

# Rock & Gem

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## ON THE COVER

Gold has a timeless appeal and usefulness to human civilization. This 3.9-cm-high specimen is from the Round Mountain mine, Nye County, Nevada. (Jeff Scovil photo/Paul Harter collection)

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# A NEVADA TURQUOISE ADVENTURE

## Collecting at the Royal Royston Claim

Royston turquoise exhibiting rhyolite matrix  
is featured in this Navajo jewelry.



Story and Photos by Thomas Farley

**N**ear the western high-water mark of the Great Basin's Sagebrush Sea sits Tonopah, Nevada, at 5,394 feet. I came to this high-desert town to search for turquoise, to experience a hunt on one of the last gem-grade turquoise mines open to the public in the United States.

A friend's interest in turquoise jewelry had ignited in me a curiosity about the semiprecious gemstone. While I am normally a gold prospector, using my metal detector to find gold in quartz, I became more and more interested in turquoise as I researched it on the Web.

An upcoming trip to Las Vegas would take me through Tonopah. From investigating, I knew that the nearby Royston Mining District was famous for turquoise and that the Otteson family offered a tour and a dig at their Royal Royston claim in of Tonopah. The \$100 dig fee did not deter me, since food, gas, research books, and a hotel room would cost more than that. Besides, what price adventure?

Tonopah is centrally located between Reno, Nevada, and Las Vegas, a day's drive from either city. I began my turquoise odyssey in Reno, principally because I was moving things from Sacramento to Las Vegas, my soon-to-be new hometown. The date was Oct. 20, 2015.

To get into the spirit of things, I first visited the W.M. Keck Earth Science and Mineral Engineering Museum on the campus of the University of Nevada at Reno. The museum is in the Mackay School of Mines Building, a classical-looking structure in Flemish-bond brick. I had read there was an outstanding display

of Nevada turquoise inside, and I was not disappointed.

A large display cabinet houses the Luella Margrave turquoise collection. It has samples from around the world, including more than 30 specimens from different Nevada mines and localities. The collection of mostly rounded and polished stones includes a Blue Gem mine specimen that weighs 704 carats! The grouping also shows stones that are often mistaken for turquoise, such as howlite, chrysocolla, wardite, imperialite and variscite.

"The Keck", as staff members sometimes call it, houses other fine collections. Its gold and silver specimens are first-class, and the history of the Comstock strike is well presented. Any rockhound should tour the museum's displays of minerals, fossils, mining artifacts, and ores. Vowing to come back soon, I next drove a few miles north to visit the publication sales and information office of the Nevada Bureau of Mines and Geology (NBMG).

The NBMG maintains this outlet at the Great Basin Science Sample and Records Library building on Raggio Parkway in Reno. It's recognizable immediately by its insulating gold-clad windows. During my Internet research on Nevada turquoise, I kept coming across references to a Frank Morrissey, an inveterate amateur turquoise collector who visited nearly every turquoise mine in Nevada. At "The Bureau", I bought a copy of Morrissey's



Group members are issued yellow bags to hold the specimens they collect on the overburden bank at the Royal Royston claim.



An excavator at the Royal Royston claim removes overburden of rhyolite and kaolin shale to expose the downward-trending turquoise vein.

seminal work, *Turquoise Deposits of Nevada*, field checked and published by the NBMG in 1968. Although the document exists as a pdf file online, I purchased the printed work for its foldout map and, to a degree, as a souvenir.

After some impulse buying—*Geology of Nevada*, a boxed NBMG rock and mineral collection, and a turquoise picture postcard—I fueled my truck and headed east on Interstate 80 to Fernley, Nevada. It's necessary to go east to hook up with U.S. Highway 95 South, which takes you all the way to Tonopah.

As I negotiated the light traffic and rural intersections, I kept looking at the postcard I had bought, slightly bent and yellowed on the back, perhaps from years of waiting to be sold. Its caption, written by the NBMG, neatly summarized what I was starting to learn: "Turquoise is a complex mixture of copper, aluminum, phosphate and water, and is found in veins, seams and nodules in a variety of rocks. It varies greatly in color from the highly prized shades of blue, green, and blue green to almost white or grey."

That correlated with my notes. The U.S. Geological Survey wrote something similar on the Web: "Chemically, a hydrated phosphate of copper and aluminum, turquoise is formed by the percolation of meteoric or groundwater through aluminous rock in the presence of copper" (<http://minerals.usgs.gov/minerals/pubs/commodity/gemstones/sp14-95/turquoise.html>).

Water and an arid climate are key factors. As water moves through layers of the chemically correct soil and rock, it causes small amounts of copper to be dissolved. Evaporation must then occur for aluminum and phosphorus to combine with the copper. The result of this reaction is to deposit turquoise in veins. Too much water in the soil initially would drive out the copper, making it too dilute to react. The process would also be doomed in a wetter climate, since evaporation must occur.

Turquoise's formula is  $\text{CuAl}_6(\text{PO}_4)_4(\text{OH})_8 \cdot 5\text{H}_2\text{O}$ , in which Cu is copper, Al is aluminum,  $\text{PO}_4$  is phosphate, OH is hydroxide, and  $\text{H}_2\text{O}$  is, of course, water. The differences in color and the shades within a color, reflect the different concentrations of each chemical. Chemicals that are present in lesser amounts, such as iron, also affect color, as does the host rock, or matrix, of the stone.

Joe Dan Lowry and Joe P. Lowry, writing in *Turquoise Unearthed: An Illustrated Guide* (Rio Nuevo Publishers, 2002), say that, generally speaking, "Stones with more copper appear bluer, while those with less copper and more iron are greener." Other experts, such as Colorado College's Richard M. Pearl, author of *Turquoise* (Earth Science Publishing Co., 1976), are skeptical and leave iron's contribution unresolved. But as I drove on and as the country emptied, I thought less about chemicals and more about the people who first occupied these lonely lands and how they worked turquoise into their lives.



This washed 3-pound, cabinet-size rhyolite rock shows a gem-grade turquoise seam.

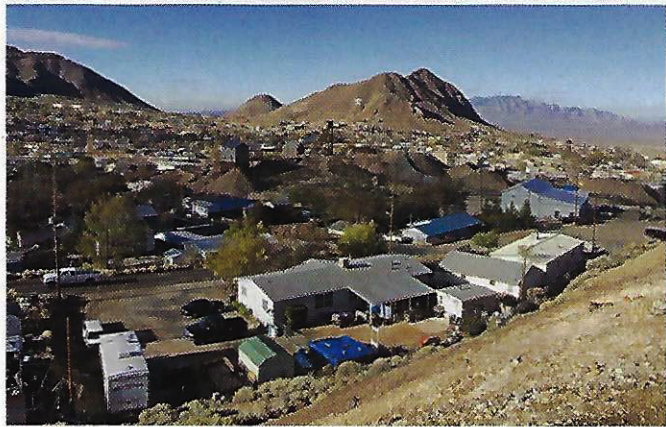
Turquoise mining and processing in Nevada goes back at least 600 years. Research Geologist Joseph V. Tingley once wrote that Anasazi (Ancestral Puebloans) mined turquoise near present-day Boulder City in southern Nevada from 300 CE to 500 CE. In 1925, George Schmidlein was led by a house servant to what she said was an old Indian mine in the Toquima Range (Nye County). Fifty miles or so northeast of Tonopah, Schmidlein found turquoise chips, crude stone tools, and a narrow, 12- to 15-foot shaft. He subsequently claimed the property, calling it the Indian Blue mine.

From their center of power in what is now New Mexico, Anasazi traded turquoise for almost everything, including California seashells, copper bells, obsidian, and even macaws from Mexico. But what about this mine near Tonopah? That is Western Shoshone country. Although I hadn't yet finished my research, it seemed likely that those early people also produced finished turquoise for its ornamental, monetary and sacred value.

Mine-scarred hills and tailing piles greeted me as I drove into Tonopah. The city is built on top of countless abandoned tunnels and mine workings; a town alive on the remnants of the past.

My destination was the historic and period-restored 1907 Mizpah Hotel, whose management has an arrangement with the Ottesons that benefits everyone. The Ottesons run rock saws and polishing equipment in the Mizpah's basement and a retail store on the first floor. Tour participants get a discount on their dig fee if they stay overnight in the hotel. All dig attendees, no matter where they stay in town, meet their guide leader at 10 a.m. in the morning in the grand lobby of the Mizpah.

After a wonderful dinner and overnight at the Mizpah, I got out at 8 o'clock the next morning to walk around the Tonopah Historic Mining Park. The park is right in back of the hotel. Challenging trails lead to myriad mining features: hoist houses, a powder



Topniah, Nevada, is a high-desert town situated near the Royston Mining District.



Low-grade green turquoise in rhyolite can be found at the Royal Royston claim.

magazine, a tunnel, and viewing areas for many now-closed silver and gold mines. For the less physically inclined, the Visitor Center offers easy access and plenty of parking. The rock and mineral displays there offer a great look at Nevada's geological resources. It was here that I first saw turquoise rough, and I found that sight compelling.

Previously, I had always seen turquoise set in jewelry or as polished stones. The rough, by comparison, had a raw and natural look that I liked very much. Royston District turquoise was represented, including an example of the rare and controversial white turquoise, which many argue is not turquoise at all. I will not settle that argument here, but the NBMG did write that turquoise colors could range to almost-white and gray. After too short a stay, I hustled out of the visitor center to get to the Mizpah lobby by 10 o'clock.

In the Mizpah, a small group of us filled out paperwork, were issued yellow nylon bags for our finds, and were introduced to the personable Dean Otteson. He seemed genuinely interested in sharing his life and his love of turquoise. Turquoise mining is a family affair; no fewer than 13 Ottesons have active claims in the Royston Mining District. We would caravan to the claim, he said, so the six of us went off to our vehicles and were soon racing out of town.

And I do mean racing. After a short stint on U.S. Highway 95 West, we headed northwest on Gabbs Pole Line Road at a furious speed. We passed SolarReserve's power plant, whose thousands of mirrors concentrated sunlight on a tower receiver that glowed like a torch. Our small convoy struggled to keep up with Dean's truck. After 20 miles, we broke westward over an unpaved, but well-graded, road toward the Royston Hills. Rain had fallen in previous days, but our caravan—a low-slung sedan, a full-size camper pickup towing an ATV, and my pickup—managed to battle through the occasional wallow. I tried not to think about damaging the load of paintings and possessions in my truck, which I was taking to Las Vegas. They would have to take care of themselves—this was a time for turquoise!

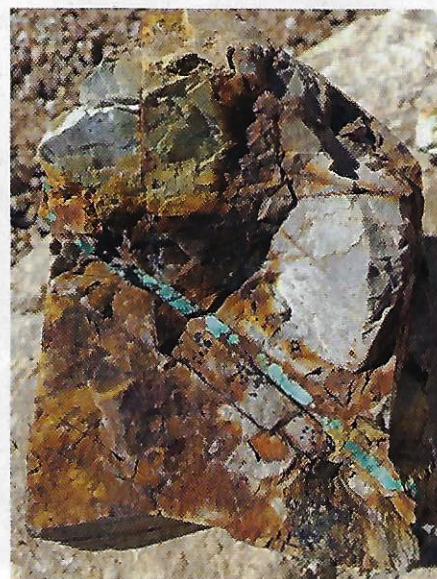


This washed hand sample is typical of the size of stones found at the Royal Royston claim.

After five or six miles on this unpaved track through desert scrub, we came to our first stop a few hundred yards from our final destination. Dean pointed out an abandoned mine that at one time supplied turquoise to Tiffany & Co. He said the old tunnel was safe to go into and that a mine room opened to the sky. Regrettably, in my haste to search, I forgot about these old workings and did not tour them before I left. After this stop, we followed Dean to his Royal Royston claim. He motioned to a bank of overburden only steps away from where we parked. It was in these spoils that we could search.

Dean's excavator was following and exposing a main vein. As it dug through less promising earth, its bucket would swing back and place overburden behind the machine. That rock was then pushed away from the excavator so we could look through it. Armed mostly with hand rakes, we pawed at the material, turning over dusty rocks and rubble. I regretted not bringing a spray bottle.

Dean said the overburden was a jumble of kaolin shale and rhyolite. This state-



Dean Otteson says that a skillful cutter could make good use of even thin veins of turquoise.

ment matched my research; the USGS Nevada state geologic map shows the claim area belonging to the Havallah Sequence of Mississippian- to Permian-age rocks altered by volcanic activity. Fractures and fissures were invaded by mineral-bearing solutions, and the gemstone was deposited as seams and veinlets.

Dean told us to simply look for color. One big rock with a hint of blue caught his attention. Our group had only rock picks and hammers, nothing heavy enough to break open the piece. I said I had a hand sledge in my truck and went to get it. Upon my return, however, the group had dispersed, each of them hunting on their own.

I looked over the rock, trying to read it. Not wanting to destroy something by blindly flailing away, I remembered Dean had said to hit the rock on the right. So I did. A 3-inch piece broke away, displaying good color. I hit the rock again and it cleaved open, exploding into a sky blue color that matched any turquoise cabochon I had ever seen. A half-inch-thick vein of gem-grade turquoise revealed it-

## Access and Amenities

The William M. Keck Earth Science and Mineral Engineering Museum is located in the Mackay School of Mines Building on the campus of the University of Nevada at Reno. Handicap accessible with restrooms. Close parking is metered and scarce when students are in session. No admission charge. (775) 784-1766; [www.unr.edu/keck](http://www.unr.edu/keck)

The Great Basin Science Sample and Records Library building housing the Nevada Bureau of Mines and Geology sales office is located at 2175 Raggio Parkway in Reno. Handicap accessible with restrooms. Plentiful parking. No charge. (775) 682-8766

The Tonopah Historic Mining Park is located at 110 Burro Street, immediately behind the Mizpah Hotel. Adequate parking for most RVs and trailers. Visitor Center and mineral display room is handicap accessible and has restrooms. Free admission to the visitor center, store, and mineral displays. For the most part, the grounds are not easy for the physically challenged. There is a charge for the walking tour, which ranges from \$3 to \$5. (775) 482-9274; [www.tonopahhistoricminingpark.com](http://www.tonopahhistoricminingpark.com)

The Mizpah Hotel is located on 100 N. Main Street in Tonopah. Handicap accessible with restaurant, bar and lodging. (775) 482-3030; [www.mizpahhotel.net](http://www.mizpahhotel.net)

Royston Turquoise mine tours are arranged and conducted by the Otteson family on Wednesdays and Saturdays from April through October. The claim site is unpaved, with uneven ground, and without facilities. People are escorted in, but can leave by themselves. Bring water, snacks, goggles, gloves, a spray bottle, and a rock hammer. See their Web site for additional items. Perhaps take a rented vehicle if you are concerned about your car. Good luck! (775) 482-9889; [www.roystonturquoise.com/minetours.htm](http://www.roystonturquoise.com/minetours.htm)

self. I was so excited that I wanted to put the rock into my bag immediately and run off with it, but I hesitated.

Our group had found the rock together. I therefore considered it a community rock, and wistfully placed it next to my tool bucket. Later, we would all have to figure out who got to keep it. And while the group had scattered, my prospecting experience taught me never to leave a productive area until it was exhausted. I was soon rewarded for staying close with samples that showed wonderfully what I had read about while getting ready for the dig: turquoise veins shot through parent rock.

These new pieces showed fracture lines and veins more clearly than the first rock, but with much less turquoise. I told Dean that, while they were interesting, they didn't seem to be good prospects for working up. He disagreed, saying that it depended on the skill of the rock cutter; that if done properly, a good show could result even from these thin veins. I later read about ribbon turquoise and how a narrow line of color through country rock could produce a beautiful cabochon. Dean was clearly an expert.

Dean asked me how splitting the first rock had turned out. He gave a big smile when I brought it over. I told him I would have to figure out who would get to keep it. He regarded me with a puzzled look, as if to say not to worry about it. Fortunately, a member of our group overheard our conversation. He shouted, "Tom, just keep it!" I happily put it in my yellow bag, already thinking where I could display it in my new home.

One of our company found a round, dense green stone that looked quite gem-

my. I hadn't read that the Royston Mining District produced nodules or nuggets; nevertheless, there it was. I read later in Pearl's *Turquoise* that when "a rock cavity is only partially filled, the surface is often rounded". The others in our group were equally happy with their finds, mostly hand sample-size rocks showing green and blue.

Having found enough rough to keep me happy, I and several others walked down to where the excavator was being used to chase the main vein. Moments before, I had seen Dean's brother and another hand leaving the mine with 5-gallon buckets of rough. It all looked very blue. Almost canyon-like, a high rock wall loomed over a deep hole that the excavator was burrowing into. The mine had been producing for some time, judging by the depth of the pit.

We spent about three hours on the claim. It felt special to walk around a working mine like this on such a beautiful fall day. Dean encouraged all of us to join a rock or mineral society in our hometowns so we could work our turquoise and find out more about rocks and gems in general. Good advice. For those without access to saws, Dean offered to cut smaller pieces back at the Mizpah.

Feeling recharged by the experience, I drove back to the main road at my own pace, enjoying the countryside. The glow of SolarReserve's tower in the distance led me to the main highway, and then I was on to Las Vegas. I thought about the Margrave turquoise collection I'd seen in Reno at the beginning of my trip. Perhaps I, too, could start a Nevada turquoise collection. Perhaps my turquoise odyssey was not ending, but only beginning. What a feeling! ♦

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