

The Rio Grande Rift

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Introduction

Mar92 News Nuggets
By Winchell

A generally little known geologic feature which is continental in scope is the Rio Grande Rift, sometimes referred to as The Great American Rift. A rift geologically refers to a very large break in the earth's surface that can be traced over a long distance. The rift, within which most of us live, is long indeed. It begins in Chihuahua, Mexico and continues probably into Alaska. (1)

This enormous feature is quite visible in the arid states but becomes less obvious due to vast forests in the north Canadian area. Also, many studies have been made in the New Mexico and Colorado areas and more is known about this part of the Rift.

About 50 million years ago most of New Mexico was almost flat, but forces deep in the earth began to uplift and commence the mountain building process, (orogeny). About 40 million years ago, large faults developed both west and east of the present Rio Grande valley.

About 30 million years ago, mountain ranges developed. On the east side, the Sangre de Christo, Santa Fe, Ortiz, Sandias, Manzanos, Los Pinos, Oscura, San Andres, Organ, and Franklin mountains are the result of this uplifting. On the west side of the rift, the uplifted elements are the Nacimiento mountains, the Mt. Taylor volcanic fields, Gallinas, Bear, and Magdalena mountains, San Mateo mountains, Black Range, Florida and Tres Hermanas mountains. The deep seated forces elevated these ranges; and the resultant cracks in the earth (faults) allowed the earth's mass between the east and west to droop down like a keystone type of wedge into the valley between. This uplifting and down dropping measures a relative vertical displacement of more than two miles of movement in some areas. This down dropping has been on going for 20 million years. While this was happening, huge volumes of gravels and other erosion products from the northern mountain ranges were filling the rift valley and creating enormous downward pressures which, in turn, forced the sides farther upward.

Lakes, parks, hot springs, calderas, gorges, lava capped mesas, and volcanos are some of the surface features this process develops. Perhaps the most exciting aspect of this continental movement is the metallic ore deposits that always accompany large silica bearing intrusive rocks.

Many of the early mining camps of New Mexico and Colorado, which prompted the early population trends of the west, are within the rift area. Countless ghost towns are all that remain of most of them. When the mineral discoveries began to run out, restlessness prompted the miners to move on to another adventure.

We will continue next month with some of the more exciting and mysterious characteristics of the Rio Grande Rift with respect to the mineralization and mining.

Footnote 1. R.W. Holmes; M.B. Kennedy; V.C. Kelly

Mineral Deposits Along the Rift

May92 News Nuggets

We have discussed that "our" Rift is of continental magnitude and consists mainly of small to moderate faults aligned in a generally parallel pattern and separated by a few to 30 or more miles. The sides are uplifting and the middle is dropping, sometimes several relative miles of vertical separation.

Mineral deposits occur in the earth's crust because of a combination of very complex events. Sometimes they are the product of large magma chambers that begin to intrude deep below the surface, while sending hydrothermal ore bearing solutions into fissures and cracks that produce crystallized dikes and sills. This intrusion usually breaks up the contact zone into which hydrothermal solutions deposit future ore bodies.

This is not a rapidly occurring event. When magma bodies are quickly forced upward, the earth's surface is breached and a volcano or a flowing lava fissure occurs. The content of the metallic ores are distributed throughout the lava mass and are not concentrated as when these hydrothermal solutions are allowed to concentrate.

Other ore bodies are the result of vein deposits created when limestone or other sedimentary rocks are replaced.

Also organic debris, such as logs, limbs, leaves, etc., can be replaced molecule by molecule, such as uranium "logs" found in the Grants area.

All of these events are very complex, barely predictable and occur in many, many, combinations of these and other natural phenomena. Mother Nature is a sloppy chemist! We should revel in those special products she combines for us to enjoy in our collections.

The one thread of commonality in all these events is that below the rift zones, within the molten rock chambers, there are hydrothermal solutions which drive all of these processes. It is happening now. The seismic events centered a few miles north of Socorro are the result of this natural drama in progress.

There are many mines associated with the Rio Grande Rift formed by one or more, generally a combination, of these natural activities. Some of those more well known are the:

- Stevenson-Bennett Apache Graphic
- Santa Rita del Cobre; Bridal Chamber; Juanita
- Groundhog; Vindicator; San Pedro
- Lincoln Lucky; Hanover; Royal Flush
- Bullfrog; Bingham; Nacimiento
- Burro Chief; Mex-Tex; Harding
- Azure (Turquoise); Kelly; Iceberg
- Questa

All of these famous locations formed within or adjacent to the Rio Grande Rift. Most achieved their prominence during the last half of the last century. We will begin to follow the history of some of them next month.

Mines & Mining

Jun92 News Nuggets

For more than a century the voices that relived and recalled the myths and mysteries and hard fact memories of the New Mexico mining lore, have spellbound listeners when recounting the saga of the Bridal Chamber.

As we have mentioned in previous discussions on the subject, valuable ore deposits usually occur on the sides of the rift where ore bearing solutions filled the brecciated voids at or near the faulted edges.

Lake Valley was one of three famous mining camps to emerge near the south end of the Black Range about 1880. Hillsboro and Kingston, the other two, were a few miles away. They all were on the west side of the rift. All had extensive gold and silver claims. Hillsboro was basically a gold camp and the other two, silver bonanzas. As so often true on the early frontier, these dramatic discoveries were quiet memories before the century's end. The boom towns were a silent listener to the winds and the ghosts.

The first claim site discovered at the Bridal Chamber was made by a cowboy-pro prospector, George Lufkin, in August 1878. Lufkin found a partner, Chris Watson, but they depleted their meager resources quickly. Next they began to seek an infusion of new funds.

Meanwhile, Indian raids (Apache) delayed their return to the original diggings. Their actual work on the discovery remained stagnant until they interested a Fort Bayard trading post owner, John Miller, in the claims. As many such historical webs are woven, the discoverer loses control of the treasure for the necessary financing.

Based on assays at the initial discovery, Miller hired an experienced mining engineer, George Daly from Leadville, Colorado. Daly later secured the assistance of Bernard MacDonald, also from Leadville.

Although highly recommended as a valuable deposit, one could hardly have imagined its extraordinary example of nature at her creative heights. The opening into the fabulous ore body was broken thru by MacDonald in mid August 1881. The "Chamber" measured more than 100 feet x 100 feet and varied from 10 to 20 feet from floor to ceiling. Almost the entire room was filled with interlaced crystals of Chlorargyrite (Cerargyrite), Silver Chloride (AgCl) and Calcite and native Silver.

The dark room was reflecting light from the glistening crystals. The sight must have stunned those eyes that first tried to focus on its magnificence! The light from candles and lamps and torches sparkled reflections back to numb the senses. No one ever had viewed such a sight before - or since. Nowhere on earth has a comparable deposit of silver ever been discovered. A candle would melt the stalactites into silver globs. Much of the silver was mined with axes and hatchets. Saws were used to cut the silver into blocks. One horn silver crystal mass weighed over 10,000 pounds!

Records indicate 2.5 million ounces of silver was recovered from the Bridal Chamber. A nearby "lesser" discovery, the Thirty Stope, produced a million ounces. It is doubtful these records allow for the actual amount removed. Most early reports of precious metal extraction were on the low side.

A very sad footnote to history: At the very hour the Chamber entrance was broken into, Mr. Daly, whose appraisal of the location was so instrumental in funding the search, was killed with three of his friends. An Apache party, lead by Chief Nane', ambushed them nearby.

Twenty two month later, the infamous Victorio would lead his Apache band to kill 16 more men at Lake Valley.

Life on the frontier indeed had its hazards, and mine safety was only one of them.

The Sandia Mountains

WHY THE WATERMELON MOUNTAINS?

Jun80 News Nuggets

By Pete Modreski

What is the origin of the name, Sandia Mountains? It's well known that sandia is Spanish for watermelon, but exactly why was this name given to the mountain range? I have always heard and accepted the story that the name is for the way the west face of the mountains, with its red (especially at sunset) granite and fringe of green forest at the top, resembles the center and rind of a watermelon. This seems to make sense; however, as is often the case with names, several other possible explanations exist.

New Mexico Place Names by T.M. Pearce (University of New Mexico Press, 1975) says that the first recorded use of the name Sandia was in the name of a Franciscan convent, San Francisco de Sandia, mentions by Fray Alonso de Benavides in his Revised Memorial of 1634. The convent was located in the "principal pueblo of the Tiwa Indians" which we now know as Sandia Pueblo. The convent was supposedly given this name because "Tradition has it that watermelons grew abundantly in the canyons of the mountains near the pueblo or in the pueblo itself". True watermelons, as opposed to squash, pumpkins or wild gourds, were not native to the southwest but were presumably introduced by the Spanish. Pearce notes that the original Tiwa name of the pueblo was na-fi-at, "dusty place", and that the Tiwa name for the mountain itself was o-ku-piu, "turtle mountain". It would seem that "Sandia" was perhaps first used in the name of the convent, then for the pueblo and for the mountain.

Another explanation is that the name is derived from the resemblance of the Sandia Mountains to a watermelon in shape, rather than color. The Glossary of Geology (American Geological Institute; 1st ed., 1972, or 2nd ed., 1980) defines a sandia as "An oblong, oval, or rounded mountain mass resembling a watermelon; e.g., the Sandia Mountains in New Mexico. Etymol.: Spanish sandia, 'watermelon'." "Sandia" (uncapitalized) is thus a general term for a certain kind of landform, though I think it is fair to say that the term is not in common use and that most geologists (even in New Mexico) are probably not familiar with it. A similar description was given in "Note on Block Mountains in New Mexico" by Charles B. Keyes, in the old journal *The American Geologist* (v. 33, 1904, pp.19-23): "Now the Sandia range is a type of mountain geographically known as a Sandia. In Spanish the word ;means watermelon. In general appearance it is as if a barrel floated in the water – that is, with one end just submerged and the other end elevated. Such, when viewed at a distance of thirty miles, is the appearance of the Sandia mountain range rising out of the vast plains around it." It would seem that there has been a lack of agreement as to whether "sandia" as a geomorphic term is supposed to resemble a whole or half watermelon! New Mexico Place Names also has this to say: "According to the testimony of an old paisano in Granada, Spain, there is a block of hills in the contrafuertes of the Sierra Nevada Mountains which is known locally as El Corazon de la Sandia because the shape of the mountain mass is like that of the heart of a melon, the pulpy center. Thus a transfer name could have been suggested by topographical similarities in Spain and NM."

Pearce also offers a fourth possible derivation: "The pueblo is spelled San Dia in the Cruzate grant of 1689, leading to the conjecture that the name may be associated with El Dia Santo, 'Holy Day'."

Which of the postulated derivations is really correct? There may be no way of telling for certain, and perhaps all of them had some influence on the adoption of the name. For my part I still favor the explain based on the color, even though the best support Pearce could come up with for this derivation is just to say that "Popular belief hold that the striped appearance of the rocks or the pinkish reflections of the surfaces at sunset led to the name "watermelon mountains" in Spanish."

Mt. Chalchihuitl -- Turquoise

Jul92 News Nuggets

We have discussed the various mineral deposits found where hydrothermal solutions intrude into edges of the Rio Grande Rift. The pegmatites and vein deposits are referred to as primary. They formed into voids and brecciated faulted areas. Sometimes ore bearing solutions replaced existing formations.

As time passes and erosion processes begin to breakdown the ore deposit, a "gossan" develops. The products commence to trickle down into the earth at the location, and sometimes below the decomposed mineral deposit new minerals begin to form which have a new mix of the elemental constituents of the decomposing gossan. These minerals are referred to as "secondary". Turquoise is a secondary mineral. It is composed of elements which were the decomposition products of other minerals. Turquoise almost always is never discovered deeper than 1200 feet from the surface. Another interesting aspect of Turquoise is that by mid-century there were no Turquoise mines discovered that had not been previously mined by Native Americans. Mining artifacts were found at Turquoise mines and were indeed used as an indicator of earlier activity.

Mt. Chalchihuitl, near Cerrillos, New Mexico, on the eastern edge of the Rio Grande Rift, is perhaps the most famous of all of the Native American mines. The Cerrillos district has been the site of mining gold, silver, copper, lead, zinc, gypsum, and other minerals. Turquoise has been mined here for at least 1200 years. When Coronado first viewed the mine site in 1540, there were pine trees in the dumps nearly 100 feet tall. These mines had been producing the precious blue stone for centuries. Indians were mining Turquoise from these workings while the Arabs were translating the Greek and Roman texts from the library of Alexander the Great. Turquoise was mined here from birth to death of Leonardo da Vinci. The mines were worked during the three centuries of the Christian Crusades.

Mining was difficult. Ladders to access levels were notched from trees with stone axes. Where lower levels were flooded, canoes hewn from logs were floated about to provide mobility. Large fires were built to heat the rock and water splashed on the heated seam of Turquoise to suddenly contract the hot rock and make it break. Stone hammers were used to break away the Turquoise. No host rock was wanted. Only tiny flecks of blue could be found in the dumps. It is very finely pulverized.

Stones from mines have been found throughout the Americas. More than 50,000 pieces were collected by the Hyde Expedition (1897-99) from Chaco Canyon. One necklace of 2500 pieces was found in one burial. Thousands of pieces were found at Chichen Itza, Yucatan. Cerrillos Turquoise has been found in most all of the states. Indeed, early Native Americans were energetic traders.

Aug92 News Nuggets
Mt. Chachihuitl Turquoise
Continued:

Last month we discussed the Turquoise secondary mineral deposits found near Cerrillos, New Mexico. The extent of these prehistoric workings are profound. Ten of thousands of tons of rock have been removed from the mine. The twelve centuries that these mines have been worked have been of extraordinary significance with regard to prehistoric trade.

Chaco Canyon is about 125 miles west of Cerrillos. Excavations at Chaco have yielded some of the more exciting Turquoise discoveries.

A small burial room, (about 6' square), and no doubt of important persons, contained 24,932 Turquoise beads and more than 700 Turquoise pendants with the skeleton remains. One skeleton had 8,385 beads and more than 500 pendants located with it.

These stones were worn as wristlets, anklets, pendants, and other ornaments for the breasts and abdomen.

A small cylindrical basket (6" high and 3" in diameter) was found inlaid with over 1200 pieces of Turquoise. Inside the basket was 2150 beads and 174 pendants. Most of these stones were from the Cerrillos workings.

Turquoise objects have been found at Kiet Siel, Chetro Ketl, Betatakin, Mesa Verde, Aztec, and most all of the other Anasazi habitations sites.

Many Aztec and Maya ruins contain Turquoise from New Mexico. Lone Turquoise mosaic skull was found at Chichen Itza with more than fifteen hundred stones, most of which are from Cerrillos.

As stated last month other minerals have been mined in the Cerrillos district. Most of those are primary deposits delivered into their respective locations by hydrothermal solutions that accompanied the intrusive magmatic body that entered the faulted zones.

All of these deposit area are unique. Explaining a textbook example of the process of geological mineral deposits is idealized and simple. But in Nature, these processes occur in combination with may other factors which given so very long time periods and intermittent sequences, the result is very unique.

Mother Nature is indeed a sloppy chemist, but she is a GEM of an earth maker.

The Harding Pegmatite

Oct92 News Nuggets

As we have previously stated, mineral deposits are all unique and are the product of a combination of ingredients, environment, temperatures, and other variables. Magma chambers, that intrude into the crustal rock and ingest it, provide varied host conditions for hydrothermal solutions to enter.

Such a circumstance occurred about seven miles below the earth's surface in north central New Mexico about 1.3 billion years ago in the pre-cambrian era. One such pegmatite, that was the product of these events and much later rifting, we call the Harding mine.

The Harding pegmatite is situated between the Sangre de Cristo Range and the Rio Grande. The mine is 6 miles northeast of Dixon on NM Highway 75.

Early this century, the mine was discovered as an economic source of Mica. The Pueblo people, who knew of the outcrop for centuries, had been using thin sheets of the Mica for windows.

The Harding is not just another mine. It is one of the outstanding mineral deposits in the world. Around 1920, it was mined for Lepidolite, the lithium mica used in making white glass. (light fixtures and old-time canning jar lids.) It also produced Spodumene, another lithium mineral used in ceramics and compounds used in thermonuclear reactions.

In 1942 the property was acquired by Dr. Arthur Montgomery. His goal was a new one. He was searching for some of the many other minerals found in the pegmatite. There are scores of others. His goal was Microlite and Tantalite and Columbite and Beryl. These minerals contained elements which were vital in producing new alloys of the era.

By 1947 forty-six tons of these strategic minerals were produced, plus 40 tons of Spodumene. At the time, the Harding was the sole known source of economically available Microlite. There were also additional reserves located on the property.

In 1950 and 1951, over 800 tons of Lepidolite and nearly 250 tons of Spodumene were marketed. In the decade of the '50's, 20% of America's Beryl supply was produced at the Harding mine.

Included in the Harding pegmatite is another unique mine called the Iceberg. It is predominately a source of Calcite. Although white and banded pink Calcite are abundant, the clear optical grade gives the deposit its great value. Baush & Lomb Optical Co. Was the major customer.

Dr. Arthur Montgomery donated the Harding mine to the University of New Mexico to preserve the natural assets of the location. Dr. Montgomery has a long history of mineralogical generosity. He was a very significant benefactor in the startup of the "Mineralogical Record".

When we next arrange a field trip to visit the Harding, you might reflect on the notion that you are touching the products of one of Mother Nature's very early laboratory exercises on earth.