I like to make up term for describing meteorites such as F2F as in Find to Fall (when an meteorite listed as a find might actually be a fall; or a Toolbox meteorite where the particular specimen was used as a tool of some sort before moving to a higher status in life, and even Meteorites 2.0 describing the meteorite collecting world post-NWA.

In this installment of the Accretion Desk, through pictures I am highlighting what I call a 100% Vein. In this case, there is a layer of iron that completely occupies one a section of this Gao and is visible in 100% of the specimen.

As you can see in the pair of half-individuals above, the metal vein runs through the entire piece cutting across both cut faces.
The exterior of this pair of half-individuals shows the 100% Vein highly visible across the entire great circle of fusion crust.
The 100% Vein is not a surface feature only, but actually represents a nickel-iron disk dividing this individual in half.
Transitioning from crust to matrix, the 100% Vein is clearly visible as it transitions across this 90 degree boundary.

Little treasures like this Gao show us that even when the proliferation of a locality has relegated specimens carrying the same name as thousands of others, each one is an important contribution to science and collection enhancement. This 100% Vein is a precious treat of space geology and solar system evolution, and I'm thankful that someone somewhere thought it interesting enough to pursue further before I got ahold of it.

Until next time....
The Diary of a Meteorite Hunting Trip

by Jim Tobin

After a couple weeks of exchanging emails between the three of us a basic plan for vacation has begun to emerge. We do not leave for another few days but for me today and tomorrow are the last days off from work to prepare. I have my list made and I have gotten a few things like batteries ready. I got a new GPS since the screen and reliability of my old Garmin had been going bad for a couple years. That was two weeks ago and I have downloaded the updated software into my desktop and laptop so I should be ready for recording our hunting.

My cell phone went out several weeks ago also. I went into the phone store convinced that I would get another simple phone and came out with an iPhone. So I guess I have enter the modern age in another way. It has a built in GPS/compass feature. But, it is only accurate to one second of latitude and longitude. That is give or take a little difference for each 90-100 feet. Making the closest I can record a find a pretty large circle of nearly 200 feet. So I can take a great picture with the camera on the phone and get a rough location but I guess I will still have to photograph the GPS sitting next to the meteorites. If we find any of course. But, we are always confident of our success. We have a way around that every trip and that is to plan aspects of the trip that can not fail to be successful. Sometimes it is astronomy, or astrophotography, this time it is a return to one of the Alamo Breccia sites to gather some more material.

I am picking up a 4×4 in Las Vegas, Paul and I will use it to get onto the dry lakes and other places we have on our list to hunt. We are staying in an RV site and taking day trips out to hunt. Sonny Clary is joining us for part of time. We are looking forward to spending some quality hunting time with him. As I am writing this I have one more day off from work and 4 days of work until we leave. Paul has to work today and has three more day of work and he will have a couple days before we leave to get the RV ready and take care of the other logistics. I have to put together a tool box to take with us in the 4×4 and get all my hunting stuff located and packed.

On the Road

We were in contact with Bob Verish as we drove and it was then doubtful he would be able to join us and Sonny for a couple days of hunting. I figured that if he could he would and as it turned out he was able to stay for two days and hunt with us. We had an uneventful fun trip out to Las Vegas. I pickup up the car and we headed toward Rachel Nevada. I had asked for something like a 4 wheel drive Rav 4 and ended up with a Ford Escape. Which was fine but I knew nothing about it. I took a few minutes in the parkgae area in Vagas to read the manual and see how the 4 wheel drive worked. It turned out that it was engaged as needed with no operator action required. So off I went in it. I have two Ford Rangers and the controls and buttons were all pretty similar. We got out of town and onto the highway going to Rachel which receives little traffic so I turned on the cruise control and the radio for a two hour drive at just over 70 mph. Well it was not long that I saw the gas gauge start to drop off at a very surprising rate. The car seemed to be getting about 9-10 miles to the gallon. This was going to create some problems. There is no gas for about 65 miles in any direction from Rachel. I filled up again in the small town of Alamo and we drove out the rest of the way. By the time we got to Rachel it at was at 75% in the tank. This meant that without buying some gas cans I could never make any head way on fuel. If I drove back Alamo to fill up I would use 25 % each way and be at 50% after each trip. Giving me very little range to drive during the days hunting meteorites. The first lake we wanted to hunt was 35 miles from the RV park. As it turned out I could buy a five gallon can of gas at the Little A’le’Inn which I did. The next morning when we drove up there to the lake I did not use the cruise control, low and behold the mileage jumped to where you would expect about 25 miles to the gallon and the gauge never hardly moved the rest of the trip. The controls for the cruise control are essential the same as in my Rangers. But, clearly they engage the 4 wheel drive all the time or do something that kills mileage. That was really the only rental car issue until the afternoon before returning to Las Vegas when the check engine light came on. Always a little scary to see. I checked the oil and water and what else I could and it was all fine so I continued driving the car hoping it was just the bring it in for scheduled maintenance time indication.
Both Bob and Sonny arrived in time for dinner at the Little A’le’inn on Saturday evening. Sonny had Brix with him and it was fun to see him again. The meteorite hunting dog would show his expertise later in the week. After dinner on Saturday night we made it an early evening and went to sleep having planned an early trip up the road to a dry lake bed to hunt for the day and observe the stars at night. Paul had checked on the Iridium flare opportunities and there was one on Saturday night that we had watched before eating dinner but the one on Sunday night was to be far brighter at -8th magnitude. It would be the brightest I had ever seen if it was clear and if we were on time to observe it.

Paul in I had visited the dry lake bed we were heading up to 8 years ago when we had been in this part of
the country for vacation. It had been too soft a surface to drive on that time and we did not spend a long
time up there hunting. We got up early and it was cold. About 37 degrees F. We drove up the road
confident that the weather would be fantastic and that the temperature would be in the mid 80′s as
predicted. The lake surface was perfect this time and we drove out into the middle. Circled up the wagons
so to speak and got ready to take off across the lake hunting. We all took differing directions and only met
up one or twice during the day. Radio communication was not working well and cell service is non existent
so we were on our own. The lake was very clean, no trash and few rocks other than prolific amounts of a
brown basalt and a black basalt. But, there is nothing unusual about that. We are used to hunting where
there is basalt.

I worked the shore on the north-east side to start and all the area inward about 50 yards. After a couple
hours I moved the car over to where I had seen Paul hunting off the lake. I drove over near him and we
talked awhile. He had found a wonderfully strange piece of rusty brown basalt. It was full of crystals. The
black needle crystals cried out hornblende to me but in a funny conversation with Bob Verish later we
decided to just call it amphibole. Later in the day we would find a piece of black basalt that had 3/8 inch
wide crystals of a white mineral in it. This is all quite strange, normally basalts cool too rapidly for much
crystal growth to occur. I was pretty jealous of Paul’s find of the brown basalt so we went off to see if we
could find another piece. After a lot of searching I found another piece that was similar with the black
needle crystals but not as nice. Still I was happy that I found a piece of this interesting rock. As we were
hunting for the sample Sonny and Brix pulled up in the ATV and it was time for the test of Brix’s hunting
skills. Sonny handed me a blue plastic glove and four meteorites in a plastic bag. He told me to throw
them in to the area around us. He took Brix and walked several hundred feet away with his back turned
and I placed did not throw the meteorites. When I opened the bag I found some very nice meteorites in it.
Far nicer than I think I would have used in dog training. I did not want to be responsible for them
accidentally getting lost. Well, as was quickly seen I had nothing to worry about. Brix found my cleverly
concealed meteorites in a very short time.

We did not find any meteorites, but we had a great time hunting. We got to know friends better. We
headed back to the base camp at lake center in the last afternoon and had some dinner. Paul set up his
telescope just before sundown. The sky was clear there was no wind and it was going to be a perfect
night for observing. The Iridium flare was spectacular. We looked at all the regular objects of this time of
year, the Ring Nebula, the Dumbbell Nebula, M31, M13, Albireo, The Double Cluster, Jupiter and some
others that I can not remember off hand. We saw many really fine meteors, most of which were bright
Orionids. As we were seeing them it came to mind that we could go to sleep get up at about 4 am and
have a look at the Great Orion Nebula. That turned out to be a really fine idea. I have never seen the Orion
Nebula look as nice in an amateur scope as it did in Paul’s. It was spectacular, and Jupiter just happened
to be putting on a show that night as well with a very visible festoon on one of the equatorial bands. There
were seconds of seeing so good that it was as sharp as I have ever seen the planet. It was a fabulous first
hunting day of vacation. Paul took some 15 second shots and managed to score this nice sporadic
meteor.
Bob took this photo of the caravan leaving the dry lake for Rachel.

We drove back to Rachel in the morning and put the RV into a spot again at the Little A'le'Inn. Then headed off in the 4×4 to Rachel Dry Lake to hunt there for the day. Sonny and Bob were already on the lake hunting by the time we got out there. Having the 4×4 was great we took some time to drive around nearly all of the lake and get an idea of what the surface was like. There was an area on the east side that was covered with stones from recent wave and wind action, but the surface was pretty awful for hunting. Paul and I ended up on the north side in the hummocks where there was abundant rock between the hummocks. We hunted diligently there for several hours and met back up around lunch time had a soda and sandwich with chips. Then headed off to do some exploring and finally ended up hunting a couple more hours on the southwest end of the lake. Both of the lake we had hunted so far were large and I am sure that there is at least a meteorite on each but it eluded the four of us this try.

Tuesday
The Alamo Breccia is found in several outcropping around this part of Nevada. The easiest for us was the Hancock Summit site. It was only about twenty-five miles from Rachel so we headed down that way early in the morning to spend the day. Sonny had told us about a petroglyph near the place we park so finding and photographing that was first priority. We found it pretty easy and looked for more but found none. We returned to the car got our packs and headed up the long steep trek to the top of the ridge that is the layers of Alamo Breccia. We gathered up a nice selection of specimens for our collections and took a lot of pictures. Had a bit of Gatorade and a granola bar and headed back down the edge of the mountain. I had been looking at the way the Alamo Breccia layers fold and twist in synclines and anticlines through the ridges and I was pretty sure that just on the other side of the road was an exposure that was only a few minutes easy walk away. It was definitely lying on its side and eroding off the top unlike the layers we had just left which were cut through and eroding as cliffs off the edge. We unloaded the packs of what we had gotten already and walked over across the road. On the way my eye caught site of the small rock in the next photo.
We had only walked a few feet off the road when we begin to see pieces of Alamo Breccia. There was no doubt about it being a continuation of the layer we had fought our way up to in the morning and on previous visits. Lying as it did the nice breccia with small size clasts was in widely separated clumps usually several feet in diameter. It was not in continuous bands as across on the ridge. But, the real benefit was that the large surface area exposed of each layer presented more shell fossils. As the following photo shows there were spots with numerous shells.
We made our way up higher and I saw the neatest stuff in one small spot. It was Alamo Breccia but it was chunks of the normal gray breccia that seemingly cracked up at some time in the distant past. The resulting cracks had filled with white quartz. It is really beautiful. As I hope you will agree as you view the following pictures. I expected that it would be really strong and polish well. I had some cut and polished within two hours of getting home and was not disappointed. We carried pieces of this and some specimens of regular Alamo Breccia with fossils that were lying around up there back to the car. A very successful rock hounding adventure. I will have fun cutting this material for my collection.
We got back early afternoon and spent time on the wi-fi and writing until around dinner time. We went over to the Little A’le’Inn to get the souvenirs we were bringing back and have dinner. It had been really convenient having dinner there instead of making something in the RV. It gave us some more time with Bob and Sonny the first two nights and tonight it was just nice to relax and unwind without cooking and cleaning up. It is vacation after all.

Once again if there had been meteorites on the lake where we walked I think we would have found them. We came back with our usual load of bullets, 50 caliber shell casings, and the other odds and ends of history that are always found on dry lakes. Paul has a piece of electronic tek that he is researching. I think it is alien tek, Area 51 is just over the hill. We saw many things of interest old skulls and bones and signs of past occupation by Native Americans. Just no meteorites.

Wednesday was a travel day from Rachel to Las Vegas. We arrived in Vegas at noon and turned in the rental 4x4. We headed off to Circus Circus RV Park to get a spot for the night. We got settled in and cleaned up and it was short taxi ride to the Luxor to go to the Titanic exhibit that is there. Wow, is all I can say of that exhibit. As a big history buff with an intense interest in Titanic it was quite exciting to see the material that was on display. I know there are some that find it questionable to bring up material from the wreck site but having been trained as an archeologist I feel we do the same thing with sites all over the world. The items in this display were presented tastefully with serious consideration to the human tragedy. Preserving the dignity of the individuals that had owned the items was near the top of the motivations for the exhibit promoters.

Paul treated me to dinner at the buffet at the Wynn. We had a really fine meal before returning to the RV for our nightly session on the laptops and a movie. We had three movie nights this trip and I think that is a record.

Thursday was a drive home day starting early. Our goal was to get back into town before the LA rush hour traffic in the afternoon began. As it turned out we got quite an early start leaving the RV park at 6:00 am exactly. So we had most of the day to unpack and rest from what was a very active and rewarding vacation.
I will do a more complete presentation of the Alamo Breccia material in my next article.

The Little A’le’Inn is worthy of some description. It is to be found in Rachel, Nevada where as the sign below indicates there are humans and well who is to say what else may be around there. Groom Lake (Area 51) is just over the mountains and not far away. Nevada was the scene of many atomic bomb tests and out near the road in front of the Little A’le’Inn is one of the monitoring units spread around the state. As we were standing by it the reading was 12 µR/h. I looked up online what natural background is and got a range from various sources of 8-23 µR/h. So after all this time since testing was done with no wind blowing the level there at Rachel was nothing to be concerned about. Everyday we were there we heard many sonic booms and some were very loud. We saw a few jets flying, but we missed seeing the spacecraft this trip.
Meteorite Market Trends
by Michael Blood

This Month’s
Meteorite Market Trends

by Michael Blood

Please Share and Enjoy:
Hunting for Flädle at Ries Crater

We travel to Nördlingen Germany to find these impact-glass “bombs”.

June 2011 – this was the year that I finally made that return trip to Germany. It was a good time of year to revisit Southern Germany where I lived 40 years ago and met for the first time my soul-mate, and now finally my fiance, Monika Waiblinger. We traveled together from San Diego.

Our first destination was her hometown where I got to meet her relatives. Those relatives, knowing her keen interest in meteorites, were very understanding when we shortly departed for a day-trip to the Steinheim Crater. Moni and I would have loved to stay longer at Steinheim but we had to return for a quick turn-around trip to the Ensisheim 2011 Meteorite Show. I have already written about our trip to Ensisheim in my July 2011 article, but in the near-future I really must report on our day-trip to the Steinheim Crater, because that was a very enjoyable locality to visit.

It was at the Ensisheim Show that we confirmed our decision to make a trip to the Ries impact-crater at Nördlingen (also known as, Nördlinger- Reis). It was at the Ensisheim Show that I saw, and understood for the first time, what was a flädle, or as it is called in German, “Flädle”. I now understood a flädle to be somewhat akin to a volcanic bomb, but instead of basalt, it is an impact-glass bomb of crater ejecta that has traveled through the air, but at a somewhat shorter distance than a tektite. Apparently it is not akin to a splash-form tektite, nor are they like Muong Nong tektites, but the reason why is not clear to me.

Since this article is but part of an on-line publication known as, Meteorite-Times Magazine, it is expected that most readers are knowledgeable about these kind of rocks known as, “impactites”. But, for those of you who may have arrived here by way of an errant Google search engine result for “German pancakes”, and are now curious about “impact-glass bomb rock-collecting”) you would be best served to go first to my REFERENCES section at the end of this article. There I have links to websites that describe what “flädle” are, and links to images of “flädle” which show that these impact-melted rocks look like bread dough that has been thrown into the air and then solidified.

Moni had already visited Nördlingen. Five years earlier on a previous trip to Germany, she somehow cajoled her sister to take her to both Ensisheim and Nördlingen! So, after the Ensisheim Show, when we returned to her relatives in Germany and told them of our plans to make another day-trip to, yet, another crater, they weren’t in the least bit surprised. Again, her relatives were ever more understanding of the mutual interest in meteorites that Moni and I shared.

So, early one nice, Spring morning in June 2011, Moni and I drive off and head for the “Aumühle Quarry in the Nördlinger Ries Crater”.

The following images are a travel log of our trip.

By the way, regarding the sign in the above image, a Geotope is not unlike a road-side-stop with a “point of interest” but which has some geological significance.
Translation for the above sign titled, "Der Geotop Steinbruch Aumühle in Nördlinger Ries" =
(This is a very rough ENGLISH translation.)

Title of the sign:
Quarry Aumühle in the Nördlinger Ries [crater]

The "Quarry Aumühle in the Nördlinger Ries" Geotope shows the rock mass caused by a meteorite impact about 15 million years ago - in the so-called "Ries Impact". These are deposited in the form of "colored-breccia" and grey, tuff-like "suevite" over each other here.

Description:

The Ries impact
At the time of the Tertiary period, an approximately 1 km large stone meteorite with a speed of at least 70,000 km/h impacted in the area of the Franconian-Swabian Alb. It formed an up to 4 km deep crater with a diameter of 25 km. Beneath the crater the rocks were smashed at several kilometers depth, extremely compressed and partially melted. The rock material was catapulted to the top and to the side ("Bunte Breccia"); part of it then glided back into the crater. Huge amounts of dust, ash, and larger, partially molten rock debris were thrown up into the stratosphere, then rained-down from there ("suevite") and covered-up the already deposited Bunte Breccia. The meteorite itself evaporated.
Pressure and heat wave vaporized all life within a radius of over 100 km in seconds.

What's to see here?
The quarry Aumühle includes the two typical rock products of Ries meteorite impact: below the "Bunte Breccia" and above the "suevite". The Bunte Breccia consists of a mixture of pre-existing rocks (gneiss and granite from the bedrock, red and brown Triassic sediments and limestone of Upper Jurassic). The particle size ranges up to meter-sized blocks of fine stone dust. The suevite (Latin from "Suevi", Swabian stone) is similar to a volcanic tuff and consists of a fine grey groundmass (originating from rock dust and larger particles), in which were included the debris from the formerly existing rock [and most importantly (for this article) including the bomb-shaped globs] still in the partially molten form (glass-bomb or 'Flädle').

Were there still other impacts, and what happened then?
The "little brother" of the Ries crater, the Steinheimer crater, is located about 45 km west, and it has a diameter of 3 km. It probably was formed at the same time with the Ries-impact, through a small "Companion" of the Ries meteorite (a so-called "Moon") or probably through a fragment of the actual Ries bolide. After the impact, an endorheic lake formed in the Ries crater, in which rainfall and evaporation in the prevailing subtropical, changeable climate was kept in balance. The depth of water was never large; at times, the lake was even dry. Over the next 2 Million years, 300 meters of clay with small brown hard nodules, as well as fossil-rich limestones were deposited. Only later when the Wörnitz River broke through the rim, then the lake ran empty.

When was the Ries recognized as meteorite impact?
For a long time, a volcanic formation was adopted for the Nördlinger Ries and its peculiar rocks. But, in 1961, they found clear evidence of a meteorite impact. In the suevite they discovered minerals, which could have only been formed under very high pressure (e.g., the high pressure modification of quartz called Coesite), and which thus clearly refute a volcanic origin. [End of translation]

On a previous trip (a week earlier) to the Steinheim crater, we visited the local museum and studied the Flädle that were on display there from the Ries crater.
On an earlier trip we visited the museum at the Steinheim Basin where we saw this beautiful example of a “flädle”. The German text in the above image:

"Fladen, Flädle oder Glasbombe von Trochtelfingen, Ries. Beim Einschlag aufgeschmolzenes Gestein, das herausgeschleudert wurde und in der Form eines Fladens erstarrte."

Translates to:

"From the German word for 'flatbreads'. Flädle (pancake) or glass-bomb from Trochtelfingen, Ries area. Rock melted by an impact and that was ejected and froze into the form of a 'flatbread'."

This wasn’t Moni’s first trip to the Reccreational region Ries

On the road to Nördlingen and the Ries Crater we encountered this sign which was our first hint that we were getting close to “ground zero” of an impact crater.

(You can click on the above image in order to ENLARGE.)
Upon entering the city limits of Nördlingen and the Nördlinger Ries we encounter another sign which gives us some indication of the significance of the impact crater to this city.

(You can click on the above image in order to ENLARGE.)

In the town of Nördlingen there are many decorative “schwien” statutes and this one sits upon a large boulder of local suevite, used as decoration in a traffic circle. Throughout the town, one can find suevite (rough and fabricated) being used in all sorts of manner. An example of a “flädle in suevite” can be seen in this image under the pig and to the upper right corner of the boulder.

(You can click on the above image in order to ENLARGE.)

On to the museum…
Now, while in the town of Nordlingen, we found the Ries Crater Museum where we were able to find good examples of “flädle” and suevite.

But first, we closely studied the geologic maps and photos of the outcrops.

At the information center for the museum was this large poster board with a Geologic Map of the Ries [impact] Crater, as well as photos of outcrops with exposures of impactite throughout the crater – to include the Aumühle Quarry (our destination for this trip).
Here is a close-up of the above image of one of the photos & text on that “poster board” display. The photo is of that well-studied outcrop at the Aumühle Quarry. At the information center for the museum you can obtain an Information Booklet which contains all of the maps and photos that appear on the poster boards and other displays.

Now this is what we are looking for – suevite with excellent cross-sections of Flädle suevite with excellent cross-sections of Flädle. The label says “Ejection Suevite from Otting”.
An excellent museum display about "Glass Bombs". Close-up of a nice, large Flädie or as the label in German says, "Glass Bomb" – shows that impact (not volcanic) bomb was still molten/plastic when in settled back to Earth within the suevite formation.
Very rough translation: "Within the suevite occurs these "glass bombs" which still maintain their basic dimensions, and can also be found as isolated finds. Due to its form, a person could tell that these Impact-glass globules were thrown into the air while still in a viscous state. They are referred to popularly as Flaedle (Flatbreads, pancakes)."
Monika Waiblinger sits at a display of boulders of suevite and other impact breccia. Kids can sit on the boulders and watch a video about how the Ries Crater was formed.

We had met Thomas Kurtz the week earlier at the Ensisheim 2011 Meteorite Show, and it was there that we made plans to meet him on this day after he gets off work at Wemding and he would show us the Steinbruch (Quarry) at Aumühle where there were excellent outcrops of the contact between the Bunte Breccia and the suevite, and exposures where fidele were weathering out of the suevite.

We met Thomas Kurtz at his office in Wemding and together we drove to the Aumühle Quarry which is situated on the outer rim of the Ries Crater. There is a very informative billboard/sign at the entrance to the quarry.

The sign at the entrance to the Aumühle Quarry states that this is “Geotop #9” – number 9 out of 100 geologically-interesting sites in Bavaria. (Go to the top of this article to see a close-up image of this sign and for a translation.)
It is only a short walk to the first outcrop.

Monika Waiblinger examines a rock that came directly from the thermal contact zone where the Ries suevite deposited itself upon the Bunte Breccia (which is directly behind her).

Compare this image with the same photo in this "Information Brochure". (You can click on the above image in order to ENLARGE.)
Thomas Kurtz is pointing out another interesting outcrop to me.

This is another outcrop (much like the previous outcrop) clearly showing the thermal contact zone between the Bunte Breccia and the overlying, flädle-bearing suevite.
I got closer to see the contact zone between the Bunte Breccia and the overlying Ries Crater suevite.

The slightly more resistant fläde stand-out in relief on the weathered face of this outcrop of suevite.

(You can click on the above image in order to ENLARGE.)
An image of a large, light-colored igneous clast from within the suevite formation is somewhat thermally altered. (You can click on the above image in order to ENLARGE.)

A good example of vesicular glass on a cobble of suevite. (You can click on the above image in order to ENLARGE.)
We found an outcrop where this portion of the suevite formation was less sintered (the groundmass had a higher percentage of clay and palagonite) and the individual clasts of relict flädle can be extracted intact (with a great deal of chiseling).

Example of a “chiseled-out” flädle. Took a lot of chiseling to get this much exposed. But even more chiseling is required to completely extract this flädle.

(You can click on the above image in order to ENLARGE.)
Another example of a “chiseled-out” flädle. Looks like this one is deformed or torn upon ejection and settling within the suevite.

(You can click on the above image in order to ENLARGE.)

Monika Waiblinger found these pieces of a flädle that had, either been dug out already, or had weathered-out after having been bulldozed-up to the surface.

(You can click on the above image in order to ENLARGE.)
Moni gave this reconstructed flädle to Thomas Kurtz in appreciation for his time and effort in leading us to the Aumühle Quarry and in explaining all of the geological features that we saw there.

(You can click on the above image in order to ENLARGE.)

The sun was starting to set, so we started back to the vehicle. We took a different path back and at that trail head we encountered these warning signs! Apparently, the quarry shouldn’t be accessed during operational hours (for obvious reasons).

(You can click on the above image in order to ENLARGE.)

At this time of year (and latitude) dusk is a lot longer period of time from what Moni and I are used to in San Diego. It was getting late and we still hadn’t had our evening meal.
Thomas suggested we go to a restaurant that is inside a nearby castle (Harburg) along the Donau River.

On the way to the Harburg castle we spotted this other quarry that has apparently been dug right into the outer rim of the crater. I suggested that this would be a great spot to visit on a future visit. I would really like to return to this area, but it will have to wait for future return trip to Germany.
We finally arrive at the castle above Harburg and we find that the huge gate is built of fabricated suevite. (You can click on the above image in order to ENLARGE.)

As we sat on the patio of the restaurant in the castle, this is the view that we had of the center courtyard, as dusk slowly turned to nightfall. Time had gone by too quickly this day, but there were many memories captured that will be cherished for a long time.

A good view of the entire quarry at Aumühle, also known as Geotop #9 out of many dozens of Geotop sites in Germany.
I hope that Thomas returns in time to recover the other Flädle before they are destroyed by the bulldozer.

(You can click on the above image in order to ENLARGE.)

I am looking forward to the next time that we can return to Nördlingen and again hike the Ries Crater.

References:

The Wikipedia entry for: Nordlingen Ries Crater
- contains links to the Nordlingen Ries Crater Meteorite.
http://en.wikipedia.org/wiki/Nordlingen_Ries_Crater

The PASSC Earth Impact Database website for: Ries Crater
- contains links to papers on the Nordlingen Ries Crater.
http://www.passc.net/EarthImpactDatabase/ries.html

(U-Th)/He DATING OF THE NÖRDLINGER RIES IMPACT STRUCTURE, GERMANY – F. J. Cooper1,
- Conclusions: New (U-Th)/He zircon data for the Nördlinger Ries impact structure give a mean age of 13.60 ± 0.58 Ma (2??).

LINKS:

Geopark Ries -
http://www.geopark-ries.de/index.php/en

Flädle – impact glass – images:
http://kauscience.k12.hi.us/%7Eted/Craters/impactites/Fladen-111g-1.jpg
http://kauscience.k12.hi.us/%7Eted/Craters/impactites/Fladen-111g-2.jpg

More images of Flädle:
http://www.spacerocksuk.com/RiesFladle.jpg

Webpages about impactites:
http://www.mindat.org/loc-68071.html: – Chaoite (native carbon) from Möttingen, Ries Crater, Nördlingen, Swabia, Bavaria, Germany

Geopark definition:
http://www.geopark-ries.de/index.php/en/the_origin_of_the_noerdlinger_ries

Suevite definition:
http://en.wikipedia.org/wiki/Suevite
http://de.wikipedia.org/wiki/Suevit

The Suevite Webpage:
http://www.impact-structures.com/suevite/the_suevite_page.htm

Geotope definition:
http://en.wikipedia.org/wiki/Geotope
http://de.wikipedia.org/wiki/Geschoensten:
- this is the list+map of the 100 Geotope in Bavaria (auf Deutsch).
- this is the list of the 77 NATIONAL Geotope in Germany (auf Deutsch).

Geopark Info Brochure for Bavaria:

Bringemeier, D.
Suevite Superposition on the Bunte Breccia in Nordlinger Ries/Germany:
- contains links to papers on the Nordlingen Ries Crater.
http://www.lpi.usra.edu/meetings/programs/sudburywa.txt

Bringemeier D.*
Research undertaken in the last decades in Nordlinger Ries, Germany, has emphasized repeatedly the sharp contact between Bunte breccia and suevite. However, extensive investigations into this layer boundary have not yet been possible due to insufficient outcrop ratios.

New outcrops enabled an in-depth investigation into the superposition of suevite on the Bunte breccia, which is assigned a key role in interpreting the transport mechanisms of ejecta of large impact.

In two quarries (Otting, Aufhausen/Seelbronn), lying several kilometres east and south-southwest of the crater, the contact between the suevite and Bunte breccia was recorded in detailed sections on outcrops of over 50 m in length.

It was possible to confirm studies made in the 1960s by WAGNER (1) that suggested a division of the suevite into main suevite, rich in pancake bombs (also called "fladle," and a relatively well-sorted, thin-base suevite consisting of fine gravel. A semiquantitative analysis of the just slightly consolidated base suevite revealed the main constituent to be "fresh," bubble-abundant, albeit sometimes bubble-deficient, angular glasses. Secondary, crystalline and sedimentary rock clasts and very rarely "fladle" were detected. Of significance for the transport mechanism of the base suevite is its content of Bunte breccia fragments and the discovery of shell fragments. Between the base suevite and the Bunte breccia is a crystalline breccia of ca. 0.1 m in thickness which is separated from the Bunte breccia by a sharp boundary. In some areas a transition bed is visible between the crystalline breccia and the base suevite. This transition bed indicates an erosive reworking of crystalline breccia by the base suevite. In one of the sections (Aufhausen/Seelbronn) the base suevite was not observed as here the main suevite lay either on the crystalline breccia or directly on the Bunte breccia. The crystalline breccia is highly altered and in the transition to main suevite contains disintegrated glasses.

In both sections structures were established that can be explained only by an erosive reworking of the subsoil caused by a shifting viscous suevite flow. Particularly on the flanks of the hummocks of Bunte breccia, lying several metres higher, the layers below the main suevite have been plained, compressed, and mixed by the suevite flow. In the Aufhausen/Seelbronn section hookshaped, decimetre-sized, finger-like compressions of Bunte breccia and crystalline breccia project into the main suevite. A clear erosive discordance between the main suevite and the base suevite is visible in the Otting section.


My previous articles can be found *HERE*

For for more information, please contact me by email: Bolide*chasseur
The year was 1961, and it all began with Dr. Carleton Moore and Harvey H. Nininger.

Arizona State College was now Arizona State University, and with the name change came the goal of emphasizing the research activities of the new university. The Research Coordinator was George A. Boyd who was very familiar with the Nininger Meteorite Collection. With a grant from the National Science Foundation and additional funds from the International Nickel Company, whose Vice-President, Herbert G. Fales was an avid meteorite collector. The collection was bought on June 8, 1960 and moved from Sedona to Tempe. Thus the Center for Meteorite Studies was created.

Dr. Carleton Moore, who had recently completed a doctorate on the topic of chemical groupings of chondrite meteorites at California Institute of Technology, was appointed as the Center’s first director. The original collection was made up of 677 distinct meteorites and the primary directive was that the meteorites must be “available primarily for purposes of scientific research by qualified scientists throughout the History of the Center”. Dr. Moore remembers that: “When I came there were very few of us that knew anything about meteorites,” says Moore, who was 29 years old when he began his career at ASU. “At that time, it was mostly chemists who studied meteorites. In the beginning, we just had a small room in the C-wing basement and everything was in steel cases; that’s where they put the meteorites before I came. And then chemistry abandoned a lecture room between the C wing and the B wing and we were given part of that for the meteorites. We eventually moved again to where the vault is now.”

After more than 40 years of dedicated service, Moore retired from ASU in 2003 but to this day he actively participates in the Center’s education and public outreach activities, and numerous public speaking engagements that reach hundreds of educators, students and members of the public each year.

Former NASA administrator Laurie Leshin was a professor in the ASU department of geological sciences and an ASU alumna, when she was named the new director after Moore retired. In 2006, Meenakshi “Mini” Wadhwa, then curator of meteoritics at The Field Museum of Natural History in Chicago, was named director of the Center and professor in the School of Earth and Space Exploration in ASU’s College of Earth, Ocean, and Atmospheric Sciences. Wadhwa oversaw the renovation of the Center’s facilities and the expansion of its research programs.

Dr. Carleton Moore, circa 1965
(Photo courtesy of ASU)
On October 21, 2011, ASU celebrated the 50th year of the Center for Meteorite Studies with a symposium attended by the Who's Who of the World of Meteoritics, and I was invited.

Dr. Moore welcomed everybody with coffee and a short introduction, and then we all settled to a full day of learning from the masters:

9:45 – Gerald W. Wasserburg – California Institute of Technology
Meteoritics and Cosmochemistry: A retrospective and Highlights

10:30 – Donald S. Burnett – California Institute of Technology
Importance of sample return missions to the advancement of Cosmochemistry

11:15 – Andrew M. Davis – University of Chicago
The role of analytical advances in the advancement of Cosmochemistry
(or how the scientists are getting deeper and deeper into the meteorites)

NOON LUNCH BREAK

1:45 – Caroline Smith – The Natural History Museum, London, UK
Meteoritics: The Significance of Collection and Curation on the State of the Field
(or how the Curator of a State-owned facility maneuvers around and through a tangled thicket of laws, rules and regulations, both domestic and international)

2:30 – Philip R. Christensen – Arizona State University
The Complementarily of Remote-sensing and Laboratory Analyses in Planetary Science
(or how the machines are taking over!!! And I thought that an electron microscope was complex!, a toy compared to some of the machines of the future!)

3:15 – Timothy J. McCoy – Smithsonian Institution
Meteoritics: Where will we be in 2061?

4:00 – Cocktail Reception, University Club
(or a great time to ask questions, and get to know a little about all of those people)

Tim McCoy – Smithsonian Museum
(Photo by Dolores Hill)

5:00 – Dinner Break

7:00 – Timothy J. McCoy – Smithsonian Institution
Dawn: A journey to the Birth of the Solar System.

Then Laurence Garvie opened the Vault, just a marvelous and very large candy store for any meteorite enthusiast!
Dr. Mini Wadhwa in the Vault
(Photo courtesy of ASU)

Holbrook “peas”

Holbrook “Peas”
(Photo courtesy of ASU)
The next morning, most of us assembled bright and early on the steps of Old Main, with coffee, coolers and wearing sturdy walking shoes. We were all going to Meteor Crater for a very special grand tour of the whole site with commentaries and explanations by Laurence Garvie and Dr. Dave Kring who knows every corner of the whole crater from the bottom to the rim.
Words are truly insufficient to describe Meteor Crater, so allow me to describe it with pictures, after thanking Dr. Wendy Taylor (Assistant Director, R. S. Dietz Museum of Geology, School of Earth and Space Exploration, ASU) for allowing me to pick and choose through the 398 pictures she took on this day. 

Time-out to enjoy the scenery

Of course, the whole of the crater
House-size rock upturned (the layers are vertical instead of horizontal) and deposited on the rim by the impact

Another example of the force of the impact: this rock was turned upside down (the older layers are on top, above the younger layers)

Layers of ejecta on the outer slopes of the crater. In the distance: San Francisco Mountain, the dormant volcano north of Flagstaff
Ruins of the mining camp built for the employees of Daniel M. Barringer a little over a century ago

(Photos courtesy of Wendy Taylor)

And now I would like to thank very sincerely Mini Wadhwa, Laurence Garvie and all the people of ASU who made me feel very welcome and who put together a great celebration of their first 50 years. I wish them many, many more.

Anne M. Black

This article has been edited by Norbert Classen
Vugs and Vacuoles in D’Orbigny Meteorite
by John Kashuba

D’Orbigny

The D’Orbigny angrite is famous for a lot of things. Among them are holes – vugs and vacuoles. The irregular vugs are usually filled with a tangle of well formed dark augite crystals. The vacuoles or vesicles are spherical. Most are empty. Some contain glass. These three dimensional features are hard to appreciate in two dimensional pictures. Trying to overcome this I’ve taken pictures from different angles then put them in motion as animated GIFs. The traditional Web View of Meteorite Times supports animated GIFs. The Magazine View does not.

Still shot of a cut spherical vesicle near the edge of a slice. D’Orbigny angrite.
Animated GIF of a slice of the d'Orbigny angrite highlighting a cut spherical vesicle near the edge.

Still shot of a tangle of augite crystals in a vug. D'Orbigny angrite.
Animated GIF of a crystal laden vug in the d’Orbigny angrite. If the image does an Escher trick and does not look like a cavity, keep looking and it should reverse. Hint; the yellowish mineral below center is near the viewer.
A small translucent crystal in the d'Orbigny angrite.
Congratulations to Bob and Moni on their marriage November 11, 2011. The Meteorite Times Team
# Meteorite Calendar – November 2011

by Anne Black

## Meteorite Falls Calendar

These meteorites fell in November but the exact dates are unknown.

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Any questions or comments, Please e-mail: [impactika@aol.com](mailto:impactika@aol.com)
Our Meteorite of the Month is kindly provided by Tucson Meteorites who hosts The Meteorite Picture of the Day.

A 264g Spaceship individual that looks like it’s still falling. Deeply scalloped backside with fine flowlines
and rollover ridges and rims. There are 4 mop-top nosecones on this incredible iron.

by Gary Fujihara, IMCA 1693
Big Kahuna Meteorites

Submit Pictures to Meteorite Pictures of the Day

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Today: 116 visits from 136 visitors
Yesterday: 217 visits from 165 visitors

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Where is my Picture?
Submit Pictures of the Day
About this Page
Billitonite Tektite
by Editor
Please support Meteorite-Times by visiting our sponsors websites. Click the bottom of the banners to open their website in a new tab / window.
Once a few decades ago this opening was a framed window in the wall of H. H. Nininger's Home and Museum building. From this window he must have many times pondered the mysteries of Meteor Crater seen in the distance.

Photo by © 2010 James Tobin