THE PLAINS OF SAN AGUSTIN:

SITE OF THE V L A

Marvin Wilkening

New Mexico Institute of Mining and Technology

Socorro, New Mexico

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US 60 climbs steadily westward from the Rio Grande Valley at Socorro skirting Socorro Peak with its 'M' and then swings across the Snake Ranch flats before passing north of the Magdalena Mountains. From the village of Magdalena, an old ranching and mining town, another eleven miles brings one to a divide covered with pinon and juniper woodland. Beyond lie the Plains of San Agustin, an unbroken expanse of grassland rimmed by gentle mountains.

The highway points the way--twenty-three miles as straight as it could be surveyed--to within a mile of Datil at the far edge of the open country. On these plains the world's largest and most sophisticated radio astronomy telescope will be built.

THE V L A

An instrument designed to receive signals from radio sources in the far reaches of the universe will be laid out in the form of a huge inverted 'Y' on this site. It is called the Very Large Array radio telescope or simply the VLA.

Cost is estimated at about 76 million dollars. It will be built by funds from the National Science Foundation and will be operated by the National Radio Astronomy Observatory under the management of Associated Universities, Incorporated of Upton, Long Island. The telescope is expected to become operational by 1976.

The principal criteria in the site selection were a large area of flat land, low geographic latitude, and high elevation. A dry climate and a quiet radio environment were other important considerations. The Plains of San Agustin fit all of these specifications to a remarkable degree.

Each arm of the "Y", 12.5 miles in length, will be defined by a pair of railroad tracks and at regular intervals there will be huge dish-shaped antennas 83 feet in diameter. Nine of these will be spaced along each arm of the "Y". The antennas and their associated electronics will be computer-controlled from a central location. Signals received by the huge antennas from distant galaxies will be stored on magnetic tape for further study by scientists at their own laboratories.

A staff of about 60 engineers and technicians will be required to operate and maintain the telescope. Astronomers and astrophysicists from across the nation and abroad will come and go as their programs demand.

Except for the tracks, the antennas, and the central instrument building, livestock and antelope can continue to use the area as before.

What Is A Radio Telescope?

Just as stars and other celestial objects emit light which enables them to be seen with the unaided eye and to be studied with optical telescopes, most of these same objects in space also give off radio waves. An appropriate receiver can amplify and record the weak signals from such radio sources in much the same way that our radios pick up signals from commercial broadcast towers. Since 1936 when the first antenna was built to specifically receive cosmic radio signals, astronomers have discovered that radio waves originate from our own galaxy (the Milky Way) and from galaxies deep in space. Another type of radio source is the quasar or "radio star", which is a precise position in space that emits radio waves, not light waves. A knowledge of the behavior of these star-like objects that appear to be in the farthest reaches of space may lead scientists to the very core of understanding of the universe itself.

It is for such studies that the V L A will be built. It will be for the young science of radio astronomy what the 200 inch Palomar telescope was for ordinary astronomy when it was completed in 1949.

THE PLAINS: High, Wide and Handsome

The San Agustin plains are usually brown and perhaps uninteresting to the casual visitor, but they have an appeal based upon their "lonesome" quality. Their size is enormous--a straight line 60 miles long can be drawn across them in a NE-SW direction. The average width is about 20 miles.

It is high country--7000 ft (2130 m) above sea level at the VLA center. Mountains surround the plains almost completely with peaks reaching 9500 ft or more; yet the distances are so great that they appear as blue hills only a couple of degrees above the horizon when viewed from near the middle of the plains. The village of Datil (rhymes with rattle) is on US 60 on the west edge of the plains in a setting of pinon pine and juniper. It is eighty miles to the Arizona line and 240 more to Phoenix in this direction.

The Continental Divide wends an uncertain course southward beyond the Datil mountains accommodating the San Agustin plains on its "east" side. The plains are indeed a "no-man's land" as far as surface drainage is concerned. More than thirty washes drain into the plains from the mountains nearby, but none flow except for short intervals during a summer thunderstorm or following an unusually heavy snowfall in the winter months.

The mountains bordering the plains are chiefly erosional remnants carved from relatively recent (Tertiary) volcanic rocks. Rock types range from ryolites to basalt. Wind and water continue to add to plains sediments at a rate estimated at the order of a few centimeters per century.

The southwest part of the plains consists of a huge playa of extraordinary flatness. The maximum relief over one 7 mile x 5 mile area is five feet, according to a survey of the area in 1939. The playa is part of the floor of an ancient lake that had an area of approximately 250 square miles and a depth of 165

feet at its highest stage. More than 200 gravel beaches, bars, spits, and wave-cut benches have been identified, many of which can be seen from the Bursum Road that skirts the southwest edge of the plains. Portions of the southwest playa, like its counter part at North Lake, 50 miles to the northeast, are covered with a few inches of water over a square mile or more following unusually heavy spring runoffs or at the end of the summer rainy season.

About one-half of the annual precipitation falls during July, August, and September as shown in Table 1. The means of the maximum and minimum temperature for each month of 1971 are given to emphasize the low night-time temperatures expected at this altitude in a dry climate. The data are taken from National Weather Service records for the Augustine station a few miles west of the V L A center.

Table 1. Augustine Station Weather

Month	Mean Precipitation (inches)	Mean Maximum Temperature, F° (1971)	Mean Minimum Temperature (1971)
January	.44	50.0°	8.0°
February	.52	50.7°	15.0°
March	.53	59.8°	19.8°
April	.47	63.4°	21.6°
May	.45	72.2°	30.2°
June	.64	84.1°	41.4°
July	2.06	86.4°	52.0°
August	2.24	78.8°	48.9°
September	1.44	75.3°	39.4°
October	.90	62.7°	29.1°
November	.27	56.6°	19.2°
December	.55	49.2°	14.9°
Annual	10.51	65.8°	28.3°

Science and Technology

The unique character of the plains and their surrounding mountains has attracted scientists on numerous previous occasions. Generally, they have had a "soft touch" on the land.

The Langmuir Laboratory for atmospheric research, built by funds from the National Science Foundation in 1963 and operated by New Mexico Tech at Socorro, occupies a point on the southern end of Baldy Ridge in the Magdalena Mountains some thirty miles ESE of the VLA center. The elevation of the laboratory is 10,630 ft. An intensive research program relating primarily to thunderstorm electricity and precipitation mechanisms is carried out by faculty and students from New Mexico Tech and visitors from other universities. Langmuir Laboratory is also the site of Dr. S. A. Colgate's digitized astronomy telescope designed to search distant galaxies for super nova events.

A woman scientist, Kathryn Clisby, of Oberlin College in Ohio and Paul B. Sears of Yale University have studied the pollen record in core material from wells drilled in 1953 and 1958-59 to depths of 645 ft and 2000 ft respectively, near the center of the playa south of Horse Springs. A remarkable reconstruction of vegetation and climate reaching back through the Pleistocene epoch of geologic time has been made possible from their data. In further support of this work, Professor Loren Potter, a botanist at the University of New Mexico, made a careful study of the present pollen "rain" over the playa in the late 1950's.

The plains area and the surrounding mountains have been extensively explored for copper, uranium, lead, zinc, and silver. There is no mining activity at present although the Kelly District near Magdalena has been a big producer of lead and zinc in the past.

Seismic and gravity techniques have been used by oil companies to gain

information about underground structures and opportunities for oil and gas production. This activity culminated in the drilling of a "wildcat" well by the Sun Oil Company at a site some six miles west of the Augustine station in the spring and early summer of 1966. The well was drilled to bedrock (Precambrian) at a depth of 12,284 ft. The negative result of the venture is reflected by the fact that the well was given to New Mexico Tech for scientific studies after necessary sealing and capping were accomplished. The first 5400 feet of the well were cased with 8" pipe and sealed.

MAGDALENA LIVESTOCK DRIVEWAY

The Santa Fe Railroad completed its branch line from Socorro to Magdalena in January of 1885. The mines at Kelly showed promise; ranch land stocked with sheep and cattle stretched westward across the San Agustin plains into Arizona territory. It was natural that stockmen should use the San Agustin plains to drive their cattle and sheep to the Magdalena railhead. To put down the threat of homesteaders blocking the way, the New Mexico Cattle Growers Association and the New Mexico Woolgrowers succeeded in getting the Secretary of Interior to withdraw lands from the public domain for the Magdalena Stock Driveway on February 23, 1918.

The driveway, though used in the early days, was greatly enhanced in 1926 when fencing and wells were put in at about ten mile intervals along the 125 mile length of the driveway. The five to ten mile width insured ample forage for the cattle and sheep as they slowly moved to market. The old CCC camp site is still visible about a half mile east of the juncture of NM 78 and old US 60.

In 1937, a year of near maximum use, 25,000 cattle and 50,000 sheep were herded to the shipping pens via the driveway. Use of this "livestock highway" decreased rapidly after World War II with the advent of the trucking industry and better roads, and in 1966 the driveway was reduced to approximately one half its previous width, and the Datil fork was eliminated. The final chapter in the colorful history of the Magdalena Driveway is being written in 1972. Adjudication of grazing rights is being completed and with it this Driveway will join in historical fact and legend the Chisholm and Goodnight trails.

BAT CAVE

Ten miles across the southwest playa as viewed from the Armijo store at old Horse Springs, the Pelona hills rise abruptly from the plain with dark volcanic bluffs clearly visible. At the point where the Pelonas jut the farthest into the otherwise flat landscape is Bat Cave.

The first substantial contribution to unraveling the mystery of the origin of corn came from vegetable material excavated in Bat Cave. This important discovery was made by Herbert Dick, then a graduate student in the Peabody Museum of Harvard University during two expeditions in 1948 and 1950. Down through six feet of trash, excrement, and miscellaneous debris, cobs and other parts of corn were found at all levels. At the bottom were tiny cobs 2 to 3 centimeters long. Radiocarbon analyses showed these to date from 2000 B.C. A distinct evolutionary sequence was observed in going from lower to higher levels. Latest occupancy of the cave was placed at 1000 A.D. Photographs of specimens taken from Bat Cave appeared on the cover of Scientific American, July 1950. This same issue contains an article on "The Mystery of Corn" including the Bat Cave findings by Paul C. Mangelsdorf, professor of botany at Harvard University.

Even though the sanitation practices may have left much to be desired, a shelter occupied almost continuously for over 3000 years is something to ponder in our times when urban renewal programs are required to demolish ghetto housing after only a couple generations of use. Bat Cave overlooking the Plains of San Augustin with their squash and corn fields below and game in the hills above must have been one of early man's most salubrious and esthetically pleasing environs.

The scene for the pursuit of the study of primitive corn has shifted to Old Mexico, but the excitement and appeal of Bat Cave in New Mexico continues.

The Spanish and the Apaches

About the same time that the American Revolution was being fought in the East, the Spanish were seeking to free their colonists in New Mexico from harassment by the Apaches. At least two military engagements occurred on the Plains of San Agustin. The first was led by Lope de Cuellar who encountered a large group of Apaches on the Plains in August of 1769. His troops were defeated by the Indians, and he was forced to retire to Chihuahua. Hugo Oconor, commanding a sizeable army, penetrated the Plains in 1775 and again in 1776. In both cases he found Apache bands and drove them to the mountains. Oconor entered the Plains from the east and left via the southwest toward what is now Reserve. Occasional skirmishes occurred between the Spanish and Indians through 1790, but after this the Plains were left to the Apache for more than another half century.

PEOPLE AND PLACES

Datil and Magdalena with the surrounding plains and the mountains make up the setting for Agnes Morley Cleaveland's No Life For A Lady. This book tells the story of a young woman who lived here at the turn of the century. It is considered a classic among books describing western ranch life.

The "aloneness" of the first families to settle in this country when horses provided the only means of transportation can scarcely be appreciated. Even now (1970 census), there is an average of only one person per three square miles in all of Catron County which extends from just west of the V L A center to the Arizona line.

Ray Morley, brother of Mrs. Cleaveland, developed a large ranch operation in the Datil area in the early 1900's and became one of the first organizers of the New Mexico Cattle Growers Association. He was a graduate of Columbia University and an All-American football player (1900).

Norman Cleaveland, son of the author of No Life for A Lady, capitalized on his early hard work on the ranch to help him win an Olympic gold medal (1924). The reaction of the cowpunchers at Magdalena when someone appeared wearing a new Olympic jacket can well be imagined!! Mr. Cleaveland, a Stanford graduate, retired in 1966 as president of Pacific Tin Corporation, a New York based firm operating in Malaysia.

Horse Springs on NM 12, thirty miles beyond Datil, was the home of Montague Stevens, author of Meet Mr. Grizzly. In fact, the ruins of the "Englishman's Castle" can still be seen a short distance north of the highway beyond what remains of Horse Springs. Stevens was one of a number of emigrees from the British Isles who came to New Mexico territory around the turn of the century. He was a hunter first, a rancher second, as his pack of 23 superbly trained hounds

will explain. Not much wonder there are no more 800 lb. grizzly bears in these mountains!

Another author of the area was the late G. W. Evans who wrote Slash Ranch Hounds. His son Pete and his wife operate a ranch with headquarters in the Tres Montosas. The Magdalena Cowboy Camp Meeting begun many decades by the Evans family is still held each summer in August at permanent headquarters just off the North Lake road west of the Tres Montosas.

Young Elfego Baca rode out across these plains on a fall day in 1884 to line up some votes at the Frisco plazas (now Reserve), another 80 miles to the southwest. Six days later he was escorted back by Socorro deputy sheriff Rose. In a three-day battle in Reserve he had single handedly held off an estimated thirty men from nearby ranches, many of them recently from Texas. The jacal where he defended himself had received an estimated 4000 rounds of pistol and rifle fire. Elfego was untouched! Although two men died, Mr. Baca was acquitted of murder and later became sheriff of Socorro County. William French, author of Some Recollections of a Western Ranchman (1927), and himself a participant in the "Mexican War" at Reserve, gives a remarkable word picture of this encounter rated as one of the most heroic six-shooter battles in all of western lore. The story has been used in many western movies and a Disney series.

The Tres Montosas are alleged to have been the headquarters for many notorious outlaws among whom was Joel Fowler whose career ended in Socorro's Hangmans Alley.

THE ALAMO INDIANS

Across the Gallinas Mountains from North Lake lies the Indian settlement of Alamo. These people, around 900 in number, are spread over an area of 52,000 acres. They are represented in the Navajo Tribal Council at Window Rock, Arizona. The Alamo Navajos are now, and have been for longer than anyone knows for sure, an exceedingly isolated Indian group.

Legends tell us that these people originated from Navajos that did not go on the "Long Walk" to Fort Sumner in 1864 when Kit Carson invaded the Navajo homeland. An Apache contribution to the makeup of the tribe is believed to be relatively recent although the Apache Clan is one of the largest in the tribe.

The Alamo lands furnish marginal grazing. Mineral wealth is negligible in comparison with the "big" Navajo country in northwest New Mexico, and there is little incentive to develop an arts and crafts industry.

Isolation, appropriate education, medical aid, and economic direction continue to present challenging problems for the tribal leadership.

THE PEOPLE OF RIMROCK

Gallup, New Mexico lies approximately 100 miles to the northwest of the San Agustin Plains. The land in between is broken rimrock country quite sparsely populated with an unusual "mix" of rural peoples.

Evon Vogt and Ethel Albert's The People of Rimrock is a sociological study of the population groups in this area. This book is the result of a six-year study conducted by the Laboratory of Social Relations at Harvard University beginning in 1949. The five cultures included in the study are the Navajo and Zuni Indians, Spanish-Americans, Mormons, and Texans. This western New Mexico country provided a unique opportunity to see the interaction of these distinct cultural groups with each other, with a minimum of external disruption that would inevitably occur in more densely populated regions.

Among the topics discussed in detail are the geographical and cultural setting, intercultural relations, the learning of values, kinship systems, ecology and economy, political structure and religious systems. Rarely have the conflicting philosophies of man's mastery over his environment versus his living in harmony with it been more beautifully illustrated than is done in this work.

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