**The Yellowstone Park Meteorite?**

Martin Horejsi

Yellowstone National Park is an amazing place. As far as national parks in America are concerned, I find Yellowstone to be more of an amusement park filled with bizarre and fascinating and scary geology rather than a scenic park like Glacier or Arches. And as a super volcano, Yellowstone Park is an anomaly that defies continental odds, and invites millions of human visitors into its steaming caldera every year, not to mention all the world-famous wildlife that wanders the innards of the volcano goring the occasional visitor.

I captured the above video on one trip. Stuff like this happens all the time there. So much so that it’s hard not to let crazy tourist things become the local entertainment. You have to go 50 seconds in to see the woman actually walk down to the boiling mud pot and stick her hand into it to see if it really is hot. But what alludes most folks is the origins of such a place. What would cause an internal continental volcano of epic proportions to be located far from where any normal Pacific Rim of Fire volcano should be? In fact, what would cause an igneous event to smile across southern Idaho and end up at the intersection of Montana, Idaho and mostly Wyoming at such a time that more than a few Doomsday Preppers are preparing for when the whole thing explodes. And personally, since I live so close to Yellowstone National Super Volcano, if it blows, I won’t notice. At least for very long no matter how fun it is to think about.

The Yellowstone Supervolcano started millions of years ago and hundreds of miles away. Usually the explanation of how the whole Yellowstone thing started is with some thinning of the earth’s crust somehow. And that “somehow” is waved off with a flick of the hand and a theoretical concept like “mantel plume theory” or some other geological hotspot hand washing smoke and mirrors. But what if there was a more reasonable explanation? Luckily such a reasonable explanation exists, but one that requires some degree of catastrophe rather than slowly moving Uniformatariansm. So the case with Yellowstone National Park is one of a large crustal-thinning impact followed by 17 million years of continental drift.

Of course there is an acceptable and anticipated resistance to explaining away a major geologic feature on earth with a simple meteorite impact, but, as we say in science when applying Occam’s Razor, the simplest explanation is usually the right explanation. However, I will leave just a little room for Henry Mencken’s observation that “For every complex problem there is an answer that is clear, simple, and wrong.”

In the book *The Roadside Geology of Idaho* by David Alt and Donald W. Hyndman (1989), there are unfortunately a scant few paragraphs that lay out the Yellowstone meteorite situation. Oddly, the authors never really come right out and say it, but rather explain away the whole Yellowstone situation, along with the Snake River Basalts (That big smile that runs across the entire southern side of Idaho) as the result of a meteorite impact because, well, what else could have caused it? And if no meteorite fell, then we would also not see a whole pile of other major geologic features spread across hundreds of miles of the western USA.

According to the book..."We think the meteorite that formed the Columbia Plateau struck 17 million years ago because that is the age of the oldest basalt flows associated with both the Columbia Plateau and the Basin and Range. We think it struck in the southeast Snake River Plain and the northern end of the Basin and Range begin in that area. Large areas of volcanic rocks that erupted in southeastern Oregon
about 16 to 17 million years ago are probably remains of the lava lake."

And further...

“If the big meteorite had not stuck southeastern Oregon 17 million years ago, the Yellowstone hotspot would not have burned its track through Idaho to create the Snake River Plain. This book would be one chapter shorter. The western High Plains from South Dakota to Texas would lack their deep deposits of volcanic ash erupted from the long chain of volcanoes that made the Snake River Plain."

As a very frequent visitor to Yellowstone National Park (mostly during the early and late season and during winter to avoid tourists), I love the idea of a meteoritic formation for this whole geologic mess. And that the destructive force that may have started the whole process may be reversed in the future with an outward super volcano explosion that again will change the geology of much of the western United States taking with it all those who live nearby. Kind of a reverse-meteorite-impact. And speaking of impacts on earth, here is the latest news on that front.

Until next time...
We are still in the aftermath of moving. My casita (workshop) is still full of unopened boxes. But my main saw for meteorite work is set up again and the diamond lap is set up. So I can get back to work soon. As it turned out the day after I wrote those first two sentences I had to cut a box of meteorites. About fifty stones many just in half but other large stones had to be thin sliced. So that was a good beginning for me this year at the new workshop.

The heater that did not work was repaired so it is warm in the workshop. It worked when we moved in but apparently had a small freon leak. After a month when I needed to use it the unit would not come on. Instead it threw up a F0 error code that meant call a repair specialist. It is a new house everything is under warranty. I told the construction supervisor of the problem and the next morning he had the man there to fix it. Could not ask for more. It is our first winter in the mountains and we are still adjusting to the cold. We are used to being near the beach down at LA. But it is a big 1 ton air conditioning/heating unit in the casita it is over big enough for the single room. In the summer I will be really nice and cool when it is 90+ degrees outside. Right now it is nice and cozy warm.

The snow did not last at our house after the storm one day in mid January just as this issue was coming out but it is lasting well on the mountains just a mile away.

Paul Harris and I are doing planning for the Tucson gemshow and think we are going to take a day to do some hunting while we are away from home. This year we are both in our new houses and may get to go out more often from this point. Last year I had a about a three hour drive to his house to pick him up. This year I have a three minute drive of one mile.
I am excited about the gemshow this year. I won’t be working too hard trying to get my book “Drilling for Meteorites” around to everyone that wanted copies to sell like last year. So I can spend more time looking at all the meteorites. I am especially excited to be giving a lecture on Meteor Crater’s history the evening of February 4th. This is part of a series of educational lectures that Suzanne Morrison is beginning this year. The series will continue into the future with more lectures by many individuals each being video recorded. There is to be a live video feed of each lecture on a special FaceBook page that she creates. I believe she is trying to get ten lectures done over five nights this gemshow. I am very honored to have been asked to be a part of this.

Now the great challenge is to squeeze 50,000 years of Meteor Crater’s history into a thirty minute talk with a question and answer period after. I may have to resort to magic to do that. I know one thing I have to stay on topic and move along if I let myself wander to something really interesting the audience might be forever stuck in 1921.

This is the ruin of the building that once housed the collection of meteorites of H. H. Nininger while he lived near Meteor Crater and studied it.

I created a FaceBook page to go along with the lecture for people to contact me if they wanted to. It will continue to serve as a resource after the talk for discussion, and questions or concerns about things related to Meteor Crater. So I have been putting up many posts about the Crater over the last month. It has been posts I did not want to make before because they would have been spoilers of the story in my own book. But now the FaceBook page is providing me great fun as I post these little treasures of history a few a week. The page is titled Meteor Crater History (of course) and it is open to the public. Come by often to see what is new. Here is a link.

https://www.facebook.com/pg/Meteor-Crater-History-1891371247642400/posts/?ref=page_internal

I did not buy more than a couple meteorites since last year’s gemshow. My life was occupied with moving most of the year. But one I did buy was a 32.2 gram beautiful almost completely crusted stone from the Madagascar fall of July 27, 2018. The meteorite is official with the name Benenitra. It has three sides that are thick smooth surfaces of primary fusion crust. But it is clear that it broke up early because the rest of the surfaces though also thickly fusion crusted show a little bumpiness.
I am eager to get to the gemshow and find a few nice stones to cut and play with and maybe some other stones like the Benenitra to just sit and wonder upon.

I have really been missing my extreme close up photography time every few days. I have the rig reassembled from moving but don't have enough room to set it up so I can work with it. That is my goal in the next few days. I have over a dozen slivers of meteorites mounted but I never ground and polished them into thin sections by the time we moved. When I find those in some box I can create hours of fun for myself making the thin sections. Then I will have days of fun with the camera imaging chondrules and other exciting stuff. I think maybe one more month of unpacking and organizing in the house will set me free to begin the long process of getting the garage in order and my workshop finished. Maybe by the next issue of Meteorite Times I can include some images of the shop.

I hope for everyone that 2019 is a safe and prosperous good year.
My meteorite-hunting partner, Greg Stanley, has always had an affection for achondrites. He even admitted as much on the Meteorite-List back in 2010 July 1st, when asked, “What types of meteorites do you collect?” he wrote, “I favor Achondrites, the more exotic the better – – – I favor Mars over Lunars.”

Even after a successful day of recovering chondrites, as we would sit around the campfire, he would always bring the discussion back around to “achondrites”. He would usually start by asking a question, like “What with all of the chondrites found on dry-lakes, why haven’t we found more achondrites?”, then eventually he would get to the part where he would describe in detail how ecstatic he would be “when he finally finds an achondrite”. Not stopping there, he would go on to state, “If I am going to dream, I may as well dream big. So, make that, When I Finally Find a Mars Meteorite!” (Remember, he favors Mars over Lunars.) Even though he would say that words couldn’t convey how he would feel, Greg was never at a loss for words when he would talk about that fabulous day when he “finds that Mars meteorite”.

But life has a way of getting in the way of our passions, and although some rough times kept Greg from his meteorite-hunts in the desert, he turned to his other passion, his art. And although too many years have gone by since we last searched together for meteorites, we still maintain contact through on-line social
networks. This has given us an opportunity to watch him develop his craft in painting and poetry, and other writings. Greg even found the words to "convey how he would feel" by writing a poem about finding a Mars meteorite. It was through the pursuit of his artistic passions that he eventually crossed paths with his soulmate, Shanna O'Brien.

Shanna is an artist, as well, but of importance here, she is also a recording artist, and at the time she met Greg, she was a long-standing solo artist. Long story short (which is better described in her own words, below), an artistic and music collaboration was formed, which resulted in the creation of WATERFALL. And one of the first creations that was born from this duo is the song “Falling Star”, which melds Shanna's musical styling's with Greg's lyrical poem about finding a Mars meteorite. And although Greg may not have (yet) found his Mars meteorite, I feel that he and Shanna have found something even more precious. “Waterfall”.

Without any further adieu, here is the YouTube link to “Falling Star” by Waterfall.

Bio for Shanna O'Brien and Greg Stanley aka “Waterfall”

There is a new duo in town named Waterfall, made up of singer/songwriter Shanna O'Brien and percussionist, Greg Stanley.

Shanna started her career in the late 70’s, playing original songs on her beloved Martin guitar in the hip clubs of Marin County. She soon recorded with many of Bay Area’s top musicians, opened for the rock group Journey, and eventually had her own show at the MGM Grand in Reno. After life-changing events took her away from the stage for several years, Shanna returned to her love of songwriting, performing, singing from her heart and accompanying herself on guitar. She eventually recorded two albums of her original music which can be found on CD Baby.

Three years ago she retired from the LA scene and brought her musical passion to Bakersfield where she met her partner, Greg Stanley.

Greg, a poet/artist/painter, always aspired to be a percussionist too! One evening he was “keeping time,” tapping on the coffee table with his fingers while Shanna played a new song for him and WATERFALL was born. Greg soon picked up a Djembe drum and has been adding noise makers to his rig ever since. Together Shanna and Greg have been bringing WATERFALL'S original sound to many appreciative Bakersfield audiences for over a year and will continue to share their love of music
End of WATERFALL bio.

My “review”:

I found listening to WATERFALL’s music to be very relaxing. I feel the positive energy that is produced through the collaboration of Shanna and Greg’s music. I figured that writing about this would be a break from current events, and would be a simple “Thank you for sharing” that I could also share with my readers. I hope those that listen to “Falling Stars” will be as inspired as I was to hear captured in a song the thrill of finding a newly fallen meteorite — FROM MARS!

End of My “review”.

If there are any updates to this story, they will appear HERE!

This article has been highly abbreviated in time for it to be included in this January 2019 publication of Meteorite-Times Magazine.

REFERENCES:


External links:

“Falling Star”, is the compelling song about a meteorite from Mars that fell to Earth, from the new Bakerfield, California group known as, Waterfall.

Other CDs by Shanna O’Brien:

Focus On the Light — by Shanna O’Brien
© Copyright – Shanna O’Brien / Shanna O’Brien (888295347884)

Music and lyrics that capture emotion and feelings people can relate too.
Genre: Pop; California Pop
Release Date: 2015.
Timeless — by Shanna O’Brien
© Copyright – Shanna O’Brien / Shanna (807207040729)
Soothing vocals, moving lyrics, Americana and soft rock that leaves you inspired and wanting to hear more.

Album Notes (2005):
Shanna “Songbird” O’Brien has been singing since a young girl. She was a featured soloist in her church choir and her family and friends would insist that she sing at functions and gatherings. Her wonderfully rich tone has always been “music to the ears.”

Shanna’s influences are traditional folk music as well as Elvis, Bob Dylan, The Beatles, Annie Lennox, Ella Fitzgerald and many more.

The ’80’s found her living in the Bay Area playing her guitar and original songs at the Sleeping Lady Café in Fairfax, The Resh House in Mill Valley and many of Marin’s music festivals. During this period she studied voice with the renowned vocal coach, Judy Davis, located in Oakland.

Eventually she recorded sessions with the “master synthesist,” Patrick Gleeson as well as Michael Cotten and Prairie Prince from The Tubes, Greg Douglass, former guitarist with the Steve Miller Band and Cory Lerios of Pablo Cruise. Greg Douglass agreed to be featured on her “Timeless” album. In the ’80’s she also opened for Journey at the Old Waldorf and went on to have her own show at the MGM Grand in Reno as well as at the Mandarin Hotel in Singapore. (Some of you who might want to check on these references should know that at that time Shanna was known as Sandy Welch.)

During the 90’s, Shanna’s path took a turn away from a music career and into film distribution as well as painting and caring for a loved one who became ill. She worked for Medallion TV Enterprises on Sunset Boulevard in West Hollywood for 10 years and was appointed president of the company after her boss passed away in Cannes, France while they were attending an international film convention.

Throughout these trying years, Shanna continued to write songs and play her guitar for friends in her living room. She calls it a stroke of amazing luck that in the year 2000 she teamed up with veteran musician / producer Terry “Bear” Cano and she credits “Bear” for helping her, to once again, pursue her musical aspirations.

Her “Timeless” CD is ready for purchase!

When not on stage, or working with Batjac Productions in Beverly Hills, Shanna can be found at Bird and Bear Music Studio, writing songs for film and TV, recording original music or simply just enjoying singing and playing her guitar.

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If you have any questions as to how to get more information about WaterFall, then please contact Shanna O’Brien at: www.facebook.com/shannasongbird

My previous Bob’s Findings can be found *HERE*
NWA 7203 Angrite - by John Kashuba

NWA 7203 was a single 107 gram fusion crusted stone from Morocco. It was purchased by Luc Labenne in Tucson in 2011.

This meteorite is a quenched angrite from a surface or near surface magma on the angrite parent body. Its texture is dendritic, a result of rapid cooling of the magma. The branches are composed of olivines and feldspar. The space between the branches is filled with pyroxene.

The centers of the branches are composed of intergrown Kirschsteinite olivine (elevated calcium) and faylitic (high iron) olivine. They are brightly colored in thin section in cross-polarized light, XPL. The feldspar is a plagioclase and is the calcium end member, anorthite. In XPL it appears white through shades of gray.

The interstitial pyroxene is an aluminum-titanium-rich clinopyroxene. In plane polarized light, PPL, it is a light rust color.

Thin shock melt veins suggest moderate shock unlike most other angrites.

Fusion crusted slice of NWA 7203 angrite about 3cm by 3cm.
Thin section sample from 1/4 of the above slice.

NWA 7203 angrite thin section PPL. Field of view, FOV, is 5.5mm wide.
NWA 7203 angrite thin section XPL. FOV = 5.5mm.

NWA 7203 angrite thin section XPL. FOV = 4.6mm.
NWA 7203 angrite thin section XPL. FOV = 2.9mm.

NWA 7203 angrite thin section XPL. FOV = 0.5mm.
NWA 7203 angrite thin section XPL. FOV = 0.5mm.

NWA 7203 angrite thin section XPL. FOV = 0.4mm.
NWA 7203 angrite thin section XPL. FOV = 0.3mm.

NWA 7203 angrite thin section PPL. FOV = 0.4mm.
NWA 7203 angrite thin section XPL. FOV = 0.4mm.
Norm’s Tektite Teasers: (Part three of three): The Austral Part of the Australasians

By Norm Lehrman (www.TektiteSource.com)

In this edition we conclude our survey of the classic three or four morphologies of each part of the Australasian tektite strewn field, now moving on to the world of Australites.

Australites! These were the stones that ignited my passion for tektites. One of my favorite activities on this planet involves wandering the dry lakes of the Australian outback looking for these little black rocks.

In the last column, I suggested that I was presenting a case that could challenge the very concepts behind the geocaricature that has introduced each segment of this series. I now believe that the picture is wrong. It presumes a singular Australasian impact that produced all of the contemporaneous Australasian tektites of whatever flavor. (See my recent articles on Muong Nongs). Happily, there is something to be salvaged from the introductory sketch: the right hand “Australite” part is still consistent with the concept that these tektites truly did come flying in from someplace far away. All Australites show the effects of thermal ablation due to atmospheric transit.

In parts one and two of this series, the following classic forms were suggested for other regions: for Indochinites: patties, teardrops, and dumbbells, (all splashforms), and for Philippinites: large bald spheroids, soccer-balls, and “bikolite-type” spallation shells. In each of these cases, the selected forms reflect high abundances.

With Australites, there is an unrivaled champion, the Flanged Button, but it most assuredly does not draw fame from its abundance. Cookie and I have personally picked up over 2000 Australites. Neither of us has yet found a complete flanged button. But if our challenge was to represent Australites with only one morphology, these lovely little flying saucer forms would be the choice. Darwin made room for one of these on the Beagle.
There is a logic to this beyond the aesthetics of a pretty face. Flanged buttons are at the center of a size-related morphological trinity. The special stones that became flanged buttons began their dive into Australian atmosphere about the size of a child’s marble or a little bigger. A film of molten glass streamed off the frontal surface in the blowtorch wind. The glass wrapped around the trailing edge, drawn in by a protective eddy. A flange formed and within a very narrow size window, the flange survives (at least until impact!)

Larger or smaller primary spheroids suffered different fates. Those smaller than the flanged button range ablated towards oblivion. Any flange that may have once formed detached or melted away onto the slipstream. The remnant form is a tiny lens that was left of the button in the middle of a flanged button. These are the most abundant Australite morphology, and are my second nominated classic form.

Larger primary bodies (up to about the size of a chicken egg) were thermally unstable. They began their atmospheric plunge chilled to the heart with the cold of near-space. Nearly instantaneous frictional heating expanded the frontal surface more quickly than heat could equilibrate, and flakes exploded away. By this process, a third Australite classic came to be, the Thermal Ablation Core.

A fourth form should be added to represent another dimension in Australite variation. The three shapes discussed above involve variations due to the size of the primary spheroid. Spheroids were clearly predominant, as they were in the Philippinites, but there were other less common primary forms---dumbbells and teardrops for example. These were subject to size-related laws of thermal ablation as were the orbs, and this gave rise to flanged teardrops and dumbbells and the consequential forms of larger and smaller size. I have chosen a nice “peanut” to represent Australites descended from non-spherical primary bodies.
In retrospect

It has been interesting to think through these nominations for membership in a set of ten or so stones to represent the three main divisions of the Australasian tektites with must-have classic forms. There is an endless list of desirable oddities and rarities, but these described are certainly among the basic set for any collection hoping to represent Australasian tektites.

I would make one change in the stones of the “classics” series. I would add Muong Nongs to the Indochinite ensemble. This addition is due neither to abundance nor aesthetic beauty. If the late Darryl Futrell was still around, we would be soul mates regarding Muong Nongs. They hold the key. Muong Nongs join the elite list for their perceived significance to the story.
The National Science Foundation (NSF) has funded world-class telescopes and astronomical instruments in Chile for decades, and the discoveries that have been made have helped to reform our views of planetary formation, black hole dynamics, and solar system processes (to name just a few). But what about meteorites?

In June 2018, I traveled with eight other educators as members of the NSF-funded Astronomy in Chile Educator Ambassadors Program (ACEAP). Over 10 days, we received extensive training on the science, technology, education, and public outreach activities being conducted at the Cerro Tololo Inter-American Observatory (CTIO; 7500 ft above sea level), the Atacama Large Millimeter/submillimeter Array (ALMA; 16,500 ft above sea level) near San Pedro, and three tourist observatories (in Santiago, Vícuña, and San Pedro).

But it was in San Pedro de Atacama that I realized there’s more to Chile than big telescopes. You see, I started my career in Astronomy but in graduate school, I was drawn to Planetary Science, and I have since built my career by studying lunar samples brought to Earth by the Apollo astronauts. Lunar glasses and the effects of impacts are now the focus of my work. So when we visited the Museo del Meteorito, I was pleasantly surprised to see such a wonderful place chock full of space rocks.

Since 2012, the museum has been situated on the outskirts of San Pedro, about a 10-minute walk from the main shopping and dining area. Two non-descript connected domes (Figure 1) house about 80 meteorites that have been found in the Atacama Desert. There is an audio tour as well as descriptive displays that describe the meteorites, how we know what we know about them, and why they are valuable scientific objects. Meteorites and jewelry made from them are for sale and the prices are reasonable. On the day of our visit, Rodrigo Martínez, the director of the museum, was there to talk to us about the facility and its meteorites.
More than 3000 meteorites have been found in the Atacama Desert since the late 19th century and classifications include almost every kind of meteorite in the world’s collections. Details on recent searches and finds can be found in Muñoz et al. (2007) and Gattacceca et al. (2011). The most recent scientific expedition occurred in 2017 and included participants from France, Chile, Argentina, Iran, and the United Kingdom. In nine days, these meteorite hunters collected over 600 meteorites! Even though they have been weathered by the desert winds, these meteorites can provide important clues to the age and origin of our solar system and its planetary inhabitants.

The visit to the Meteorite Museum was less than two hours of our 10-day expedition to visit astronomical observing sites in Chile, but as the lone planetary scientist in the group of ACEAP participants, I was drawn to the beautiful space rocks (Figure 2). I really enjoyed visiting the telescopes (Figure 3), learning about the cutting-edge scientific discoveries that are happening, and gazing up at the pristine dark skies. But thinking back on the trip now, I am reminded that we need to look up – and down! – to truly appreciate and understand our place in the Universe.

Figure 2. Some of the 70 meteorites on display. L to R: chondrites, irons, pallasites.
Figure 3. The author in front of the dome housing the 4-m Victor Blanco Telescope at CTIO.

To find out more about the program and our experiences, search for “ACEAP” on Facebook or “#ACEAP2018” on Twitter. To find out more about the Meteorite Museum, visit its webpage at http://www.museodelmeteorito.cl/.

References


Tissint Martian (shergottite)
Paul Harris

Our Meteorite of the Month is kindly provided by Tucson Meteorites who hosts The Meteorite Picture of the Day.

Tissint 120 gram individual is from a private collection and is about 98% fusion crusted. This Tissint sits up nicely for display and exhibits a nearly complete black, glassy fusion crust. Contributed by John Sinclair
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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