 03:34PM

If it is chalcedony, why shouldn't it be called purple chalcedony? That does avoid one more varietal name.

Travis Hetsler  June 11, 2016 04:48PM

There is also an "Indonesian Purple Chalcedony" or alternatively "West Java Purple Chalcedony", that forms deep purple veins as opposed to orbs, so I am sure the name "Agate" was used as a trade name to avoid confusing the two (which seems to have had the opposite effect lol). See link: http://www.indoagate.com/purple.html

Edited 2 time(s). Last edit at 06/11/2016 04:50PM by Travis Hetsler.

KEITH January 17, 2017 01:01AM

I have recently acquired a kilo of small pieces of this material and after a thorough inspection I found several pieces that had little clear crystals on top of some of the spheres that when i examined with a jewelers loupe of 10x look like a perfect stilbite and some were clearly six sided quartz crystals with multiple termination on both ends. I know this is relatively new material and am still looking to see who has done some further mineralogical study on this material.

Response: Zero agates and zero chalcedonies have zeolites. However, in volcanics with agates, stilbite can be close by.

Alfredo Petrov January 17, 2017 02:42AM

Analyzed some interstitial waxy material yesterday from a still uncleaned botryoidal violet chalcedony. It was saponite.

Response: As a volcanic ash flow engulfed a near-shore site with radiolarian sediment, one would expect various bentonitic clays to be found. This is how the radiolaria were engulfed.

Tim Jokela Jr March 07, 2017 02:40PM

Would you call this material amethyst, Alfredo?

For anybody wondering, it is indeed natural, not carved, dyed, or anything.

Found as individual spheres to large clusters, floaters, no matrix, in clay.

Wayne Corwin  March 07, 2017 03:02PM

Love to see some of those in situ :-D

Travis Hetsler  March 10, 2017 04:42PM

The article posted below that gives the most detail I have seen as well as mining shots of this chalcedony.

http://www.indoagate.com/manakarra.html

Uwe Kolitsch  March 10, 2017 06:41PM

Thanks, added to locality page.

Reply · Quote · Report · Send a PM

Jolyon & Katya Ralph March 10, 2017 06:56PM

Note that some pieces of this are dyed to enhance the colour. But there are also plenty which are natural.

Response: This statement is made with no evidence. Purples are related to sepiolite clays in many siliceous rocks. Celadonite in the ash would produce greens. The color types are very limited and often intermixed in the same specimen, so this comment is speculation pretending to be a factual observation.

Christopher Jolicoeur March 24, 2017 12:11PM

I have a fair amount of this... about 5 kilos. Large pieces and small. I discussed it with my mentor the other day who also has a piece and he said it is a purple form of Melanophlogite. What colors it purple he was not sure. What are your opinions on this? Perhaps this topic should be moved from the fakes and frauds as it is no longer being discussed as that?
PS I am new... nice to meet you all! -Chris

Edited 1 time(s). Last edit at 03/24/2017 12:12PM by Christopher Jolicoeur.

Response: Infrared shows no melanophlogite.

Uwe Kolitsch  March 24, 2017 03:00PM

"I discussed it with my mentor the other day who also has a piece and he said it is a purple form of Melanophlogite."

I would choose a different mentor.

Christopher Jolicoeur March 24, 2017 03:10PM

ok.... thank you for your thoughtful advice. So the common consensus among experts is that it is in fact a botroydial purple chalcedony? I'm trying to nail this down so that when I sell it I am giving proper information. Thank you. -Chris

Alfredo Petrov March 24, 2017 04:35PM

Christopher, the crystal habits in the material are quite variable; some is cryptocrystalline chalcedony, others are botryoidal masses of small terminated amethyst crystals which are not chalcedonic.

Christopher Jolicoeur March 24, 2017 04:53PM

Thank you Alfredo for that specific information. I do appreciate knowing exactly what it is. Such an interesting material. I believe my mentor shall get demoted for his false claim.

Edited 1 time(s). Last edit at 03/24/2017 04:53PM by Christopher Jolicoeur.

Jolyon & Katya Ralph March 24, 2017 07:25PM

The names 'grape agate' and 'grape chalcedony' have been used for this material on the market, and these are simply trade names.

There are many other 'trade names' that don't accurately represent the mineral species described'

'Bohemian Topaz'

'Herkimer Diamond'

'Moss Agate'

etc etc etc

It's not up to us to create a new scientifically accurate name for this material. We have one already, and it's this.

For trade names, we simply report what names are being used and what the material really is.

Jason Evans April 06, 2017 01:17AM

Keith, I too have found those transparent sheaf like crystals in my purple Indonesian chalcedony/botryoidal amethyst and my first thought was stilbite, but looking closer it does not seem right for stilbite, they are more like dumbell or peanut shaped , not like the wheat sheaf form of stilbite. then I looked at some of the photo's that have been uploaded and saw that rice grain and sheaf like crystals are found with this, mine has both of those forms, and it says it is quartz. I find this really intriguing as I never knew quartz could grow this way, then again I also never knew that quartz could form as botryoidal aggregates of small terminated crystals!
I got this specimen simply because I thought it looked nice, and it's turned into something far more interesting than I expected!
Are there any links to photos of quartz showing this habit?

UnusualsheaflikequartzinpurplechalcedonyfromIndonesia.JPG

Clifford Trebilcock April 06, 2017 04:26AM

Keith and Jason,

I have also noted these tiny dumbbell shaped crystal forms in a batch of small groups of purple chalcedony balls.
To me the they appear to be made up of tiny quartz crystals. Also noted individual regular shaped quartz crystals
on occasion attached to some spheres. The dumbbell shaped forms remind me of many of the artichoke quartz
crystals from the Francon Quarry in Montreal.Interesting specimens under the scope.

Cliff

Scott Rider April 06, 2017 05:28PM

Those little sheafs almost look like two spheres molded together. I have a few pieces of this material and none have that, but under 40x loop the other spheres do seem to be made up of tiny pyramidal terminations!!!

Response: Confusing secondary growth with primary nucleation of silica on radiolarians.

One of my specimens color range goes from a pasty white, to green to some orange, and finally purple. The white aggregates almost appear to be included by a clay like mineral. And the orange almost appears like iron-oxides... So maybe there is a lot more involved on at this location than we speculate.

The one thing I did notice is that the chalcedony specimens from some parts of Maharashtra, India are very similar. Not the color, as they are usually colorless, but the crystal forms are quite similar. I have a few pieces from there that have pretty much the exact same crystallization from India. Little spheres that appear to be made up of tiny terminated quartz crystals. Cross sections reveal that there could be at least 2 generations, a fiberous acicular formation of chalcedony making up the majority of the sphere, topped off by a 2nd gen, macroscopic "regular" quartz terminations. It is just like the Indonesian material.

Response: Radiolarians are not crystal quartz. They are balls with spines. Sometimes quartz nucleation occurs on the spines. Enough silica migration and nucleation and this would have become Madagascare ocean jasper, which is also a radiolarite.

Either way, I love these specimens. If you get a good one, they sparkle with a purple glow that is truly unique!!!

Alfredo Petrov April 06, 2017 08:52PM

This discussion should not be under the "Fakes and Frauds" messageboard! It could give the wrong impression to beginners.

Doug Daniels April 07, 2017 01:06AM

Remember, in the original post the question was whether such specimens were natural or fake, which is likely why it was posted under "Fakes and Frauds". Maybe it should have been posted in the general messageboard first, but, I can understand why it was done as it was.

Peter K. Szarka April 07, 2017 01:36AM

Alfredo's partly correct. This topic should not be in this thread if questioning the legitimacy of the specimens. They are real and have been available for some time now in various colours: yellow, brown, green, gray, purple. Some specimens have gradients of colors across them. Not uncommon to see green, grey and purple together.

I've watched the evolution of this stuff's availability on eBay from the start. These first started appearing commonly from Indonesian sellers on eBay well over a year ago, closer to two. Then YouTube videos started showing up with Indonesians selling the material. Chinese sellers next appeared with them next a few months later. Price went up, size came down on cherry-picked specimens. Finally, a few Americans started listing these in the Fall of 2016. Now there's a flood of this material everywhere.

And here is where I'd consider this topic eligible for inclusion in this thread as a marketing ploy. In person, the vast majority of these specimens look much the same as many other chalcedony

dug out of clay. Dull, earthy, with no sparkle. But with the huge influx of grape chalcedony/grape agate occurring early summer 2016, sellers' specimens started taking on great lusters. I suspect oil, silicone, leafshine, water, etc. is being used to 'enhance' them. Not exactly a new ploy in the mineral business. And this is as far as the deception goes I think. The actual specimens are real. But you'll have to watch for 'enhancement'. A soapy water wash of a glistening piece might disappoint a buyer.

Edited 2 time(s). Last edit at 04/07/2017 01:40AM by Peter K. Szarka.

cascaillou April 23, 2017 05:18PM

check this link for a list of chalcedony treatments:

https://www.mindat.org/forum.php?read,62,369000,369000

Marek Chorazewicz April 25, 2017 04:24AM

George Rossman had mentioned finding some phillipsite in the volcanic matrix on the back side of his purple grape specimen from Indonesia when we talked at the most recent MSSC meeting in Pasadena...

Best Regards,
MarekC

Joel Dyer April 25, 2017 11:11AM

Peter, this has turned into such a lengthy thread that I hope I haven't missed something... Have you got any of the spherules analyse? XRD might be able to tell you the crystallization degree of the material.

Raman spectroscopy will tell you even better what SiO2 phase this is, partiularly if it contains for example moganite.

I'm in the process myself of starting - or actually continuing - a joint publication project with an experienced mineralogist, concerning moganite & quartz content in Finnish vs foreign

chalcedony & some other similar SiO2 materials.
Of course, there have been similar studies carried out already, but no such comparitive work in Finland yet, as far as I'm aware and have been told. Please correct me if this is not true.

So, if you would like me to include some of your material in the study, I'd do it for nothing, but would need a few "balls" of the stuff, preferably slightly different looking / different shades. The same goes for other chalcedony/flint/agate etc chip donations. You will be provided with the anaysis results, no charge. This is a one-off project deal for me, for a limited time only ;-) .

You (whoever it is) can get hold of me via a private message or **preferably** via firstnamelastname"at"hotmail.com

Cheers,

Joel

Edited 4 time(s). Last edit at 04/25/2017 11:14AM by Joel Dyer.

Peter K. Szarka April 26, 2017 12:13AM

Cascaillou,

Thanks for that link. I was not aware of it and it's highly informative. The scope of treatments is truly astonishing.

Macro Cosmos July 20, 2017 10:52AM

I recently acquired a sample and took a photo at high magnification:
https://flic.kr/p/VFeC8v

Tiny cubical formations essentially form the botryoidal structure, really interesting. They are truly amazing!