

Mindat agate discussion on Lake Superior agates, Comments by Ashley Wise Responses by Donald Kasper 9-2-2017

I found the responses by others particularly uninformative, so keep only those of Ms. Wise here, who is the inquisitive rockhound asking the questions in this case.

Don

Geologic origins and diversification of agates

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 curiosity 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.

Response: Opaque white quartz (skip-n-atoms) have host rock and inclusions of almost pure albite. It is hard to spot as the feldspar is dark brown to almost black, looking like basalt.

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?

Response: It is not an issue of random luck and finding the right spot by chance. The agates occur in the vesicular, celadonized basalt only. If you find zeolites, you are in the wrong place as zeolites prevent agate formation. Solid opal or quartz vesicles means you are probably close. Basalt in alternation with ash layers is preferred. If in basalt flows, scout the flow tops and bottoms only.

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?

Response: Don't know for sure, but looks like you need an iron-rich basalt, heavily oxidized red. Or it came from humic acid staining by weathering over time. Then look for the oldest identified flows.

There's some other types of agate and geodes around. The shore of gooseberry has a lot of quartz 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 those 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.

Response: Then it is not all one lava flow, and life becomes interesting.

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.

Response: Spreading center running down the lake makes it highly improbable the lava on the west and east shores are compositionally related.

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!

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.

Response: So what made the candy striper and opaque red agates? Weathering. That intruded clays and iron. More weathering intruded more clays as clays are so very insoluble, so you have

to be in the oldest rock possible to find them, and from a near surface flow top. Those flows may now be gone from erosion that released the agates, but there may be a few relict low-relief mounds or mesas.

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.

Response: Probably coming from an ash contact stratum layer in the gorge walls. Else, hunt in the celadonized green basalt zones, if any. If not regional, then hunt the fault contacts. Vein agates and geodes (lava shell agates) in the rhyolites, amygdules in the basalts.

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?

Response: Volcanoes ring the northwest shore of Lake Superior were probably also a source, some volcanoes in Canada lake shore.

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 kweenaw agates in the source basalt on the shorts, but the red & white lakers are much more elusive.

Response: Thomsonite. In zeolite lavas you get zeolites. They prevent agate formation. Bad news. Like trying to find agates in granite. If the zeolites are up-stratum, go down the profile if exposed to see if agates are underneath.

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?

Response: Long lapse, maybe half million years between flows. Check the upper sandstone-basalt contact.

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: If you do up the topographic profile and the agate source stops, you obviously passed the agate source. If there is a basalt flow over ash, that supercritical fluid contact made the agates and jaspers in a 3 inch thick layer, and that is it for that flow. Going up onto the cap basalt will then show 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.