Tezontle in Spanish Colonial Baja California

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Abstract

Jesuit Fathers Juan de Ugarte and Miguel del Barco established Mission San Francisco Javier Viggé-Biaundo in what is now Baja California Sur. Their mission buildings were erected using tezontle (vesicular basalt), the material also employed for waterworks. Transformed from hunter-gatherers into agriculturalists by the mission system, some neophytes also became quarry workers and skilled masons. Archaeological rediscovery of the Spanish colonial vesicular basalt quarries reveals how neophytes extracted local stone and prepared it for construction projects. As testaments to the fascinating history of early acculturation in Baja California Sur, still-standing tezontle buildings and tezontle irrigation works that continue to channel water are anticipated to help draw tourists to the Mexican state.

Introduction

This study reviews the Jesuit colonization of Baja California, then more specifically examines the early days of Mission San Javier. The most Mexican of natural building materials, tezontle, or vesicular basalt, was used by Father Miguel del Barco in architectural and agricultural applications at and near his mission. Tezontle quarries near the mission were reported nearly three centuries ago; we were able to rediscover their remnants through archaeological field survey. Tourism has long been critical to the Baja California economy, and we anticipate that historical sites will become tourist attractions perhaps nearly as important as fishing and watersports. The remarkable Spanish colonial tezontle constructions should play a significant role in the developing heritage tourism on the Baja California Peninsula.

The Jesuit Order in Antigua California

Following Las Casas’ experiment of peaceful conquest of hostile Indians in Verapaz, Guatemala, mendicant and Jesuit missionaries took up the task of settling, converting and assimilating the Indians living in northern New Spain in villages modeled on Spanish towns. The Crown, for its part, financed the missionaries in the hope of conquering the north for as little expenditure of scarce resources as possible. From the point of view of the Crown, then, the mission as an institution served the dual purpose of controlling potentially hostile Indian groups and preparing the Indians for life in Spanish society as productive taxpayers [Jackson 1982:iii].

Less than 30 years after Christopher Columbus explored the Caribbean Sea, Hernán Cortés conquered Tenochtitlan, heart of the Aztec Empire. Over the decades, while indigenous societies suffered disease and stunning population loss, Cortés and many of his followers prospered. The Spaniards grew rich not from gold, but from gifts of land, or encomienda, from the Spanish Crown. Land-rich conquistadors became hidalgos (noblemen) in Nueva España. Their lands in central Mexico were densely populated by sedentary, agriculture-based Indian societies and often contained mineral wealth.
However, the “conquest” and colonization of Antigua California took a different tack. There, the Jesuit order was granted royal authority to explore, to pacify indigenous peoples, and to settle the region. Mainland Mesoamerica was environmentally diverse and home to millions of sedentary farmers. In contrast, Baja California was a desert whose Native population was small, 25,000, if that many (Mathes 2005:210).

During the final decades of the sixteenth century, the Jesuit order transformed frontier outposts into autonomous local communities supported by Indian labor. By 1697 the Jesuits had “spiritually conquered” the Mayo, Yaqui, Ópata, Pima Bajo, Tarahumara, and Tepehuan Indians among others and in so doing established an ecclesiastical foothold in Sinaloa, the Pimería and Tarahumara zones of the Sierra Madre Occidental, and in Sonora. In 1697 The Pious Fund of the Californias, established by royal license, allowed the Society of Jesus (SJ) to expand their apostolic network to include Antigua California, which lay just across the Gulf of California. The Pious Fund would subsidize the settlement of pueblos, the construction of missions, the conversion of souls, the supply of provisions, and the payment of soldiers to protect Jesuit outposts in California. The Jesuit presence in Baja California, known as Pax Jesuitica, lasted from 1697 to 1768. Mission San Francisco Javier Viggé-Biaundó, founded in 1699 by Francisco Maria Piccolo, was the second church built during this era.

The Jesuits had an inauspicious beginning in California; colonization was marred by logistical challenges, such as poor crop cultivation, inadequate rainfall for mission-based communities, and the ongoing threat from hostile Natives. Among the predominant indigenous peoples of Baja California were the Cochimi, Huchiti, Guaycura, and Pericú (Figure 1).

Figure 1. Map of Baja California, showing the distribution of the primary Indigenous groups according to the accounts of Jesuit missionary Miguel del Barco. Note the location of Mission San Javier near the boundaries of three different Indian territories. Map by Reygadas and Velázquez Ramírez (1983:17).
The Jesuit missions in Baja California relied on provisions of food and other supplies from missions in the Pimerías (what is now southern Arizona and northern Sonora), including wheat, corn, cattle, horses, and sheep shipped from the port on the Yaqui River (De la Torre Curiel 2013). The missions also received church ornaments and furniture from Acapulco. Industrious soldiers, sailors, farmers, ranchers, and specialized tradesmen and their families all congregated at the mission. Colonists worked in the churches and pueblos and on farms or cattle ranches that belonged to the Society of Jesus. Mission neophytes were put to work cleaning plots of land, farming, and starting construction of the mission churches.

**Tezontle**

*Tezontle* is a distinctive igneous rock found in virtually all parts of the Mexican Republic with volcanic history. Small cavities dotting its natural surfaces make it particularly suitable for building with mortar, which is more firmly anchored than with rocks with slicker or more uniform surfaces. *Tezontle* is also a material of great strength and is preferable to softer or more brittle stones such as sedimentary rocks like sandstone. Consequently, *tezontle* was used extensively for both prehistoric and early historic buildings throughout many parts of Mexico. Houses constructed of it possess splendid earthquake-resistant qualities. Many structures built by the clerics and conquistadores four centuries ago remain in almost perfect condition today (McAndrew 1965).

Few types of stone in Mexico have been utilized for so long or have served such a broad range of applications, from floors and structural foundations in modest homes to ostentatious facades, domes, columns, and other embellishments in public buildings or in religiously inspired architecture. Mesoamerican peoples in Teotihuacán and Tenochtitlan used *tezontle* in the construction of civic and residential structures (López Luján et al. 2003; Barba et al. 2009).² Aguilar-Moreno stated:

… in Tenochtitlán’s most recent constructions, the Aztec began to focus on the solidity of buildings due to the ever sinking subsoil. As a result, *tezontle*, a strong and light volcanic stone was extensively used. *Tezontle* was very popular because it was easy to cut and its texture and color was appealing. It was used in the construction of monumental buildings, filling in walls and roofing … Another popular technique used to prevent the city’s sinking was to use platforms as foundations or to drive wooden piles into the earth in close-packed formations. This has been revealed in excavations [Aguilar-Moreno 2006:225].

From the sixteenth century onward, Spanish colonial architects and masons used *tezontle* to build many of Mexico’s most enduring and renowned edifices, including the Metropolitan Cathedral and National Palace. Father Juan de Ugarte and Father Miguel del Barco, two of the most revered figures in the history of Baja California, used *tezontle* to build the Mission of San Francisco Javier Viggé-Biaundó (Figure 2) and its attendant reservoirs and canal system that irrigated nearby fields.

**The Early Days of Mission of San Francisco Javier Viggé-Biaundó**

Of all regions of the vast overseas dominions of Spain the long crooked finger-like peninsula jutting over eight hundred miles southward by slightly eastward from the fertile State of California, took longest to conquer and settle. True, in the southeast there were the fierce Guaycuros; but elsewhere Spanish soldiers had crushed or worn down far more formidable opposition. And yet from the first determined but unsuccessful attempts of Cortés in 1532 (to 1536) until 1697, expedition after expedition failed to
effect a permanent settlement. Not war-like savages but sterile, unproductive lands, and persistent droughts often lasting seven and more years, constituted the insurmountable barriers [Burrus 1967:1].

The Baja California peninsula consists largely of desert and rugged mountain ranges ca. 1500 m asl. The earliest explorations by Cortés in 1535, Francisco de Ulloa in 1539, Fernando de Alarcón in 1540, and Sebastián Vizcaíno in 1596 were brief and limited to coastal areas (Mathes 1992:xiv). In fact:

Between 1533, when the region was first sighted, and October 25, 1697, when it was permanently settled, Baja California was visited by 19 documented maritime expeditions, which over the intervening 164 years spent approximately 2,535 days or 6.95 years within areas populated by the Cochimí, Guaycura, and Pericú [Mathes 1992:xiv].

Geographic isolation, the apparent lack of wealth, poor farmland, punishing climate, scarce water, and hostile Indians delayed the colonization of California for well over a century. Father Johann Jakob Baegert thought Baja California may have been colonized too soon:

All reports which deal favorably with California, her wealth, fertility, or other things necessary to make life comfortable belong without exception to the category of false reports, regardless of who the authors are. Except for her pearls, her two and a half kinds of fruit, her almost permanently blue sky and, at least in the shade, her not too hot and never too cold air, California has nothing which deserves to be praised and esteemed or needs to be coveted by even the poorest of inhabited lands of the globe … Therefore, neither I nor all those who have lived with me in California could understand how it could
happen that certain people would speak with so much praise of this peninsula and make it one of the most beautiful countries on earth. Did they perhaps dream of their own fatherland? Were they under the spell of a vision of a paradise on earth? Did they use special magnifying or some other extraordinary glasses when they put their reports on paper? Did California at the time experience the seven fruitful years of Egypt or the golden age of which the poets dream? Or did California at a later time turn completely upside down and change into an entirely different land? [Baegert 1952:175].

Despite such misgivings, in 1683 Padre Eusebio Kino and Admiral Isidro de Atondo y Antillón established a base roughly 32 km north of Loreto. From it were launched expeditions into the mountainous interior to find routes to the Pacific Ocean and likely areas for settlement (Vernon 2002:x–xi). According to Burrus:

In Loreto, were both the ecclesiastical and military headquarters of the entire Baja enterprise. After 165 years of unsuccessful attempts to get a permanent foothold on the forbiddingly-sterile peninsula, Juan María de Salvatierra, S.J., established with the assistance of his countryman, Francisco María Piccolo, S.J., this important base from which not only Lower California was evangelized and governed but also Upper California until Monterrey replaced it as the capital of both Californias on February 3, 1777 [Burrus 1967:28].

Mission San Francisco Javier was founded in 1699 by Father Francisco Maria Piccolo near Biaundó spring, named by Cochimí Indians, about 32 km south of Loreto and 8 km north of its present and final location (Figure 3). Its initial location was selected, at least in part, owing to the proximity of no fewer than three different Native groups that the Europeans hoped to missionize; it could thus be used as a central base from which missionaries could visit all three. San Francisco Javier was abandoned in 1701 because of a threatened Indian revolt (Vernon 2002:22), and soon thereafter Fray Juan de Ugarte (1662–1730) replaced Padre Piccolo, who left for Mission Santa Rosa de Mulegé.3 Father Ugarte introduced Old World livestock, domesticated plants, and European farming systems to Mission San Francisco Javier, helping to make it the first self-sufficient community in Baja California. W. Michael Mathes tells us that:

Figure 3. Structure at Rancho Viejo, the first site of Mission San Francisco Javier Viggé Biaundó. Note tezontle masonry side wall at right, adobe courses separated by cobbles on front wall. Reygadas photo.
... primarily between the years 1702 and 1720 through the efforts of Father Juan de Ugarte who carefully studied the environment of each area to select, and thus assure, the definitive adaptation of the olive, pomegranate, peach, lemon, fig tree, corn, beans, garbanzo, wheat, melon, sweet potato, watermelon, squash, grape, date palm in the respective missions [Mathes 1981:180].

In 1706 Ugarte relocated the mission to San Pablo, where he had earlier established orchards (Figure 4). According to Mathes:

In his own mission of San Francisco Xavier Vigeé-Biaundó, Ugarte built the first irrigation works of the peninsula, and at the visita of San Miguel de Comondú in 1714 he initiated the concept of land reclamation by transporting thousands of mule loads of soil to create arable fields [Mathes 1981:180].

The Honduran Jesuit priest, Father Juan de Ugarte, was hardworking, farsighted, and creative:

He not only revived San Javier Viejo, but he constructed the first stone buildings at the present site, made dams and aqueducts, and established gardens at San Miguel in the arroyo 20 miles to the north that would soon be known as Comondú. He also logged the mountains west of Mulegé to provide the timber to build El Triunfo de La Cruz, the first ship built in California. In addition to his material accomplishments and great physical strength, he was an outstanding spiritual leader, a stirring preacher and priest, and a most prodigious savior of souls. He died on December 28, 1730, at Misión San Javier [Vernon 2002:24].

Within his own lifetime Ugarte was famous for his work in Lower California:

A great organizer, architect, builder, explorer, agriculturist, highly intelligent, gifted with artistic and scientific ability and mechanical resourcefulness, he also possessed great physical strength and endurance [Brandenburg and Baumann 1952:206].

Baegert (1952:122) stated that “Father Ugarte and Father Druet, in mud and water over their knees, worked harder in the stifling field than the poorest peasant and day laborer.” Remnants of the irrigation system,

Figure 4. The oldest living olive tree (ca. 300 years old) for both Baja and Alta California, at Mission San Javier. Reygadas photo.
including the dam upstream from the mission, have survived. In fact, portions of the irrigation system that Father Piccolo built at the first mission site, also of tezontle, continue to transport water to agricultural fields (Figure 5).

The Innovative Father Barco

Father Miguel del Barco was a missionary for 30 years in Baja California (Burrus 1984:39); he was put in charge of Mission San Javier with the dependent mission of San Pablo, both near Loreto, in 1741 (Burrus 1984:39). Barco wasted no time beginning work on the mission church. It took 14 years to build the structure, and it was completed in 1758. Yet:

The great tragedy of the Baja California missionary adventure was that, soon after the stone churches were completed, the Native American converts, for whom they were built, died from smallpox epidemics spread by their neighbors, the Spanish colonists [Burckhalter 2013:153].

Barco was ambitious and inspired, and he built upon the work and organizational skills of his predecessors at Mission San Francisco Javier Viggé-Biaundó. Mission neophytes had 40 years of experience cultivating crops; now they would also quarry stone in the local mountains and bring it to the mission. Barco is believed to have been the first missionary to build extensively with tezontle at Mission San Javier. Tezontle was not the only local building material exploited; limestone was also extracted for crushing, burning, and conversion to adhesives for masonry constructions:

This remarkable [mission] structure used quarried [tezontle] stone set with mortar from cement made of local limestone. A kiln (El Horno) located 10 miles distant, midway between missions San Javier and Comondú, may have been used to fire the limestone as part of the cement-making process. The labor involved in mining the limestone, transporting the ore to the kiln, gathering and cutting trees and sticks for fuel, then firing the stone to enable it to be ground into cement, is almost beyond comprehension. After this laborious process, the cement had to be transported to the building site, where it was mixed with sand and water to make mortar … Stone for the mission walls must have been quarried and trimmed to accurate rectangular blocks in a nearby canyon. A skilled stone-mason was imported from the mainland to supervise and train the Indians to build the
high mission walls and construct the vaulted roof of the nave. The lofty, domed bell tower looks over the deep valley, and the cornice of the main structure is lined with decoratively carved stone cone-shaped pináculos [Vernon 2002:26–27].

Father Barco used vesicular basalt in the irrigation system set up to water the fields of crops and to provide fresh water to the community. Barco is well known for his Historia natural y crónica de la antigua California (1973), The Natural History of Baja California (1980), and Ethnology and Linguistics of Baja California (1981). He was geologically savvy, as his nearly 260-year-old comments reveal:

The stone which the Mexicans call tezontle is found in great abundance in many territories of the peninsula, though not in all of them. If this stone were found in Europe, it would be greatly esteemed, because it is the best that has ever been found to build vaulted roofs. It is extremely porous, or, shall I better say, full of hollows. It cannot be described any better than by comparing it to sugar which has been artificially made to resemble a sponge, and which is used in the summer for refreshment. It is different only in the material, the color, and in the fact that water does not penetrate to the interior of tezontle … Tezontle … is light on account of being full of hollows, and also because … it is … very porous, so that, if a tezontle were solid and without hollows, it would still be lighter than a piece of dry wood of equal volume. This holds true not only with respect to the heavy woods, but also to those of a medium and ordinary weight. From this one can infer how much it must weigh when it is full of hollows, as the best quality tezontle often is, like sponge sugar! There is also another type of tezontle which, although it has many and thickly set hollows, it is not so perfectly sponged as the first. Nevertheless, it is still very good for the same purpose as the other one.

Tezontle is excellent, as I have already said, to make vaulted roofs, because it has firmness and consistency in addition to its light weight. And because it is full of little hollows or eyes, mortar can get inside them, seizing and binding one stone to another admirably. In addition, when the already cut stones are being placed on the roof, they can be hit with a hammer lightly against the stones which have already been set, as required in order that they become well fixed. This can be done without any danger of breaking or cracking them, as would occur with brick and other stones, because tezontle does not crack, nor does it break up unless it is hit with great force. Therefore the tezontle roof becomes very firm, and the walls which support it, because they are carrying little weight, are less subject to collapse. The shaping of the stones is not difficult, nor does it call for special workmanship, as it is done only to flatten them a little so that they can be brought together with one another on their upper and lower parts. I have seen a vaulted roof made of tezontle so thin that it was only about four fingers in thickness and was almost flat, without convexity, and which was to serve as floor for a small choir. And because they feared that it would collapse loaded with people, a few years after being built they decided to knock it down in order to remake it in better fashion. But it was a lot of work, because those little tezontle stones were so strongly joined together that a crowbar was needed to force out the pieces gradually until the job was finished. This is the way it happens with roofs made of this material and which, not being of recent construction but
completely dry already, will not fall down (unless another great violence is added) even though the keystones have been removed. This is because the stones are so strongly joined to one another as well as because they are so lightweight. In fact, the more lightweight these stones are, the smaller is the force with which they pull near their center. This lightness, however, is no obstacle to this type of rock carrying upon it all the weight that a roof made of brick or another stone is able to support. In New Spain tezontle is used so much that, in the cities and places where it exists (because it is not found everywhere), vaulted roofs are not made of any other material. In Mexico there is a surprising abundance of tezontle, and there it is used not only for roofs but also they take advantage of it to construct a good part of the walls of some buildings. They place large squares of tezontle in between the hewn quarry stones, so that they add beauty and utility all at once [Barco 1980:292–295].

The successful use of tezontle for the San Javier church and its spectacular dome seems to have inspired Barco to find other applications for this material. Tezontle was used in agricultural and hydraulic ventures, including canals, stopcocks, reservoirs, and terraces. Today, the agricultural fields in San Javier cover 6.5 hectares and are still irrigated by water flowing from the eighteenth century reservoir (Figures 6–8).

The Tezontle Quarries

Tezontle outcrops are usually found in hills with reddish exposures. Tezontle float material can be found as loose stones weathering out of such outcrops, typically transported downslope via gravity. These are often not very large, but after shaping, the largest ones can still measure 30–46 cm in length, the same or a little less in width; in other words, it is perfectly adequate for use as masonry blocks:

I have seen them as long as three, four, or more handbreadths and over two in width, but one finds only a few of these. One finds great abundance of the smaller variety of all the ones mentioned, particularly the very small ones. I have seen veins of this stone showing up in the hills and demonstrating

Figure 6. Reservoir at San Javier Mission, with walls of quarried tezontle. Reygadas photo.
that they were quarry stone followed by tezontle. However, having worked one of these in order to extract large stones, and having obtained a few, it was evident that farther in the stone no longer had hollows but was becoming dense rock, like a type of quarry stone and, for this reason, that project was abandoned. Perhaps the other veins are like this one. Some of the stones are covered on the outside with a thick crust without hollows, so that they look like an ordinary rock until, taken up in one’s hand, they are recognized to be tezontle because of their light weight and, when they are cut are found to have the spongy look inside, resembling therefore the sponge sugar also in this respect. These stones can be shaped easily not with the point but with the cutting end of the pick. Their color resembles dark red ochre, though some places tezontles approaching the color of iron rust are also found, but this is a rare occurrence. This latter type is just as lightweight as the first [Barco 1980:293].

In order to locate the San Javier tezontle quarries reported by Barco three hundred years ago, two of us (FRD and JAM) engaged Guillermo Bastida and Víctor Manuel Osuna Romero as local guides, mulebacking (Figure 9) through the Sierra de la Giganta from San Javier village. Only 4 km north of San Javier, toward the Mesa de San Alejo, evidence of tezontle quarrying matching Father Barco’s description was found (Figure 10). Father Miguel del Barco may have traveled this very same trail three centuries earlier, supervising Indian workers as they quarried the stone blocks and transported them to the mission site, where they were lifted into place and fixed with mortar. No tools or traces of tools were observed at the old Spanish colonial working faces nor where tezontle had also been exposed by historical mining activities, but large percussion flake scars are still visible on the rock face where tezontle blocks were separated from the parent outcrop. Incompletely separated blocks in some cases still bear unfinished wedging holes (Figure 11).

“Tezontle Tourism”

Traditional tourists have “a limited interaction with the natural or social surroundings … [and traditional] tourism is equated with hotel occupancy” [Gámez 2007:203].

Alternative tourism, on the other hand, is becoming increasingly popular among those seeking unique experiences off the beaten path. This typically takes
Figure 8. Panoramic air photo of irrigated fields both up and downstream from Mission San Javier with tezontle-lined waterworks indicated by heavy lines. Legend: (1) stopcock; (2) streambed; (3) cemetery; (4) mission buildings; (5) large well; (6) small well; (7) stone walls. Base photo courtesy of Google Earth, additions by Reygadas and Boxt.

Figure 9. Spanish colonial mule track to the tezontle quarries on the Mesa de San Alejo, above Mission San Javier. Arce photo.

Figure 10. Working face of one of the Spanish colonial tezontle quarries used for Mission San Javier construction. With naturally exposed layers of consistent thickness, rectangular tezontle blocks could be easily broken from the outcrop. Arce photo.
two forms, either ecotourism to and through unfamiliar deserts, mountains or jungles, or archaeological/historical tourism, where participants might envision themselves as time travelers. For more than 50 years Mexico has been a leading destination for archaeological/historical tourism and is also attracting increasing numbers of bird counters and whale watchers as ecotourists. Alternative tourists are willing to go without comfortable, resort-type accommodations and to pay higher prices for requested tourist experiences. We believe that the San Javier area has much to offer alternative tourists and recommend its addition to the itinerary of any historical tour of Baja California.

A high point of the senior author’s student days at the Universidad Autónoma de Baja California Sur (UABCS) was attending Dr. Miguel Mathes’ Semanas de Información Histórica (Historic Information Weeks). Between 1981 and 1987, Mathes invited Dr. Miguel León Portilla, Dr. José María Muriá, Maestro Eligio Moisés Coronado, and other noted scholars to journey throughout Baja California with him as their guide. On their return to UABCS, these renowned Mexican historians and archaeologists regaled both students and faculty with their experiences. In 1999 these discussions led the senior author to develop an academic program in Alternative Tourism. Its goals were: (1) to raise public awareness about the natural environment and Baja California Sur’s cultural heritage, including archaeological sites and historical properties; (2) to foster fieldwork and laboratory studies in archaeology, following the legal mandates set forth by the Instituto Nacional de Antropología e Historia; and (3) to address practical aspects of tourism such as conservation and ecology. The long-term goal of the program was to create jobs as caretakers/guides for individuals who live on or near threatened historic sites and/or natural landscapes.

As noted by Busto-Ibarra (this Quarterly double-issue), Baja California Sur is developing at a rapid pace. Negative impacts such as theft, vandalism, and pollution, hitherto almost unknown, are starting to appear throughout the region. Small and remote villages like San Javier are now accessible from anywhere on the peninsula. The newly paved road from Loreto to San Javier is bringing unprecedented numbers of tourists. Our task is to facilitate the economic benefits of tourism while mitigating the threats to natural and cultural resources posed by an ever-increasing influx of visitors.

The senior author and his colleagues at UABCS’s Department of Alternative Tourism have identified natural and historical resources in Baja California Sur and have tried to develop creative ways to protect them from destruction. The historical tezontle quarries and irrigated fields at Mission San Francisco Javier

Figure 11. Columnar block of tezontle in one of the Spanish colonial quarries near Mission San Javier, with wedging hole incompletely perforated at center. Arce photo.
Viggé-Biaundó present unusual examples of the national patrimony that should continue to attract tourist attention and that must be protected.

Rediscovery of the Spanish colonial *tezontle* quarries only marks the beginning of our journey. We are now in the process of seeking permission from landowners and other authorities to include the *tezontle* mines within the itinerary of local historical tours. The long-term objective is more ambitious. With cooperation from the diocese, San Javier village, and state government, the authors hope to renovate a portion of the eighteenth century canal system, bringing back to life the first successful irrigation system in the Californias, the same system that fed Father Ugarte’s first vineyard in 1710 and helped Father Barco complete the San Javier church in 1758.

**Conclusion**

Despite a unique administrative advantage from the Spanish Crown—permission to colonize without any monarchical interference—the Society of Jesus still struggled to establish its foothold in Baja California. The Spanish colonization of the Baja California peninsula was arduous, and it failed for the first 164 years. However, two missionaries, Ugarte and Barco, eventually built a system of dams and canals, creating the “jewel of the Baja California mission churches” (Vernon 2002:26) using *tezontle* quarried nearby. The value of *tezontle* in construction has been recognized for years. We, however, propose a new application: its use as a cornerstone in the development of Baja California Sur’s alternative tourism industry.

**Endnotes**

1. Mathes (2005:210) estimates that Antigua California was inhabited by not more than 25,000 people, a far cry from the millions inhabiting mainland Mesoamerica.

2. According to Collins Orman (2001:277), “The most common construction material used on Teotihuacan homes was a mix of porous chunks of volcanic stone (*tezontle*) and clay, gravel, and mortar.”

3. Father Juan de Ugarte administered the Pious Fund of the Californias between 1697 and 1700. As procurator in Mexico City, he allocated private donations for missionary efforts in Nueva España. In 1702 Father Ugarte left Mexico City for Mission San Francisco Javier, which had been abandoned the previous year due to threats from the Native population. Ugarte spent the rest of his life among the region’s Cochimí Indians. Significantly, Ugarte is credited with the establishment of a mission in the Sierra de La Giganta, a goal that even Father Eusebio Kino was unable to accomplish in 1684 (Mathes 1977:40).

4. Because of his successful experimentation with crops and land management, Ugarte was later appointed to manage the *temporalidades* at other missions, assuring their success. *Temporalidades* were land holdings of the Jesuit Order in the Spanish Empire that supported a broad range of economic enterprises, including farming, cattle ranching, grazing, etc.

5. From the earliest years of the spiritual conquest of Mexico, friars would establish *visitas* in the hamlets and villages of the countryside around each monastery. McAndrew (1965:27) explains, “These were little churches or chapels, usually equipped with a lockable sacristy or storeroom, and perhaps a cell or two for the friars who would visit periodically in order to minister to the Indian villagers.”

6. This Quarterly double-issue’s guest editors, Dr. Brian D. Dillon and Dr. Matthew A. Boxt, led archaeological tours independently of each other for many years, Dillon to and through Mexico, Guatemala and Honduras, Boxt to Mexico. Their friend, colleague, and mentor Miguel Mathes likewise led tours to the

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historical missions of Baja California, especially after his retirement from the University of San Francisco.

Acknowledgments

We dedicate this effort to the memory of Dr. Miguel Mathes, celebrating his lifelong commitment to the study of Antigua California. Miguel Mathes was so prolific that one cannot research any aspect of Baja California history or ethnology without first consulting his publications. Since 1980, the senior author considered Mathes his mentor and one of his closest friends. We also would like to express our gratitude to Don Guillermo Bastida, Víctor Manuel Osuna Romero, and Jesús Martínez Delgado for their support in the field, helping us saddle up and search the sierra for tezontle quarries. We also thank Sandra Robles Gil Mestre for her support and are especially grateful to Dr. Rose Marie Beebe, Dr. Robert M. Senkewicz, and Dr. Karina Busto-Ibarra for reviewing the manuscript.

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