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ARTICLE

Archaeological Analysis of a Water Mill from the Nineteenth Century in Salta, Argentina

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Abstract
Hydraulic mills were introduced in the early colonial period in the Americas to grind wheat into flour. During the nineteenth and twentieth centuries, the rise of the agro-export model in Latin America shaped the development of a flour industry in which water-powered mills played a central role. Over time, these technologies were used not only to increase production for the export market but also to meet the needs of domestic consumption, both local and regional. In this context, in 2017 we began to investigate the characteristics of a hydraulic mill, currently in disuse, in the town of Payogasta in the province of Salta (Argentina), to determine its chronology and functionality. In addition to surveying the structure, we conducted excavations in the nearby rooms that were part of the site. We found that this mill was in operation between the end of the nineteenth and the end of the twentieth centuries, grinding wheat, corn, carob, and red bell pepper, and that the adjoining rooms were used to house the people who were waiting their turn to grind their raw materials.

Resumen
La introducción de molinos hidráulicos en el territorio americano se produjo tempranamente durante el periodo colonial, como consecuencia de la necesidad de disponer de una estructura para moler el trigo. Durante los siglos diecinueve y veinte, el auge del modelo agroexportador en Latinoamérica condicionó el desarrollo de una incipiente industria harinera, donde los molinos movidos por la fuerza del agua jugaron un rol central. Con el tiempo, estas tecnologías se utilizaron no sólo para aumentar la producción destinada al mercado de exportación, sino también para satisfacer las necesidades de consumo interno, tanto local como regional. En este contexto, en 2017 comenzamos a investigar las características de un molino hidráulico, actualmente en desuso, ubicado en la localidad de Payogasta, en la provincia de Salta (Argentina), a partir de la determinación de su cronología y funcionalidad. Además de relevar la estructura, se realizaron excavaciones en las habitaciones cercanas que formaban parte del yacimiento. Los primeros resultados indican que este molino estuvo en funcionamiento entre fines del siglo diecinueve y fines del siglo veinte, destinado a la molienda de trigo, maíz, algarroba y pimiento rojo, y que las habitaciones contiguas se utilizaban para alojar a las personas que esperaban su turno para moler.

Keywords: historical archaeology; grinding technology; chronology and functionality; zooarchaeology; northwest Argentina

Palabras clave: arqueología histórica; tecnología de molienda; cronología y funcionalidad; zooarqueología; Noroeste Argentino

Spanish conquerors arrived in America with a highly developed hydraulic technology, built on the successive contributions of the Roman Empire in the Classical Age and the Arab caliphates in the Middle Ages. During the Renaissance, the Spanish achieved remarkable skill in building hydraulic structures that fit the topographic conditions of each territory and that used hydraulic energy, which was easily accessible and economical in comparison to animal traction and human effort (Turriano 1996).

Mills with horizontal hydraulic wheels efficiently use the scarce flows of water in mountainous areas. Their simple mechanisms require little maintenance compared to vertical hydraulic wheel mills (*azuda* or *aceña*; Cara Barrionuevo et al. 1996). As the architecture of the horizontal hydraulic mills became more sophisticated, they were able to divert watercourses through channels, making it possible for mills to be located farther from riverbeds and thereby avoiding the destructive consequences of floods (Escalante Fernández and García Saavedra 2018).

The introduction of hydraulic flour mills in America in the sixteenth century, and their heyday during the eighteenth and nineteenth centuries, played an essential role in the flourishing of the Spanish colonies, where they coexisted with local grinding technologies, such as manual mortars (Rojas Rabiela et al. 2014). The first hydraulic mills were in Mexico, where more than 300 structures can be traced (Morales 2006). They were built in lower numbers in Central America (Solórzano 1986), as well as in Colombia (Satizábal Villegas 2004), the viceroyalty of Peru (Bell 2016), Uruguay (Sanmartín 2011), Chile (Lacoste 2018), and in the central west, northwest (Sica 2005), and Cuyo regions (Figueroa 2006) of Argentina. They fell into disuse after the incorporation of turbines and steam power in the second half of the nineteenth century (Lacoste 2018).

Wheat was one of the fundamental elements in the diet of the colonizers but was absent in the Americas. The development of the mills was a logical consequence of the cultivation of this cereal to produce flour, with which to make bread and other foods (Morales Moreno 2008). The rise of the agro-export model during the nineteenth and twentieth centuries in most Latin American countries brought about the development of an emerging flour industry in the most fertile territories. In Argentina, the most fertile land was in the Pampean region, an extensive and wet plain located in the center of the country (Artuso 1917; Djenderedjian et al. 2010; Fernández 2000; Martirén and Moyano 2019; Martirén and Rayes 2016).

The Industrial Revolution that began in England in the eighteenth century generated a reorganization of the world economy, which led to growing industrialization in different countries of Western Europe and the United States toward the end of the nineteenth century and the beginning of the twentieth century (Hognogi et al. 2021; Ostafin et al. 2021). This modernization led to major investments in technologies and the installation of large industries in the most important cities. Most of the rural agro-industrial spaces—flour mills, pasta factories, oil mills, wineries, among others—engaging in family and regional production no longer met the technological requirements of the modern economy (Dal Sasso and Caliandro 2010). Those mills with simpler technologies and lower productivity, such as the horizontal hydraulic mills located in rural regions of the interior provinces, were progressively abandoned in the face of growing competition from steam mills that were more technologically advanced and had greater productive capacity; these steam mills were located in provinces of the Pampas region, such as Buenos Aires, Santa Fe, Córdoba, and Entre Ríos (Lera 2005; Martirén and Rayes 2016).

Modernization processes favored population growth with subsequent urbanization, yielding a strong demand for supplies, mainly raw materials related to food. Newly developed nations such as New Zealand, Australia, and Canada and Latin American countries such as Argentina significantly increased their meat and cereal exports (Bandieri and Blanco 1996). Argentina became one of the largest suppliers of corn, wheat, and oats to the world, as well as the main exporter of chilled, canned, and frozen meats (Gilberti 1970). To meet these export needs, mills progressively introduced technologies that increased their grinding and production capacities (Fernández 2000). The mills also faced increasing local and regional demands for products made from wheat.

Although no survey indicates the exact number of mills in Argentina, historical, archaeological, and patrimonial research suggests their widespread and continuing activity throughout these centuries (Bugallo 2014; Bugallo and Mamaní 2014; Bugallo et al. 2014; Caggiano 2009; Caggiano and Dubarbier 2013; Cieza 2010; Conti 2007; Figueroa 2008; Hocsman 2003; Manzini Marchesi 2019; Mata de López 2005; País 2011; Quintian 2012). Their operating technology was comparable throughout the country, even though there were differences in the size of the structures and the volumes

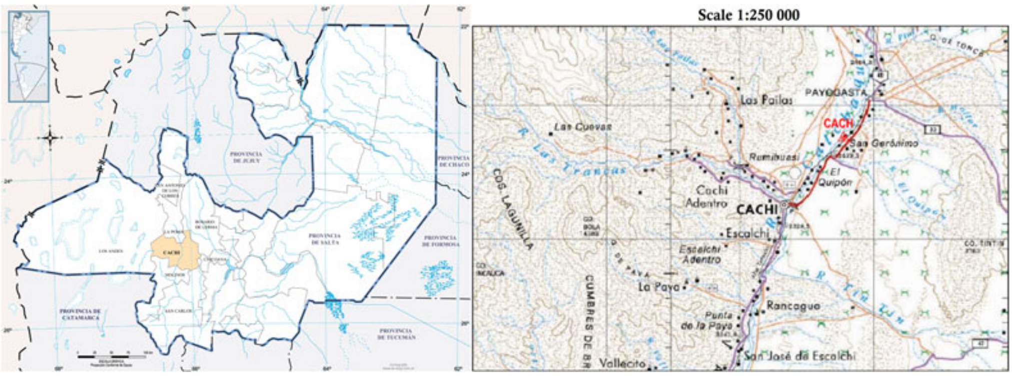

Figure 1. Overview of the study area (from Marinangeli and colleagues [2022]). (Color online)

milled. In those mills located outside the Pampean region, such as the mill we present here, production was more related to local or regional economies; there was less activity around them than with mills in the Pampean region (Caggiano 2009; Caggiano and Dubarbier 2013).

In this context, in 2017 we began to investigate the characteristics and functionality of a hydraulic mill, currently in disuse, in the town of Payogasta (Salta Province in Northwest Argentina), which would have supplied flour to the local market (Figure 1). The first questions that arose had to do with the type of production that was carried out and the chronology of operation of this structure. In this article, we address these questions based on data from the survey of the mill and the excavation of a sector of the site.

Hydraulic Mills in the Argentine Northwest

The previous investigations of hydraulic mills in the Argentine Northwest were limited, particularly from an archaeological perspective. The closest data in comparative and geographic terms come from a flour mill located in the Quebrada de Humahuaca (province of Jujuy) that operated during the nineteenth and twentieth centuries.

The hydraulic mills in this area had a horizontal roller and operated similarly. They were built against a hillside or sloping landscape, on whose slope was a ditch used for irrigation of agricultural crops. Generally, the mill was part of the residential unit or linked to it. In some cases, it was placed on a plot of land directly related to production, outside the residential unit of its owners. The mill was usually associated with other buildings, such as corrals, warehouses, restrooms, storage rooms, and places where fires were built and used as shelters (Bugallo et al. 2014). Its grinding room had an upper part and an underground part where the wheel (*rodezno*) was located, which rotated using water provided by the canal or irrigation ditch.

Most mills had an anteroom emplaced before the grinding room; this anteroom was used to store the grains, flour, and tools and provided space for people to spend the night while waiting for their turn to grind their wheat. People were engaged in a variety of activities such as caring for animals, eating, resting, or socializing while they were waiting. The busiest time for milling was between the winter months, from May to August; milling activity decreased when river flow lessened before the rainy season. The heavy summer rainfall made milling more difficult because the increased flow of rivers and creeks would cause the canals to deteriorate (Bugallo and Mamaní 2014).

In the area near our investigation, the Calchaquí Valley of Salta, we identified several mills with similar characteristics in Palermo, Bella Vista, Payogasta, Cachi, Cachi Adentro, Escalchi, Laxi, Seclantás, Molinos, Colomé, Luracatao, Angastaco, and Piul. Some of those other mills have been surveyed and photographed: all used the same type of technology and were located in the vicinity of the Calchaquí River, the main watercourse that crosses the valley. We identified two mills less than 20 km from Payogasta: one belonged to the Ruiz de Los Llanos family on the road to Cachi town, and the other was part of the Laxi family ranch. In both the grinding machinery is preserved, although the

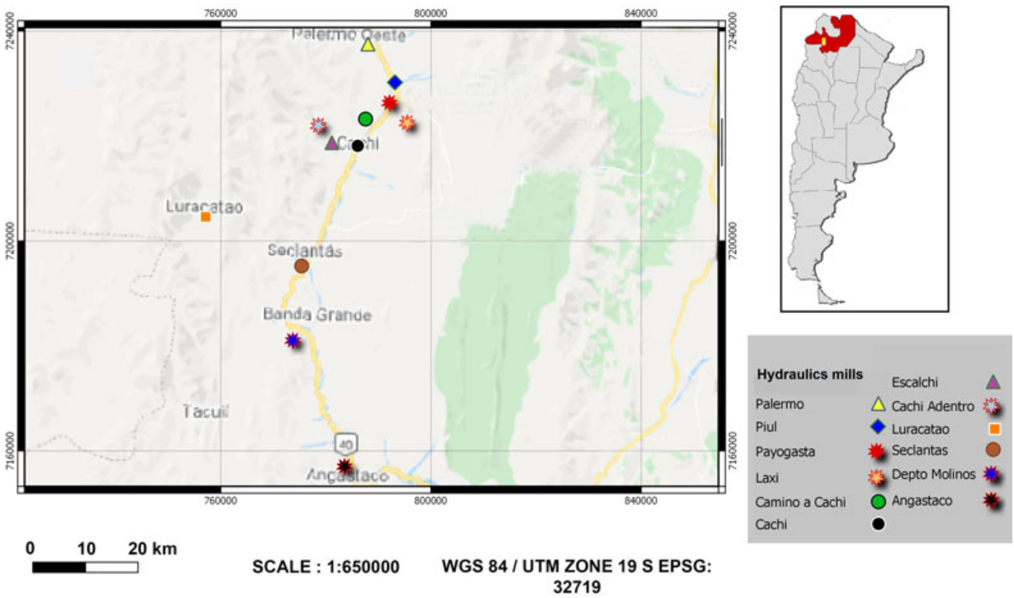

Figure 2. Distribution map of the hydraulic mills in the Calchaquí Valley. (Color online)

mills show a gradual deterioration due to a lack of maintenance on their walls and ceilings. Another mill is located in the Department of Molinos, 58 km from Payogasta. It is close to both the river of the same name and National Route 40 and is maintained well because it is a tourist attraction (Figure 2; Pifano and Dabadié 2016).

Study Area

The Historic Mill is located in the town of Payogasta (Department of Cachi, Salta Province) at 2,410 m asl in the northern sector of the Calchaquí Valley (Figure 3). This valley is defined by several

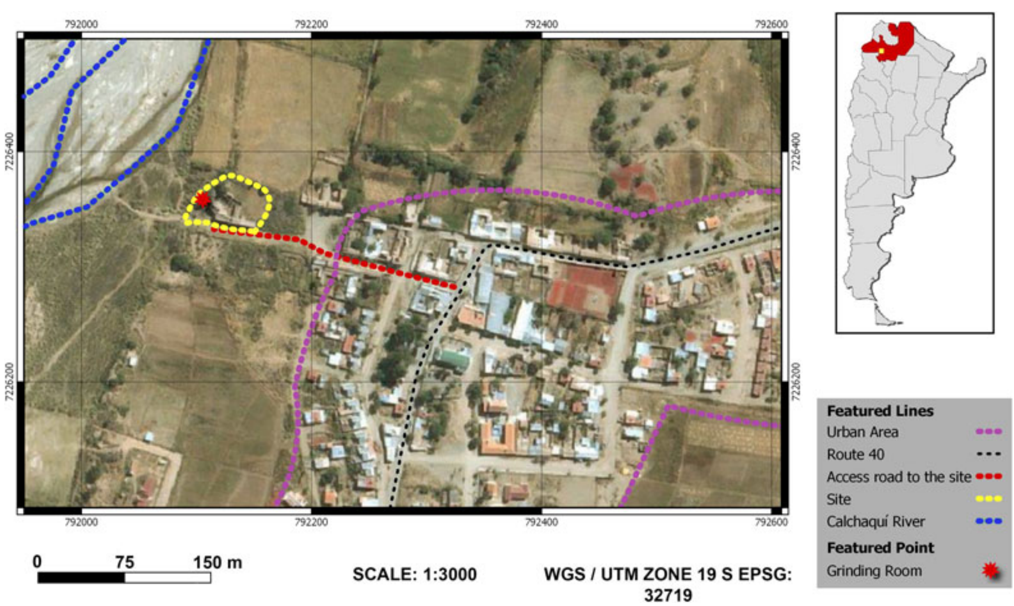

Figure 3. Location of the site in reference to the urban area of the town of Payogasta, National Route 40, and the course of the Calchaquí River. (Color online)

snow-capped mountains ranges that form a north–south strip of approximately 200 km along the western foothills of the sub-Andean mountains, where the Calchaquí River flows.

Large extensions of rocky mantles, piedmont deposits, alluvial cones, slopes, and several levels of terraces carved by the Calchaquí River and its tributaries are the most outstanding geomorphological features of the area (Paoli 2002). The climate is dry (semidesert zones) and temperate in the south, whereas in the north it is cold. Several factors such as the Andean winds that are devoid of moisture, the atmospheric dryness, and the oxygenation of the air, determine a stressed amplitude between day and night temperatures. The rainy period is from November to March, when rainfall varies between 80 and 150 mm. Generally, the rain is torrential, with a high evaporation rate caused by high temperatures, which reduces the amount of water available for use. This results in soils with poor pedologic development and low fertility (Hongn and Seggiaro 2001). From the town of Payogasta to the north, the flora is typical of the pre-Puna regions: it is mainly xerophytic, with hardy grasses and dwarf plants standing out. In the lowlands where irrigation depends on the rivers, the soil is fertile, favoring agriculture and grazing. It is important to note that only between 2% and 3% of the surface is usable for agricultural purposes, with mountainous topography predominating. The region's fauna includes camelids *Lama guanicoe* (guanaco), *Vicugna vicugna* (vicuña), *Lama glama* (llama), and other mammals and birds (Paoli 2002).

Methodology

The first archaeological studies—a planialtimetric and architectural survey of the structures and the excavation of specific sectors—at the Historic Mill were carried out in 2017 as part of the doctoral research of the first author. Six rooms were identified: one contained the mill itself, and the other five were related to it (Figure 4). All the rooms had significant deterioration of the walls and lacked ceilings. The room containing the machinery showed evidence of maintenance: new layers of adobe on the ceiling; cement on the lintels, doors, and windows; and a lining of cement of the canal or ditch from where the water entered to activate the grinding wheels (Pifano and Páez 2020).

In 2019, a 1 × 1 m grid was made in Enclosure 2; it was excavated by artificial levels of 0.05 m, identifying 14 strata until reaching the sterile soil at a depth of 0.735 m. Seeds, corncobs, ceramic fragments, earthenware, faunal bone remains, charcoal, wood, paper, coins, and leather and metal

Figure 4. Planimetry of the Historic Mill of Payogasta showing the room containing the milling machinery and the other five rooms that make up the site. (Color online)

fragments were recovered. No remains could be dated by ^{14}C. The finds were treated in the laboratory, where they were cleaned, labeled, and preserved. This article focuses on the results of archaeofaunistic, archaeobotanical, and ceramic analyses, as well as data from coins and paper remains.

The analysis of the archaeofaunistic remains was carried out at three levels: (1) macroscopically, (2) using a 10× hand lens, and (3) with a Leica A60 stereomicroscope through a zoom system of up to 40×. Reference bone collections from the Grupo de Estudios en Arqueometría (GEarq-FIUBA) were used for anatomical and taxonomic identification and quantification. For the Mammalia group, several body weight categories were stipulated: small-medium (S-M; 1–15 kg), medium-large (M-L; 15–50 kg), and large (L; > 50 kg) mammals. The following measures of taxonomic and anatomical abundance were used: number of specimens identified per taxon (NISP), minimum number of individuals (MNI), and minimum number of elements (MNE). From a taphonomic standpoint, the action of natural agents was evaluated, and these features of anthropic bone modifications were analyzed (Binford 1981; Fernández Jalvo and Andrews 2016; Lyman 1994; Mondini 2002): the types of bone fractures, edge shape, state of the bone at the time of fracture (Mengoni Goñalons 1999; Shipman and Rose 1983), and thermal alteration (Álvarez et al. 2017; De Nigris 2004).

The observation and analysis of plant remains were carried out under a stereomicroscope, which enabled separation of the remains according to the part of the plant (cobs, seeds, endocarps). Subsequently, identification was carried out using texts on diagnostic characteristics (Winton and Winton 1935) and identification keys. Density and ubiquity were used as quantification methods (Miller 1988; Pearsall 1989; Popper 1988). Density was calculated as the absolute number of recovered remains (*n*) per liter of excavated sediment (L). The ubiquity or presence analysis considered the number of samples or levels at which a taxon appeared within the set.

Analysis of the ceramic fragments began with a macroscopic approach and then observation with a low-magnification binocular loupe (20×–40×). The characterization of the pastes took into account nonplastic inclusions, textural relationships, and semi-quantification of the observed components (Bishop et al. 1982; Cremonte 1986, 1988; Matson 1963; Shepard 1968). Features such as the degree of compaction, the characteristics of the fracture, and the type of firing made it possible to determine the way in which the vessels were produced and used. Likewise, the agents of postdepositional affection and the degree of integrity of the assemblage provided information about the taphonomic processes that occurred after the vessels were discarded. A morphological analysis was also carried out identifying the general shape of the piece and the section of the vessel to which the fragment belonged. Regarding their decoration, the treatment of both surfaces (internal and external), the type of decoration (painted, engraved, etc.), the structure of the design, and the characteristics of the motifs—whether they were geometric or figurative—were analyzed (Orton et al. 1997; Shepard 1968).

Analysis of the recovered coins and paper was carried out after treating the corrosive processes (coins) and cleaning them (paper). Descriptions and identifications were made by consulting relevant catalogs and reviewing documentary records.

Results

The mill's structure is similar to those of its nineteenth- and twentieth-century contemporaries with a horizontal wheel (*rodezno*). It has two floors: the lower one or gully, where the mechanism in charge of activating the machinery was located, and the upper one or grinding room where the flour elaboration process took place (Bugallo and Mamaní 2014; Sánchez Jimenez 2015).

At the back of the grinding room, the ditch or canal enters with a 45° inclination. This slope causes the water to gain speed so that it hits with greater force the sponn or blades (*álabes*) attached radially to a piece of wood of the horizontal impeller; this transforms water energy into mechanical energy. The impeller is coupled to a shaft or metal axle, which directly activates the upper wheel or mobile millstone (*volandera*), without the need to use gears.

The upper circular stone of the machinery, located in the upper part of the building or room, rotates on the sill or sleeper (*solera*), which is fixed to the spindle by a peg. This peg (*lavija*) has two functions: the rotation and the calibrated separation of the millstones. We identified the inscription 5-1908 on the upper stone, which could correspond to the date of its installation. The lower stone has the same

Figure 5. The Historic Mill of Payogasta: (a) the mill room and its enclosures; (b) the entrance arches (in front) and the mill room (at the bottom); (c) milling machinery; (d) detail of the flywheel of the previous figure, where the inscription of the date is engraved (photographs by Andres Jäkel and Pablo Pifano). (Color online)

design of grooves as the upper stone but is inverted, so that it can work without rubbing and be arranged horizontally. There is another millstone at the entrance to the site, which has more wear than the other ones, which could mean that it was placed there after falling into disuse (Figure 5).

Once the hydraulic mechanism is operating, the raw material to be ground is slowly introduced into a grain regulation system located above the mobile grinding wheel. The hopper (*tolva*) is a wooden container, with an inverted pyramidal shape and openings at both ends. From there the raw material moves to the millstones where, due to centrifugal force, it migrates from the eye outward, passing from groove to groove and being crushed on the flat parts of the millstones (scissors effect), which must be perfectly level. The incised lines are generally deeper in the center than in the periphery. Both the rotation speed and the distance between the millstones are adjusted to create a suitable grinding process for the type of flour produced. Finally, the ground product, which is generally coarse to medium-grain flour, falls into the wooden drawer or container (*harinal*) and from there is measured and stored. The presence of a manual metal-and-wood shovel and a wooden container suggests that the unit of measurement used in this mill was the *almud*, with a capacity corresponding to 5 L of water.

Analysis of the Millstones

Plant microtraces were obtained from scrapings from the mobile grinding wheel, the hopper, the channel through which the grain is conveyed from the hopper to the millstones (*canaleja*), and the wooden drawer or container (*harinal*): they showed a higher frequency of wheat starches (*Triticum* sp.) than corn starches (*Zea mays*). The former starches are generally circular, variable in size, and smaller than 10 microns. Alterations, such as cracks and perforations, were observed in the starch membranes that were directly associated with mechanical breakage caused by grinding. Corn starches have circular and polyhedral morphologies, varying in size between small (<10 microns) and medium (10–25 microns). A carob starch and a set of red-colored plant cells (chromoplasts) were also identified, corresponding to the presence of *Capsicum annuum*, which is evidence of red bell pepper milling (Pifano et al. 2022).

Analysis of the Materials Recovered from the Excavation

For safety reasons the excavation was carried out in an enclosure next to the one containing the milling machinery. This room is built of adobe with stone foundations. The roof is made of cardon wood (*Pachycereus pringlei*) and straw and is mostly destroyed. A door connected it to an open space from which the grinding room was accessed. The excavated grid yielded the following results.

Archaeofaunal Record. Seventy-one archaeofaunal remains were obtained, with a total NISP of 20 (l#1 = 2; l#2 = 6; l#3 = 5; l#4 = 2; l#5 = 1; l#7 = 1; l#8 = 1; l#9 = 1), an MNE of 3 (l#1 = 1; n3 = 1; l#8 = 1), and an MNI of 3 (l#1 = 1; l#3 = 1; l#8 = 1; Table 1). Fifty-one specimens were grouped as NID (not determined).

Due to the high degree of fragmentation, few bones could be identified to the species level. An adult individual and a juvenile one referred to *Ovis orientalis aries* (sheep) and *Capra aegagrus hircus* (goat) were determined through a maxilla with teeth and a radius. Most of the bony remains were identified to the class level (Mammalia) and were referred to large (L) and medium-large (M-L) taxa; they were

Table 1. Values of NISP, MNI, and MNE for Each Stratigraphic Level.

Level	Taxon	NISP	MNI	MNE
#1	Mammalia indet. L	1	1	1
	Mammalia indet. M-L	2		
#2	Mammalia indet. L	3		
	Mammalia indet. M-L	3		
#3	Mammalia indet. L	2		
	Mammalia indet. M-L	1		
	Artiodactyla			
	cf. *Ovis/Capra*	2	1	1
#4	Mammalia indet. L	1		
	Mammalia indet. M-L	1		
#5	Mammalia indet. L	1		
#7	Artiodactyla			
	cf. *Ovis/Capra*	1	1	1
#8	Mammalia indet. L	1		
#9	Mammalia indet. M-L	1		
	Total	20	3	3

Table 2. Details of NISP with Natural and Anthropic Modifications Identified.

		Natural Modifications			Anthropic Modifications			
Level	Taxon	Cm	T	Mn	C	SM	GB	IN
#2	Mammalia indet. L				3	1	2	
	Mammalia indet. M-L	1	1		2		1	1
#3	Mammalia indet. M-L						1	1
	Artiodactyla							
	cf. *Ovis/Capra*						1	1
#4	Mammalia indet. L	1	1	1				
	Mammalia indet. M-L		1	1				1
#5	Mammalia indet. L				1			
#8	Mammalia indet. L				1		1	1
#9	Mammalia indet. M-L						1	
	Total	2	3	2	7	1	7	5

Notes: Cm: carnivore tooth mark; T: trampling; Mn: manganese oxide coatings; C: cut mark; SM: scratch mark; GB: green breakage; IN: impact negative.

probably introduced domestic ungulates, such as *Bos primigenius taurus* (cow), *Equus ferus caballus* (horse), *O. o. aries*, and *C. a. hircus*. In the first case (Mammalia L), remains of a mandible, vertebrae, ribs, and a proximal epiphysis of the humerus were recognized, whereas in the second case (Mammalia M-L), remains of tibia diaphysis were identified.

Different proportions of remains affected by natural agents were recorded (l#2 NISP% = 10; l#4 NISP% = 20; Table 2). In l#2 (NISP% = 5) and l#4 (NISP% = 5), there was evidence of carnivore chewing in the form of grooves (*scoring*) and edges (*crenulated*) in rib remains from Mammalia L and in the thoracic vertebrae from Mammalia M-L (Figure 6a). Trampling marks were also determined in the remains of diaphyses of long bones from Mammalia M-L of l#4 (Figure 6b; NISP% = 10) and in a rib fragment of Mammalia L of l#2 (NISP% = 5). Likewise, manganese oxide precipitation was observed in a rib from Mammalia L and in a long bone fragment from Mammalia M-L (Figure 6b; NISP% = 10), both from l#4.

Anthropic modifications varied in the assemblage of MP (l#2 NISP% = 50; l#3 NISP% = 20; l#4 NISP% = 5; l#5 NISP% = 5; l#8 NISP% = 15; l#9 NISP% =5; Table 2). Three bone chips (NID) from l#6 showed thermal alteration in an advanced burned state (NID% = 2) and were calcined (NID% = 4; Figure 6c). In addition, one scratch mark (NISP% = 5) was observed on a rib fragment of Mammalia L. Traces of cuts made with a metallic instrument were observed (NISP% = 35) on the ribs (Figure 6d) and the proximal epiphysis of the humerus of Mammalia L and on rib fragments and the diaphysis of the tibia of Mammalia M-L (Figure 6e). Long bone specimens of Mammalia L, Mammalia M-L, and *Ovis*/*Capra* with green-bone fractures were also found (Figure 6f; NISP% = 35); 71.42% of these fractures were associated with impact negatives.

Plant Macro-Remains. All the archaeobotanical remains belong to carpo-remains ($n = 32$) and include fruits, seeds, or parts of them (Table 3; Figure 7). Of these, 13 were complete, and 19 were fragmented or broken. Except for one specimen that showed evidence of thermal alteration, the remaining were preserved in a dry state.

The highest density of remains was observed in excavation units 2 and 3. This value may be overestimated because there was a greater proportion of fragmented remains, but other lines of evidence indicate the highest density are in these levels (Figure 8).

Given that the remains with the highest absolute frequency were peach endocarps, which were also the most fragmented, ubiquity was used to analyze the importance of each taxon (Figure 9). Peach

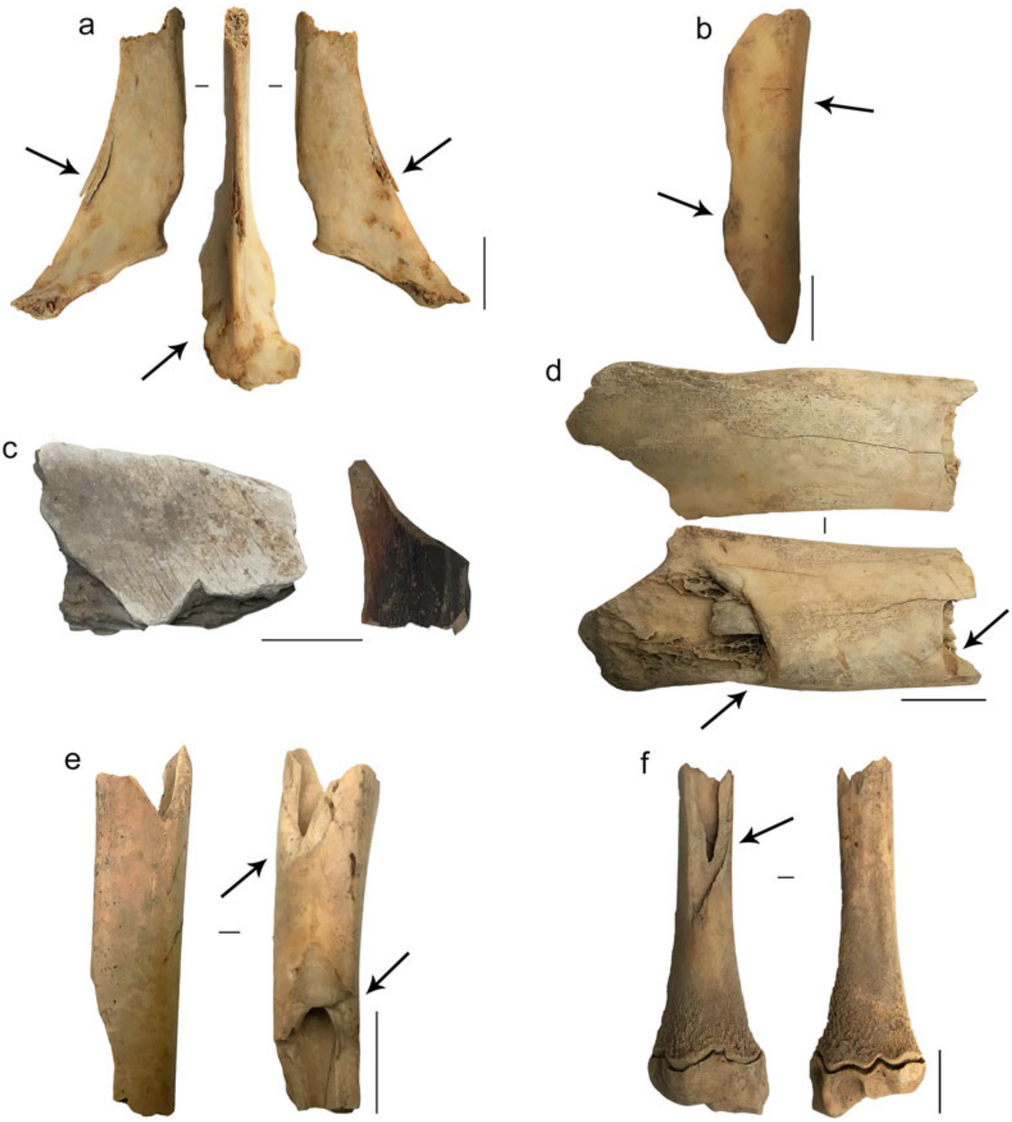

Figure 6. Details of natural and anthropic modifications for the Historic Mill of Payogasta: (a) spinous process of thoracic vertebra from M-L Mammalia indet. with carnivore marks (n4); (b) diaphysis of tibia of M-L Mammalia indet. with trampling marks and diagenesis (n2); (c) bone chips with "advanced burnt" degree of thermal alteration (*right*) and calcined (*left*; n6); (d) rib of L Mammalia indet. with traces of cutting and scraping (n2); (e) diaphysis of tibia from M-L Mammalia indet. with fresh fracture and negative impact (n3); (f) distal radius of *Ovis/Capra* with fresh fracture and negative impact (n3). Scale = 1 cm. (Color online)

Table 3. Species, Plant Part, and Absolute Amounts of Carpo-Remains.

Species	Common Name	Plant Part	Absolute Amount
Prunus persica	Peach	Endocarp	27
Prunus armeniaca	Apricot	Endocarp	1
Zea mays	Corn	Cob	2
Cucurbita maxima	Pumpkin	Seed	2
Total			32

Figure 7. Plant carpo-remains recovered in the excavation: (a) peach endocarp; (b) apricot endocarp; (c) corn cob without grain remains and corn cob with grain remains in domes; (d) pumpkin seed. Scale: 0.5 = cm. (Color online)

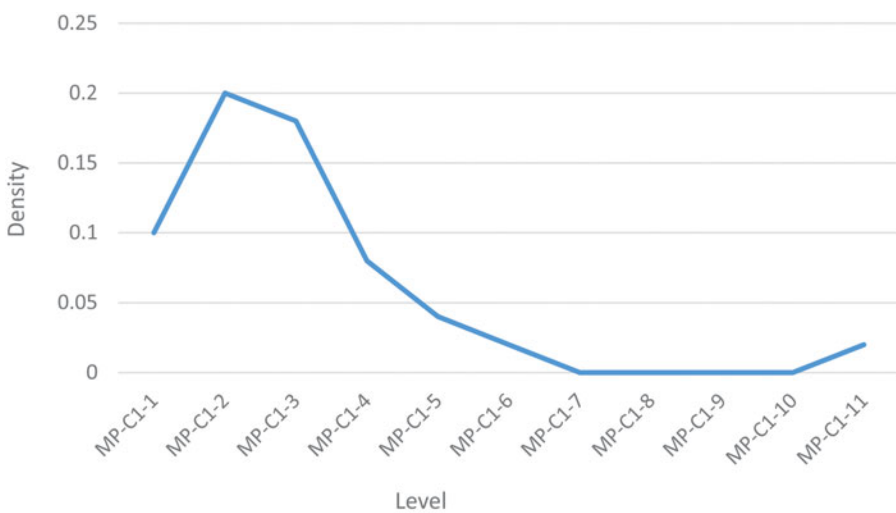

Figure 8. Density of carpo-remains recovered in the different levels of the excavation of the archaeological site.

endocarps (Figure 7a) were found to be the most ubiquitous; that is, they were present in the greatest number of samples or levels. They were followed by pumpkin seeds (Figure 7d), which were recovered from the superficial levels. Apricots had the least ubiquity (Figure 7b). Concerning the corn cobs, one of the remains had the base of the grain, and the other one had clean domes (Figure 7c): both are of the

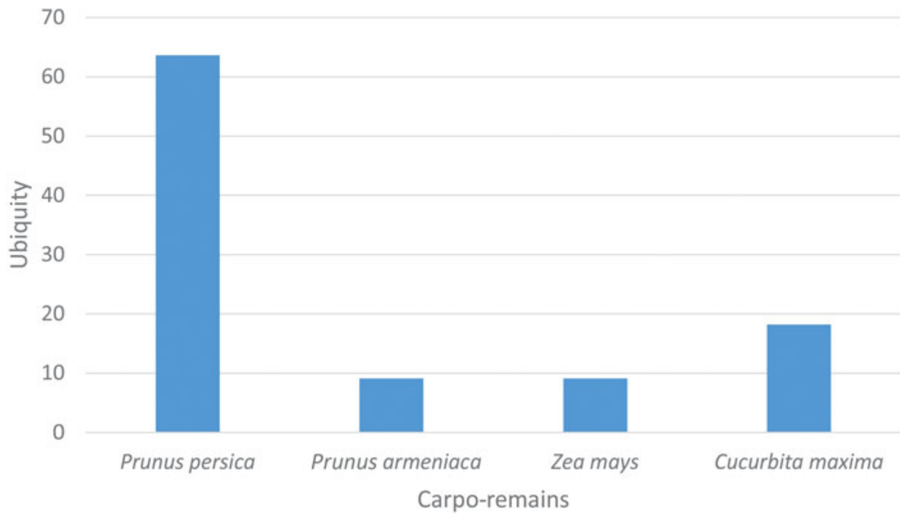

Figure 9. Ubiquity of each botanical taxon identified from the excavation of the archaeological site.

pisingallo variety that is no longer cultivated today because of its high water requirements (Martínez Zabala et al. 2022).

Analysis of the Pottery Fragments. The 12 fragments recovered correspond to a small number of vessels (open and closed shapes). A bowl (*puco*) of Santa Maria style (a local ceramic style developed between AD 900–1430), a vessel or jar with a polished external surface from the Santa Maria or Inca style, and other vessels without decoration were identified (Figure 10). The fragments of the same style could not be assembled, but it can be inferred that they correspond to the same piece because of their morphological and technological characteristics.

In this assemblage, there are two outstanding features. Because the fragments are not rolled, it is suggested that they were fractured inside the enclosure, probably by trampling after their use and discard. Yet, a large number are burned on both surfaces or in the fracture area (42% of the total), indicating that they were exposed to direct fire, probably after the pieces were broken. Only two fragments may be modern, and all the rest are from precontact times.

Analysis of Coins and Paper Remains. The three recovered coins correspond to 20 cents of Peso Moneda Nacional (M$N), which was the official Argentine currency between 1881 and 1970. One has the inscription of the year 1924, another one has the inscription of 1942, and the third one corresponds to the 1890s but its deterioration prevents identification of the last digit in the date (Figure 10). Another coin was found in surface collections and has the inscription of the year 1954. The recovered paper has the year 1973 printed on it, which corresponds to an electoral ballot on which the name of Solano Lima can be read (Figure 10); he was the candidate for vice president on the ticket with Héctor José Campora (Pifano and Páez 2020).

Discussion

Our research uncovered finds in the milling room and related to the mill itself, as well as evidence from the associated enclosures, one of which was excavated. The mill's hydraulic characteristics are similar to most mills installed in the Americas during the nineteenth and twentieth centuries; it needed water energy for its operation, using simple mechanisms that required little maintenance (Cara Barrionuevo et al. 1996). Its location on the banks of the Calchaquí River, a permanent watercourse, ensured that its activity did not depend on the availability of water.

The archaeobotanical analysis carried out on the grinding wheels indicates that the main grains from which the flours were produced were wheat, followed by corn: both were grown locally to supply

Figure 10. Ceramic fragments, coins, and fragments of the ballot recovered in the excavation of Room 2 of the site. (Color online)

the needs of the local population. The presence of carob and plant cells associated with red pepper chromoplasts indicates that they were also processed in the mill but to a much lesser extent. Red peppers were incorporated late into the Calchaquí Valley, approximately around 1930–1940, so its grinding was probably later than that of the other products. Furthermore, the water content of the red pepper causes it to be absorbed into the surface of the millstones, so if the grains and these fruits had been ground at the same time, the latter would have affected the purity sought for the former. This suggests that both grindings were not contemporary and that the grinding of the pepper occurred later (Pifano et al. 2022).

The inscription engraved on the upper grinding wheel of the mill provides significant chronological data; it allows us to infer that by 1908 the mill was already fully operational. The other millstone, found at the entrance to the site, is very worn out, which suggests that it was used previously and was put there when it was replaced by the one with the later date. Therefore, the mill would have been in operation for a long time before 1908, which corresponds to the late nineteenth-century date of the oldest coin recovered from the excavation. The other coins, as well as the paper that is part of an electoral ballot, indicate that the mill was also used during much of the twentieth century, although not always to grind the same materials (Pifano and Páez 2020).

The excavation data from Room 2 show that it was intended for transitory overnight stays for people who were waiting to grind their plant materials. As in the mills in the province of Jujuy, it is likely that these rooms provided an area for the people waiting for their turn to grind to eat, rest, and socialize. Although most of the users were residents of the valley, ethnographic data from Payogasta (Pifano et al. 2022) indicate that the mill was also used by inhabitants of the Puna region, who exchanged animal products for vegetables or grains, which they then took back to their places of origin after being milled. This supports the evidence that plant and animal products were cooked and consumed in the perimeter of the enclosures.

The presence of skeletal parts of exotic domestic ungulates with cut marks and thermal alteration (some of them were partially carbonized; see Figure 5c, right) suggests that those who occupied Room 2 consumed them, probably after being roasted, (Binford 1981; De Nigris 2004; Fernández Jalvo and Andrews 2016; Lyman 1994; Mengoni Goñalons 1999; Shipman and Rose 1983). Because of the high level of fragmentation (by trampling and by the action of carnivores and humans) and the type of exhumed elements of a low diagnostic level, the taxonomic assignments are still open (*Ovis/Capra* and *Bos/Equus*). Today, *Capra* livestock is important in the region both for consumption of meat that is roasted on a grill and for their secondary dairy products. The consumption of bone marrow is indicated by the evidence of negative impacts associated with green-bone fractures (Binford 1981; Fernández Jalvo and Andrews 2016; Lyman 1994; Mengoni Goñalons 1999).

Few plants were found, probably due to the size of the excavated surface, the type and part of the plant used, the cleanliness of the space, or the differential preservation of the remains. The recovered peach and apricot endocarps (Figure 7a–b) suggest the consumption of fresh fruits. There are records of consumption in different preparations, both canned and dehydrated (Pochettino 2015), although in most cases, the endocarps are discarded. The dehydrated ones, commonly called *orejones*, preserve the endocarps, which could have possibly been consumed, in addition to fresh fruit. The corn cobs may have been part of the diet of the people who spent the night in the enclosure, although they could also correspond to the cobs brought to the place to obtain flour. In any case, the identification of the *pisingallo* variety, which is no longer cultivated today because it requires higher humidity conditions, may be an environmental indicator. It is likely that when the mill was operating the climatic conditions were more favorable for agricultural production than today.

Domestic activities related to consumption, however, would not have required much crockery, given the absence of earthenware. The high proportion of heat-altered fragments, mostly on both surfaces and in the fracture, suggests that these materials were already fractured when they were deposited in the sediment that formed the floor of the room and were not part of vessels in use. This suggestion is also supported by the characteristics of the decorative styles, which are mostly from precontact times, several centuries before the mill was operational. Only two of the fragments analyzed could belong to modern vessels, although their characteristics do not allow further inferences.

Conclusions

In summary, the analysis of the mill and the materials from the excavation of one of the enclosures provides important evidence about the chronology of the site and the activities that took place there. The absolute dates and the relative indications suggest that the mill would have been in full operation toward the end of the nineteenth century and at least until the 1970s, as indicated by the date printed on the ballot recovered from the excavation. During most of this time, grains were ground: mainly wheat and corn, and occasionally carob and red pepper. Red peppers would have been ground in the last stage of use of the structure.

The results of the excavation of Room 2 suggest that activities related to the consumption of food, mainly of domestic exotic animals and vegetables, took place there. Some bone remains show evidence of subsequent chewing by carnivorous mammals; these probably were domesticated, such as dogs (*Canis lupus familiaris*) and cats (*Felis sylvestris catus*) that were frequently found in human settlements. Other mills in the Argentine Northwest had rooms associated with the grinding machinery, where people who came to the site could wait for their grains to be ground. Varied activities took place there, including leisure activities, eating, and resting food. The evidence from Room 2 is consistent with this information. It can be inferred that the mill was used not only by the immediate neighbors of the town but also by people from more distant places, including the Puna, with which social and commercial ties are currently maintained.

Finally, the analysis indicates that the influence of this mill, like most of those found in the valley, was restricted to the local or regional level; its operation was oriented to supplying the domestic market. In contrast, those found in the Pampean area were fundamental to the functioning of the agro-export model in Argentina.

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References Cited

Álvarez, María C., Agustina Massigoge, Nahuel Scheifler, Mariela E. Gonzáles, Cristian Kaufmann, María A. Gutiérrez, and Daniel A. Rafuse. 2017. Taphonomic Effects of a Grassland Fire on a Modern Faunal Sample and Its Implications for the Archaeological Record. *Journal of Taphonomy* 15:77–90.

Artuso, Francisco. 1917. La industria molinera argentina: Producción, consumo y exportación del trigo y su harina. PhD dissertation, Facultad de Ciencias Económicas, Universidad de Buenos Aires, Buenos Aires.

Bandieri, Susana, and Graciela Blanco. 1996. La historia agraria Argentina en los siglos XIX y XX: Una síntesis pendiente. *Noticiario de Historia Agraria* 11:133–150.

Bell, Martha. 2016. Delimitar y gobernar las aguas de Lima: Relaciones urbano-rurales y rivalidades administrativas en Lima colonial. *Histórica* 40(1):7–33.

Binford, Lewis R. 1981. *Bones: Ancient Men and Modern Myths*. Academic Press, New York.

Bishop, Ronald L., Roberts L. Rands, and George R. Holley. 1982. Ceramic Compositional Analysis in Archaeological Perspective. In *Advances in Archaeological Method and Theory*, edited by Michael B. Schiffer, pp. 275–330. Academic Press, New York.

Bugallo, Lucila. 2014. Los propietarios de los molinos en la Quebrada de Humahuaca, 1860–1980: La molinería: De actividad rentable a la fabricación de harinas para autoconsumo. In *Quebrada de Humahuaca, estudios históricos y antropológicos en torno a las formas de propiedad*, edited by Ana Alejandra Teruel y Cecilia Fandos, pp. 139–184. Universidad Nacional de Jujuy, Jujuy, Argentina.

Bugallo, Lucila, and Lina M. Mamani. 2014. Molinos en la Quebrada de Humahuaca: Lugares de encuentro de gentes y caminos: La región molinera del norte jujeño, 1940–1980. In *Espacialidades altoandinas: Nuevos aportes desde la Argentina: Miradas hacia lo local, lo comunitario y lo doméstico*, edited by Alejandro Benedetti and José Tomasi, pp. 63–118. Universidad de Buenos Aires, Buenos Aires.

Bugallo, Lucila, Lina M. Mamani, and Laura H. Paredes. 2014. Moliendas y producción de harinas para autoconsumo en las economías domésticas quebradeñas durante el siglo XX. In *Investigaciones del Instituto Interdisciplinario Tilcara*, edited by M. Elisa Aparicio, Alejandro Benedetti, Lucila Bugallo, Lina M. Mamani, Pablo Mercolli, Mónica Montenegro, Clarisa Otero, et al., pp. 65–106. Universidad de Buenos Aires, Buenos Aires.

Caggiano, María A. 2009. Construcción de la identidad molinera durante el siglo XIX: Siguiendo las huellas en Chivilcoy. In *El área pampeana: Su abordaje a partir de estudios interdisciplinarios*, edited by Centro de Estudios en Ciencias Sociales y Naturales de Chivilcoy, pp. 220–285. Centro Universitario Chivilcoy, Buenos Aires.

Caggiano, María, and Virginia Dubarbier. 2013. Elementos modeladores del paisaje natural y cultural en la Pampa Chivilcoyana: La introducción del cultivo de trigo. *Anuario de Arqueología* 5:213–230.

Cara Barrionuevo, Lorenzo, José L. García López, José D. Lentisco Puche, and Domingo Ortiz Soler. 1996. *Los molinos hidráulicos tradicionales de los Vélez (Almería)*. Instituto de Estudios Almerienses, Almeria, Spain.

Cieza, Gabriel L. 2010. Procesos organizativos y acceso a la tierra en el Valle Calchaquí. Master's thesis, Facultad de Ciencias Agrarias y Forestales, Universidad Nacional de La Plata, Buenos Aires.

Conti, Viviana. E. 2007. Articulaciones mercantiles del espacio salto-jujeño durante el período rosista. PhD dissertation, Facultad de Humanidades y Ciencias de la Educación, Universidad Nacional de La Plata, Buenos Aires.

Cremonte, María B. 1986. Alcances y objetivos de los estudios tecnológicos en la cerámica arqueológica. *Anales de Arqueología y Etnología* 1:179–217.

Cremonte, María B. 1988. Estudios tecnológicos de cerámicas arqueológicas del N.O.A. *Cuadernos de la Facultad de Humanidades y Ciencias Sociales* 1:36–48.

Dal Sasso, Pascuale, and Lucia P. Caliandro. 2010. The Role of Historical Agro-Industrial Buildings in the Study of Rural Territory. *Landscape and Urban Planning* 96:146–162.

De Nigris, Mariana E. 2004. El consumo en grupos cazadores recolectores: Un ejemplo zooarqueológico de Patagonia Meridional. PhD dissertation, Facultad de Filosofía y Letras. Universidad de Buenos Aires.

Djenderedjian, Julio, Sílcora Bearzotti, and José L. Martirén (editors). 2010. *Historia del capitalismo agrario pampeano: Expansión agrícola y colonización en la segunda mitad del siglo XIX*. Teseo, Universidad de Belgrano, Buenos Aires.

Escalante Fernández, María del Mar, and María L. García-Saavedra. 2018. La energía hidráulica como fuerza motora: El ejemplo de los molinos hidráulicos de Navalagamella (Madrid). In *Actas RAM 2015: Reunión de Arqueología Madrileña*, pp. 127–136. Sección de Arqueología del Colegio de Doctores y Licenciados en Filosofía y Letras y en Ciencias de Madrid, Madrid.

Fernández, Sandra. 2000. La industria molinera en Santa Fe, modernización y cambio tecnológico en un ámbito regional pampeano: Un estudio de caso en el cambio de siglo (XIX–XX). *Cuadernos de Historia: Serie Economía y Sociedad* 3:77–112.

Fernandez Jalvo, Yolanda, and Peter Andrews. 2016. *Atlas of Taphonomic Identifications: 1001+ Images of Fossil and Recent Mammal Bone Modification*. Springer, New York.

Figueroa, Paola R. 2006. Los molinos hidráulicos en Mendoza (Argentina) durante el período colonial (S.XVI, XVII y XVIII). *Universum* (*Talca*) 21(1):28–47.

Figueroa, Paola R. 2008. El patrimonio intangible de la molienda en Mendoza: Su reconstrucción a partir de los molineros de Reynaud (Luján de Cuyo) y Rachi (San Carlos), Mendoza, Argentina. Electronic document, https://www.iau.usp.br/sspa/arquivos/pdfs/papers/02516.pdf, accessed November 15, 2022.

Gilberti, Horacio C. 1970. *Historia económica de la ganadería Argentina*. Editorial Solar, Buenos Aires.

Hocsman, Luis, D. 2003. Estructura rural, territorialidad y estrategias domésticas en la Cordillera Oriental (San Isidro-Finca El Potrero-Colanzulí-Finca Santiago, Salta). PhD dissertation, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, Buenos Aires.

Hognogi, Gheorghe, Alexandra Marian Potra, Ana Pop, and Simona Mălăescu. 2021. Importance of Watermills for the Romanian Local Community. *Journal of Rural Studies* 86:198–207.

Hongn, Fernando D., and Raúl E. Seggiaro. 2001. Hoja Geológica 2566-III, Cachi: Provincias de Salta y Catamarca. Instituto de Geología y Recursos Minerales, Servicio Geológico Minero Argentino. *Boletín* 248:1–87.

Lacoste, Pablo. 2018. Molinos harineros en Chile (1700–1845): Implicancias sociales y culturales. *América Latina en la Historia Económica* 25(3):103–132.

Lera, Mariana. 2005. Transformaciones económicas y sociales en el departamento de Cachi (Salta) a fines del Siglo XIX. *Mundo Agrario* 6(11):1–31.

Lyman, Lee R. 1994. *Vertebrate Taphonomy*. Cambridge Manuals in Archaeology. Cambridge University Press, Cambridge.

Manzini Marchesi, Lorena. 2019. De molinos hidráulicos a bodegas vitivinícolas en el área metropolitana de Mendoza Argentina (1885–1930). *Estudios del Patrimonio Cultura*l 17:86–103.

Marinangeli, Gimena, Agustina Ollier, and María C. Páez. 2022. Trueque y dinero: Impacto de las lógicas del mercado en las formas comunales de organización andina de los pobladores de Cachi (Salta, Argentina). *Historia Agraria* 88:73–97.

Martirén, José. L., and Daniel Moyano. 2019. La formación de mercados de alimentos en Argentina: Un análisis sobre la comercialización de las harinas de trigo entre Santa Fe y las plazas norteñas (1880–1895). *América Latina en la Historia Económica* 26(1):1–33.

Martirén, José L., and Agustina Rayes. 2016. La industria argentina de harina de trigo en el cambio de siglo: Límites y alcances, 1880–1914. *H-industria@* 10(18):1–27.

Martínez Zabala, Catalina, María C. Páez, María L. Pochettino, and Natalia Petrucci. 2022. Variedades y usos actuales del maíz en el Valle Calchaquí Norte (Salta, Argentina): El aporte de la etnobotánica en la interpretación de los vestigios vegetales del pasado prehispánico. *Arqueología* 28(3):10360.

Mata de López, Sara E. 2005. *Tierra y poder en Salta: El Noroeste Argentino en vísperas de la Independencia*. CEPIHA, Salta, Argentina.

Matson, Frederick R. 1963. Some Aspects of Ceramic Technology. In *Science in Archaeology: A Comprehensive Survey of Progress and Research*, edited by Don Brothwell and Eric Higgs, pp. 489–493. Thames and Hudson, London.

Mengoni Goñalons, Guillermo L. 1999. Cazadores de guanacos de la estepa patagónica. PhD dissertation, Facultad de Filosofía y Letras, Universidad de Buenos Aires.

Miller, Naomi F. 1988. Ratios in Paleoethnobotanical Analysis. In *Current Paleoethnobotany: Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*, edited by Christine Hastorf and Virginia Popper, pp. 72–85. University of Chicago Press, Chicago.

Mondini, Mariana. 2002. Modificaciones óseas por carnívoros en la Puna argentina: Una mirada desde el presente a la formación del registro arqueofaunístico. *Mundo de Antes* 3:87–110.

Morales, Luz M. 2006. Trigo, trojes, molinos y pan, el dorado de la oligarquía poblana. *Theomai* 13:1–13.

Morales Moreno, Humberto. 2008. Los molinos de La Asunción y San Miguel en Tecamachalco y Acatzingo, estado de Puebla (resultados de la arqueología industrial). *Apuntes* 21(1):136–145.

Orton, Clive, Paul Tyers, and Alan Vince. 1997. *La cerámica en arqueología*. Editorial Crítica, Barcelona.

Ostafin, Krzysztof, Magdalena Jasionek, Dominik Kaim, and Anna Miklar. 2021. Historical Dataset of Mills for Galicia in the Austro-Hungarian Empire/Southern Poland from 1880 to the 1930s. *Data in Brief* 40:107709.

País, Alfredo. 2011. Las transformaciones en las estrategias de reproducción campesinas en tiempos de globalización: El caso de Cachi en los Valles Calchaquíes. PhD dissertation, Facultad de Ciencias Agropecuarias, Universidad Nacional de Córdoba, Córdoba, Argentina.

Paoli, Héctor. 2002. *Recursos hídricos de la puna, valles y bolsones áridos del Noroeste Argentino*. Instituto Nacional de Tecnología Agropecuaria (INTA), Centro de Investigación, Educación y Desarrollo (CIED), Salta, Argentina.

Pearsall, Deborah M. 1989. *Paleoethnobotany: A Handbook of Procedures*. Academic Press, London.

Pifano, Pablo J., and Madalen Dabadie. 2016. Approach to the Grist Milling Activity in Northern Calchaqui Valley (Salta) during the 19th and 20th Centuries. *International Journal of Humanities & Social Studies* 4(6):326–333.

Pifano, Pablo J., Marco A. Giovannetti, Gimena A. Marinangeli, and María C. Páez. 2022. Molienda de pimiento rojo en el molino histórico de Payogasta (Cachi, Salta): Aportes desde la arqueobotánica. *Andes* 33(1):140–168.

Pifano, Pablo J., and María C. Páez. 2020. Aproximación cronológica al funcionamiento del molino hidráulico de Payogasta (Cachi, Salta) durante los siglos XIX y XX. *Revista Teoría y Práctica de la Arqueología Histórica Latinoamericana* 9(10):45–57.

Pochettino, María L. 2015. *Botánica económica: Las plantas interpretadas según tiempo, espacio y cultura*. Sociedad Argentina de Botánica, Buenos Aires.

Popper, Virginia S. 1988. Selecting Quantitative Measurements in Paleoethnobotany. In *Current Paleoethnobotany: Analytical Methods and Cultural Interpretations of Archaeological Plant Remains*, edited by Christine Hastorf and Virginia Popper, pp. 53–71. University of Chicago Press, Chicago.

Quintián, Juan Ignacio. 2012. La elite salteña durante la formación del Estado, 1850–1880: Comercio regional y distribución de la tierra. *Anuario del Instituto de Historia Argentina* 12:47–79.

Rojas Rabiela, Teresa, Ignacio Gutiérrez Ruvalcaba, and Roberto Santos Pérez. 2014. Molinos hidráulicos de trigo en México: La Mixteca Alta, Oaxaca. In *Irrigation, Society, Landscape: Tribute to Thomas F. Glick*, edited by Carles Sanchis-Ibor, Guillermo Palau-Salvador, Ignasi Mangue Alférez, and Luis Martínez-Sanmartín, pp. 387–401. Universitat Politècnica de València, Valencia, Spain.

Sánchez Jiménez, Francisco Javier. 2015. Estudio histórico-técnico de los molinos hidráulicos de Alcalá de Guadairá. PhD dissertation, Departamento de Ingeniería del Diseño, Universidad de Sevilla, Sevilla.

Sanmartín, Lina. 2011. *Patrimonio industrial, molinos y hangares*. Seminario de crítica 183. Instituto de Arte Americano e Investigaciones Estéticas, Universidad de Buenos Aires, Buenos Aires.

Satizábal Villegas, Andrés E. 2004. *Molinos de trigo en la Nueva Granada (siglos XVII–XVIII)*: *Arquitectura industrial, patrimonio cultural inmueble*. Universidad Nacional de Colombia, Bogota.

Shepard, Donald. 1968. A Two-Dimensional Interpolation Function for Irregularly Spaced Data. In *ACM* '68*: Proceedings of the* 1968 23*rd ACM National Conference*, pp. 517–524. Association for Computing Machinery, New York. https://doi.org/10.1145/800186.810616.

Shipman, Pat, and Jennie Rose. 1983. Early Hominid Hunting, Butchering and Carcass-Processing Behaviors Approaches to the Fossil Record. *Journal of Anthropological Archaeology* 2(1):57–98.

Sica, Gabriela. 2005. Maíz y trigo; molinos y conanas; mulas y llamas: Tierras, cambio agrario, participación mercantil indígena en los inicios del sistema colonial. Jujuy siglo XVII. In *Jujuy, arqueología, historia, economía y sociedad*, edited by Daniel SantaMaría, pp. 106–124. El Duende, San Salvador de Jujuy, Argentina.

Solórzano, Juan C. 1986. Técnicas y producción agrícola en Costa Rica en la época colonial. *Revista de Filosofía de la Universidad de Costa Rica* 24(59):85–92.

Turriano, Juanelo. 1996. *Los veintiún libros de los ingenios y máquinas*. Ministerio de Cultura Biblioteca Nacional, Ediciones Doce Calles, Fundación Juanelo Turriano, Madrid.

Winton, Andrew L., and Kate B. Winton. 1935. *The Structure and Composition of Foods*. Wiley, New York.

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