

'A Beautiful Cradle':

Subject Indicators and the Decipherment of Genre on Andean Khipus

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Abstract:

This article analyses how khipus, Andean knotted cords for communication, indicated their subject matter. Spanish chroniclers attested to the existence of different genres of khipus; however scholars have not known how or if khipus indicated the genre of data they stored.

Ethnographic testimony reveals that needlework bundles -- "kaytes" -- attached to primary cords served as subject indicators. This article surveys post-Inka kaytes, examining one from colonial Huarochiri through an interdisciplinary methodology that provides a model for kayte interpretation. This new evidence about subject indicators supports the hypothesis that khipus encoded information through hierarchical levels of significance, and furthers decipherment.

1.0 INTRODUCTION:

How did khipus, the knotted cord communication system of the Andes, indicate which topics they covered? Spanish chroniclers attested to the existence of different genres of khipus in the Inka Empire, stating that each kind of government official used the type of khipu that registered their "genre of subject matter" (Calancha, 1974-1981 [1638], I:205) including "histories, laws and ceremonies, and economic accounts". Being able to identify the subject covered in any particular khipu would advance decipherment; however, until now, scholars have not known how or even if khipus indicated the genre of the data that they stored.

Recently uncovered ethnographic testimony from Huarochiri Province, Peru, reveals that the needlework bundles, or "*kaytes*", found on the primary cords of many khipus signified the knotted cords' subject matter. This article will examine *kaytes* from post-Inka khipus, focusing on one containing silver metallic threads from an 18th century khipu in Huarochiri (Figure 1).



Figure 1. Silver threaded kayte, Khipu B, Collata, Peru. Photo by author.

The meaning of this kayte will be analysed in terms of ethnographic, historical, and physical evidence. Additional information about the significance of the kayte's silver braiding comes from a 17th century Spanish missionary, Baltasar de Salas, who called kaytes "beautiful cradles" ("*Zuma kkepa*"), using a word for "cradle" that referred specifically to the cup for holding stones in a braided sling (Viscarra 1901, 327; Bertonio 1612). The methodology used here to interpret the silver threaded Collata kayte provides a model for studying these objects, establishing a pathway for identifying the genre of other khipus with kaytes. Understanding how kaytes functioned presents crucial insights into khipu semiosis, supporting the hypothesis that information was encoded on khipus through hierarchical levels of significance.

2.0 INKA AND POST INKA KHIPUS:

The use of khipus to record information was ubiquitous throughout the Inka Empire (c 1400 -- 1532 AD) (Urton 2003; 2017). During the Inka era,

kipu specialists served in every community throughout the realm, while a hierarchy of government khipu experts maintained knotted cords about tribute, harvests, the transport of goods, births and deaths, and all the records necessary for effective governance (Figure 2).



Figure 2. Inka khipu expert holding a khipu, Martín de Murúa [c 1600] 2004.

Photo by author.

According to the 17th century Jesuit chronicler, Bernabe Cobo, "There were different quipos for different kinds of things, such as for paying tribute, lands, ceremonies, and all kinds of matters pertaining to peace and war" (Cobo, 1979, 254). Another Jesuit writer, José de Acosta, stated that khipus were "registers made up of cords on which different knots and different colors signify different things... [W]hatever books can tell of histories and laws and

ceremonies and accounts of business is all supplied by the quipus so accurately that the result is astonishing.... There were different quipus, or strands, for different subjects, such as war, government, taxes, ceremonies and lands" (Acosta 2002, 342). Based on the accounts of these and other Spanish chroniclers, modern scholars often categorise Inka khipus into two basic types or genres: those encoding numerical and accounting information, and those containing historical and biographical narratives (see Urton 2017).

Spanish colonisers brought European scribal culture into the Andean highlands in the wake of the 1532 Iberian invasion (Burns 2010; Salomon and Niño-Murcia 2011; Rappaport and Cummins 2012), but alphabetic records never entirely displaced corded texts. For over 400 years under both Colonial and Republican rule, Andean peoples continued to create and curate khipus, although the extent and kind of khipu use varied by region.

The most common type of post-Inka khipu consisted of knotted cords for recording livestock and produce. Such khipus, made of plant or animal fibres, were utilised throughout Ecuador, Peru, and Bolivia. Although these herding and produce khipus were relatively simple, usually fashioned from a single cord, they signified meaning in many of the same ways as more elaborate khipus (Núñez del Prado 1950; Mackey 2002; Hyland 2014). These common methods of signification included knot location, cord colour, knot direction, and ply direction. These modern ethnographic herding khipus

appear to represent an unbroken tradition which descends directly from pre-Columbian livestock khipus (Brokaw 2010).

Complex post-Inka khipus have been reported from Bolivia (Pimentel 2005) and the Cuzco area (Puente Luna 2019). (1) However, the Central Peruvian Andes exhibited the greatest degree of khipu diversity in the Colonial and Republican eras. Single cord khipus in this region take a variety of forms and appear in multiple contexts beyond herding. Khipus in the Central Andean community of Rapaz, for example, consist of multi-coloured single cords onto which are tied tufts, tassels, and even cloth dolls (Salomon 2017). According to the village ritual experts, these khipus served as yearly calendars of past festivals. In the communities of Cuspón and elsewhere, female specialists still create funerary khipus which are bi-coloured, knotted single cords (Tun and Zubieta Núñez 2016); the signifying knots must be placed on specific locations on the corpse so the deceased can pass through to the next life (Vírhuez pers comm). Hybrid khipu/alphabetic texts known as "khipu boards" were made throughout the highlands until the early 20th century (Hyland, Ware and Clark 2014; Hyland, Bennison and Hyland in press). The khipu boards provided a list of villagers' names, with a single khipu cord hanging next to each name. In the Central Andes, the khipu cords on these objects consisted of sophisticated combinations of colour and thickness, encoding detailed information about each individual's obligations to community rituals.

Khipus that recorded information about the internal affairs of local kinship groups ("*ayllus*") have been found in the Santa Valley (17th century), Tupicocha (19th century), and Anchucaya (20th century) (Urton 2017; Medrano and Urton 2018; Salomon 2004; Hyland 2016). These "ayllu" khipus share a classic Inka structure: a top cord made of cotton or wool from which hang multicoloured and knotted pendant cords. The 18th century Collata khipus discussed below partake in this basic structure, but their pendants have a much greater level of complexity in terms of colour, fibre, and ply direction than most other khipus (Hyland 2017), with the possible exceptions of the Central Andean khipu boards and several highly colourful Inka khipus.

Although post-Inka khipus show certain innovations, such as having objects tied onto pendants and a proliferation of single cord variations, in general the degree of continuity between Inka and post-Inka khipus is striking. Archival testimony about the 20th century khipus of Anchucaya allowed the author to uncover the meaning of the two most common color patterns (color banding and seriation) on khipus (see Hyland 2016); Jon Clindaniel has demonstrated that the decipherment of these colour patterns holds true for Inka khipus from the core of the Empire (Clindaniel 2018). Likewise, the significance of features such as ply and knot direction appears to be consistent between Inka and post-Inka khipu cords (Hyland 2014; Urton 2017; Clindaniel 2018). In other words, despite some differences, there is a

high degree of stability in multiple aspects of khipu semiosis throughout the Inka, Spanish, and Republican eras.

3.0 SUBJECT INDICATORS -- "KAYTES"

3.1 Kaytes as subject indicators

In many instances, a needlework bundle known as a "kayte" is attached to one end of a khipu's top cord. Such bundles may be round or oblong, and may have unbound fibres coming out of the free end. In all "Inka style" post Inka assemblages of khipus -- Santa Valley, Collata, Tupicocha, and Anchucaya -- at least one khipu in the group bears a kayte on the end of its top cord. Similar needlework bundles also occur on Inka khipus.

The existence of these "ornamented knobs" on post-Inka khipus was first noted by anthropologist Frank Salomon in his study of the khipus of Tupicocha in Huarochiri Province, Peru (Salomon 2004: 153-155). There are today ten khipus in Tupicocha, each one belonging to a corporate kin group known as an "*ayllu*" and playing a ceremonial role in the annual investiture of the ayllu officers. Several of these khipus, which have been radiocarbon dated to the late 19th century (Salomon 2004:127-9), have elaborate needlework bundles on one end of the top cord. Villagers call these ornamented knobs "supports" ("*sostenes*"), referring to the fact that one grips the knob to hold the khipu. Salomon also heard them named "heads" ("*cabezas*") or "crowns" ("*coronas*") in reference to their position within each khipu. One elderly man

spoke of the knobs as "*pachacamantas*", or "around a hundred", which Salomon understood to refer to the ideal number of persons in each ayllu (Salomon 2004, 154). Community members can no longer interpret the khipus, and have no consensus about the significance of these ornamented bundles. Salomon has suggested that the kaytes might indicate either topographical features, like mountains, or temporal events like festivals. However, he considered the kaytes primarily as a subset of a larger group of markers that included tufts, brightly coloured threads, and objects tied anywhere else on the khipu, and his analysis focused almost exclusively on the possible significance of the non-kayte markers.

In fact, the recently discovered testimony of Mariano Pumajulka, a khipu expert from Anchucaya, a village near Tupicocha, presents new information about kaytes. In 1935 Mariano Pumajulka explained the role of kaytes to the Peruvian anthropologist and Huarochiri native, Julio Tello (Hyland 2016). Tello's life-long interest in khipus is attested to by the existence of over 1000 handwritten pages about khipus in his unpublished papers in the Tello archive in the University of San Marcos. Tello recorded extensive notes on his interview with Pumajulka, but never published this interview (Hyland 2016). In 2015, Mariano's elderly grandson, Mecias Pumajulka, confirmed to the author many aspects of his grandfather's testimony about khipus, including his description of the kayte.

According to Tello, Pumajulka stated:

"The khipu has a main cord that one begins to read from left to right, guided by the presence of a large button [*botón*] at one of the ends of the main cord. Sometimes it is a tassel with two or more colours, with wool or a tuft of hair that symbolised or denoted different subjects. In reality this button served as an introduction to reading the khipu, and as an indicator at the same time, showing the purpose and qualities of the subject or subjects registered on the khipu... this button is called the major kayte. On the other end, there is another smaller [button] that is called the minor kayte and indicates the end or appendix of the book." (2)

In Quechua, the word "kayte" or "cayte" means "wool thread, spool of wool, bundle of wool" (Lira, 1982 [1941]: 127), equivalent to the Spanish word "*ovillo*". Pumajulka also referred to the kayte repeatedly as a "button" ("*botón*"). In the 17th century, the Mercedarian friar, José Marin, employed the same word, "button", to describe the kaytes on khipus. Marin wrote that the people of Andajes, to the north of Huarochiri, wore a headdress composed "of many cords together, woven from diverse colours, and they ornament [the cords] on one side with a button ... and this button falls in the middle of the forehead; ... this serves them as their Quipos, which are the same as little books in other nations." (3) Throughout the colonial era, most buttons on clothing consisted of fabric balls stuffed with wool, linen scraps, or other

textiles, and were often wrapped or braided; in rural areas, such cloth buttons continued to be made into the early 20th century.

Pumajulka's testimony, as recorded by Tello, makes it clear that the kaytes were not merely decorative, but served two practical purposes: (1) to indicate the beginning of the khipu text ("*kayte mayor*") and the direction in which it was "read"; and (2) to signify the subject matter or genre ("*materia*") of the khipu. Therefore, the kayte on this khipu from Anchucaya would have indicated this khipu's subject matter (Figure 3). This particular khipu records the annual communal labour tasks performed by each member of the Suni-sika ayllu in the early 1930s (Hyland 2016). It is reasonable to suppose that this particular orange and yellow kayte indicates that this is an ayllu labour accounting khipu. This Anchucaya kayte bears a strong resemblance to a kayte found on one of the Santa Valley khipus, which likewise denoted the annual contributions by each member of an ayllu (Urton 2017; Medrano and Urton 2018), further strengthening this identification.



Figure 3. Major kayte on Anchucaya khipu (RT 21287). MNAAHP, Lima Peru.

Photo by author.

Another source of information on kaytes and their classification system is found in an obscure and often overlooked chronicle, *Copacabana de los Incas*, written by the Augustinian friar Baltasar de Salas in the 1620s (Viscarra 1901). Salas worked for years as a missionary in the Lake Titicaca region where he was able to observe local customs. He cited khipus ("kypus") throughout *Copacabana de los Incas*, reserving an entire chapter for what he called "Ovillos" or "Kcaytos" ("kaytes") -- the balls or spools of thread that were necessary for interpreting khipus (4). He explained that these objects were symbols ("*guiones*") created by wrapping brightly coloured yarns into a ball and, in some cases, adorning these balls with gold and silver threads

(Viscarra 1901, 326-327). Salas provided indigenous terms for different kaytes, most of which included the Aymara word "*chympu*", meaning "emblem or sign that allows people and things to be classified" (Manuel de Lucca, 287; see also Arnold and Ayca 2006, 194), a highly appropriate term for objects that indicated the khipu's subject matter. He referred to "chympus" explicitly as kaytes; for example, he explained that the "chympu" for "elderly women" ("*tayka*"), was a "purple kayte" ("*kayto morado*") indicating khipus that expressed the wisdom and commands of mothers (Viscarra 1901, 329).

Salas described kaytes in general by the Aymara phrase: "Zuma kkepa" or "Beautiful cradle" (Viscarra 326). In the 17th century, the word "kkepa" referred specifically to the cradle in the middle of a sling for holding the slingstone (Bertonio 1612, '*quipa*'). (5) The cradles on Andean slings display a variety of construction techniques -- such as braiding, warp-wrapping, and tapestry weaving (Cahlander 1980) -- that are very similar to that of kaytes. Like kaytes, sling cradles often have colourful patterns and, in the case of ceremonial dance slings, may incorporate tassels and tufts of wool. Instead of slingstones, the "kkepa" on the khipu carried symbols pertaining to the classification of the khipu.

The Andean sling tradition is the most "long-term, widespread and diverse" in the world, with "the most elaborate, colorful, decorative and largest slings" (York and York 2011, 75-76). Sling manufacture continues to be considered an exclusively male occupation in the Andes, one that is highly

skilled. Men not only make slings but also spin their own thread so that it has the distinctive qualities necessary for braided slings (Zorn 1982). Jeffrey Splitstoser has argued that there existed "formal and structural" relationships among slings, wrapped batons, heddle samplers ("*musa waraña*"), and wrapped Middle Horizon khipus (Splitstoser 2014, 61-63). Salas' use of the Aymara term for sling cradles to describe kaytes suggests a formal and possibly a symbolic link between the two types of textile objects.

According to Salas, there existed six major types of kaytes, each signalling a different khipu classification, which were subdivided in turn (Viscarra 1901, 326-335):

- I. For communication with oracles or divine beings, including prayers;
- II. For communication with the dead, including songs in honour of the dead, and mourning the death of the King;
- III. For records of law, including religious laws, and how to conduct rites and ceremonies;
- IV. For the worship of the dead, including songs celebrating military victories;
- V. For chronological khipus, including all numerical khipus, and historical khipus recording notable events; this is the largest category;
- VI. Obituary khipus, including khipus that are worn on the body and recount the lives and deeds of venerable men and women.

The final class of obituary khipus recalls the funerary khipus of Cuspón and suggests that such khipus may once have contained information about the life of the deceased. Salas's typology contrasts sharply with the division into accounting and narrative khipus that guides much of current khipu research. In fact, one of the most intriguing aspects of Sala's kayte typology is that he placed accounting khipus in the same division with chronological/historical khipus, seeing these as inherently similar, presumably because they both focused on numerical data. He also describes several different kinds of kaytes containing gold and silver thread. Kaytes with gold and silver thread could indicate khipus that recorded songs and prayers to divine beings known as *huacas*, or that boasted of military victories, or that marked the coronation of kings. Salas's presentation of khipu typology provides new insights into how these subject indicators contributed to the khipu interpretation.

3.2 Inka era kaytes

Needlework bundles like those described by Pumajulka and Salas occur on the ends of many Inka khipus as well. For example, in the Berlin Ethnology Museum, at least four Inka khipus from the site of Pachacamac on the Peruvian coast bear large kaytes with sophisticated braiding on one end of their top cord (see VA42544; VA42597; VA37857; and VA42599; the first three of these kaytes are oblong, while the last one is round). Seven Inka khipus

with kaytes in the Berlin museum were excavated in Ica/Pisco (VA16135a; VA16136; VA16138; VA16141; VA47084; VA47126; VA47122ab), one is from an archaeological site near Lima (VA37857) while other khipus with kaytes lack any provenance. A purportedly Inka khipu (PAM 1326) in the Museum of Cultures (MUDEC) in Milan possesses an unusual kayte in which the final portion of the top cord is wrapped with salmon coloured thread before ending in a braided tassel (Milillo 2020, 73-87).

The 17th century Andean chronicler, Guaman Poma, illustrated Inka khipus with bulbous, tufted kaytes on the ends of the top cords, attesting visually to the existence of khipu kaytes (eg Guaman Poma 1615, 362-3, the Guaman Poma website, Det Kongelige Bibliotek, Copenhagen). In general, Inka kaytes have fewer colours than post-Inka kaytes, although the warp-wrapping, braiding and/or weaving on Inka kaytes is often highly elaborate. Both Carmen Arellano (1999) and Carlos Radicati speculated that such markers "would have served to easily identify the quipu in its respective archive or repository" (Radicati 2006, 334) (6), but neither presented any evidence to support this suggestion. Nor did either scholar hypothesise about the nature of this proposed identification; that is, whether the marker indicated authorship, provenance, subject matter, or some other significant quality.

4.0 THE SILVER THREADED KAYTE OF COLLATA, PERU

4.1. The 18th century khipus of Collata

For centuries, the community of San Juan de Collata in Huarochiri Province has guarded two khipus in its sacred archive -- an antique wooden chest hidden in a secret underground chamber in the church sacristy. The archive contains over 100 manuscripts stored in specially prepared goat-hide folders; for many years the two khipus lay on top of the documents in an open plastic bag. The khipus have been moved to a professionally curated storage cabinet, prepared by Zoila Forss Crespo Moreyra, kept in a secret location.

Village leaders invited the author to study the khipus in 2015 and 2019. Each khipu consists of a top cord from which hang multicoloured pendant cords. Khipu A has 295 pendants of varying lengths, from nubs a millimeter long to cords over 48 centimeters in length (Figure 4).



Figure 4. Close up of the pendant cords on Khipu A, 2019. Photo by author.

Khipu B has 197 pendants, but shows evidence of deterioration and appears to be missing cords (Figure 5).



Figure 5. Khipu B, San Juan de Collata 2019. Photo by author.

When a man accepts responsibility for a major village festival for the first time, he is shown the archive, which was kept secret from the other community members until recently. Senior men tell initiates that local Andean leaders created the khipus as letters ("*cartas*") during their wars on behalf of the Inka in the late 18th century. Khipu literacy appears to have been widespread in Huarochiri among Andean peoples during this period, when native insurgents created khipu missives as a way of ensuring secrecy and affirming cultural legitimacy (Salomon 2004; Szeminski 1987). Spanish chroniclers claimed that Inka runners, known as *chaskis*, carried khipus as letters during the Inka period (Conklin 2002: 54-55). However, the khipus of Collata are the first khipus ever identified as epistles, in this case by the descendants of their creators.

Although it is believed that most khipus were made of cotton, the pendants of the Collata khipus were spun from fibres of six different animals - - vicuña, deer, alpaca, guanaco, and viscacha -- according to the herders assigned to assist me. The herders, who carefully examined each pendant to determine the fiber, insisted that the fibre type conveyed meaning, referring to the khipus as "a language of animals". Many pendants contained fibres of two animals, and of multiple colours as well, including yellow, red, blue, green, white, black, gray, purple, pink, orange, golden-brown, light brown, medium brown and dark brown. One of the most remarkable features of the Collata khipus is that they appear to represent a logosyllabic form of writing, with at least some pendants indicating syllables. According to Collata oral history, Khipu A was created by the head ("*jefe*") of the leading village ayllu, known as Alluka. An analysis of the khipu based on these local traditions reveals that the final three cords of Khipu A represent the three syllables of "Alluka", while cords at the end of Khipu B phonetically indicate "Yakapar", the name of the leading ayllu in the nearby community of San Mateo de Otao (for a fuller discussion, see Hyland 2017).

It is unclear whether the Collata khipus' phoneticism is a colonial development spurred by contact with alphabetic writing, or if it echoes possible phoneticism in pre-Columbian khipus. If the former, it nonetheless reflects a tradition spanning four centuries, worthy of regard. If the latter, it opens up the prospect that pre-Columbian khipus may have phonetic

elements. Khipu phoneticism may also be a regional rather than a temporal phenomenon associated primarily with the Central Andes. It is notable that the Collata khipus' phoneticism is linked to the use of diverse animal fibres; there are indications that some of the Inka khipus believed to be made entirely of cotton may contain pendants created from the fibres of camelids, deer, and other creatures.

The Collata khipus served as a form of clandestine communication during the 1783 revolt of Felipe Velasco Topa Inca Yupanqui (Hyland 2017; Sala i Vila 1995; "Levantamiento de Topa Inca" 1783; Walker 2014). Felipe Topa Inca, a Lima artisan who hailed originally from Cuzco, claimed royal Inka status through his father as a member of the imperial lineage ("*panaca*") in Cuzco descended from the Inka Emperor Topa Inca Yupanqui. He also insisted that he was a maternal cousin to the Inka rebel, Tupac Amaru, whose revolt convulsed the highlands from 1780 until the latter's capture and execution in 1781 (Walker 2014). Furthermore, Felipe declared that Tupac Amaru's death had been faked by Jesuits who secretly crowned Tupac Amaru as Emperor. The Emperor, he continued, was hiding in a jungle fortress guarded by 4000 lowland troops, and had chosen Felipe to continue the rebellion against Spanish Colonial rule. During the revolt, Felipe boasted to friends in Lima that he and his followers "had a secret [form] of communication in various parts, and that did not use ink, but [consisted of]

imperial letters that were read only at night" (Testimony of Andrés Mendigure, 1783) (8).

In June, 1782, Felipe Topa Inca planned the rebellion at the home of his General, Ciriaco Flores, a farmer from the Yakapar ayllu in San Mateo de Otao. During this period Ciriaco, who was illiterate in Spanish alphabetic writing, made letters -- referred to as "*cartas*" and "*recaudos*" -- that he sent to leaders in other villages, informing them that the Inka emperor had returned and urging them to join the revolt ("Testimony of Ciriaco Flores", Cuaderno 2, 1783). The following year in late January and early February, Felipe roused his supporters in Collata, where the mayor, Antonio Pascual, from the Alluka ayllu, swore fealty to the rebel ("Testimony of Lorenzo Lopez" 1783). Pascual sent a letter to the mayor of neighbouring Jicamarca, telling him and his men to come to Collata immediately to give homage to the new King. According to witnesses, however, neither the mayor of Jicamarca nor any of his officials could read or write alphabetic script. Presumably the "letters" referred to in the prisoners' testimony were related to the khipu epistles of Collata; this appears especially to have been the case with Khipu B, which concludes with "Yakapar", the name of Ciriaco's ayllu. What can an analysis of the silver threaded kayte on khipu B reveal about the subject matter of this khipu, and can such an examination shed light on whether Khipu B could be one of the "letters" created by Flores in June 1782?

4.2. The silver threaded kayte

There are two major kaytes on Khipu B. The first is composed of a brush of bright red deer hair wrapped in light brown braided vicuña fibers (3.8 cm long). The second major kayte (5.1 cm long) consists of a cone filled with animal fibres, wrapped in a zigzag patterned braid of silver metallic thread with three bands of red silk. A round ball is attached to the end of the kayte; the ball is wrapped with silver metallic thread around its the base, with threads of red silk and brownish-gray alpaca coming out of the upper half (Figures 1 and 6). A minor kayte -- a small round object with silver threads braided around the base and topped by soft brown alpaca fibres -- marks the end of the khipu (Figure 6).



Figure 6. The minor kayte on Khipu B, indicating the end of the khipu, 2019.

Note the braiding of the silver threads along the base. Photo by author.

In the seventeenth century, the Mercedarian chronicler, Martín de Murúa, wrote that the Inkas made special royal khipus using gold and silver (Radicati 2006, 69). If this were the case, it is likely that the Incas would have sewn gold and silver wires or flat discs ("*chaquira*") onto the kaytes. Salas described multiple colonial kaytes decorated with gold and silver thread, including those that indicated khipus for recording the coronation of kings, and announcing military victories and wars. Such indicators of imperial coronations or military campaigns would have been highly relevant to the subject of the Collata khipu. Both Murúa and Salas emphasised that gold and silver were used for khipus with divine and/or royal significance. The Collata major and minor kaytes appear to be wrapped with silver thread, which would make this the only khipu known to incorporate gold or silver. The author has not received permission from the Collata authorities to test the threads, so it cannot be determined for certain yet that it contains silver. However, its tarnish pattern matches that of silver thread from this period, which typically included a high percentage of alloys so that the thread would not turn black (Járó 2003).

During the Inka era, gold and silver were numinous materials considered especially well suited to be "vehicles for and representations of the divine" (Floyd 2016). Because these precious metals possessed an essence that made them the ideal medium for representing and communicating with divine

beings, they were particularly appropriate for the ruling emperor and his consort, who likewise enjoyed a numinous and sacred status. Throughout the colonial period, members of the Inka aristocracy favoured the use of silver and gold threads in ceremonial garments as an expression of their royal Inka ancestry (Phipps 2010). The apparent use of silver in the Collata kayte underscores this khipu's royal status, in keeping with a khipu about the Emperor Tupac Amaru and his emissary, Topa Inca.

The technique of creating metallic threads such as those found in the Collata kayte was European, imported to the Andes during the colonial period. To make a silver thread of the kind used in this kayte, a thin flat silver strip was wrapped around a core yarn of silk, linen, cotton or wool. Because the silver sheathing has been partially rubbed away on the central body of this kayte, the internal portion of the threads is visible, revealing what seems to be a core of "linen or another bast fiber" (Phipps, pers comm July 1 2019). Phipps has documented how silver and silver gilt threads frequently were woven into traditional Andean male and female garments by Inka elites in the seventeenth and eighteenth centuries. As she writes, "The incorporation of precious foreign materials, such as silk and metallic threads, into the indigenous textile tradition thus served to heighten the symbolic power as well as the beauty of individual garments" (Phipps 2010, 5). Silver and gold thread embroidery, known as "goldwork", featured as well on ecclesiastical vestments during this period (Heard 2016). The silver metallic threads, as well

as the red silk ones, on this eighteenth century kayte would have enhanced the khipu's importance as well as its allure.

As an artisan who specialised in creating and repairing religious imagery, Felipe Topa Inca was familiar with the silver and silk threads used on the kayte. In his workshop in Lima, he possessed the tools and materials -- such as special needles, thread, ruffles, velvet, silk, and satin -- to adorn the saints statues which he made and sold. At the time of his arrest, for example, his workshop contained a statue of Our Lady of the Rosary whose case was garnished with a trim made of silver thread ("Inventory of Manuela Marticorena's store and workshop" 1782). The religious items that he crafted for the shop sold well within the competitive Lima market, attesting to his high degree of skill. The kayte's form is similar to that of European tassels used to decorate colonial religious items; however, the presence of alpaca fibre shows that the kayte was made in Peru.

The silver threads were wrapped around the kayte with considerable skillfulness. The kayte's creator used a traditional Andean form of braiding with multiple threads to produce a round cross-section. (7) D'Harcourt notes that this type of complex braiding to create cords with round cross sections was typical in pre-Columbian slings, and that proficiency in this art continued into the early 20th century (d'Harcourt 1962, 83-93; see also Cahlander 1980). According to Silverman, the zigzag pattern seen in the Collata khipu specifically indicates Inka nobility (Silverman 2008, 157). During the Inka

Paccha ceremony, the Emperor poured corn beer through a vessel with a zig-zag channel (see "Paccha", Museum of Fine Arts, Houston, 91.1552), with the zig-zag representing his imperial status.

A similar zigzag border decorates Emperor Topa Inca Yupanqui's tunic in his depiction with a colonial heraldic coat of arms granted to his descendants in Cuzco. Felipe Topa Inca, a member of Topa Inca Yupanqui's lineage, carried the description and image of this heraldic device on his person, where it was discovered after his capture ("Inventory of papers" 1783). Zigzags or chevrons appear in other colonial depictions of the Inca Emperor Topa Inca Yupanqui, most notably in Murúa's seventeenth century painting of the ruler with three large red chevrons on his tunic, attributed to the Andean artist Guaman Poma (Murúa, 2008, f. 44v). The red zigzag stripes on Topa Inca Yupanqui's tunic are echoed in the three crimson zigzag stripes on the kayte. In other colonial images of Emperor Topa Inca Yupanqui, such as Guaman Poma's line drawings (Guaman Poma 1615, 110-111) and the Brooklyn Museum's mid-18th century portrait, zigzags appear on the ruler's shield (Brooklyn Museum 1995.29.11). We see, therefore, that there are multiple, reinforcing indicators on the kayte that this khipu concerns imperial matters. The presence of what appears to be silver as well as a zigzag design signifies Inka royalty. Additionally, zigzags may denote the Emperor Topa Inca Yupanqui specifically along, perhaps, with other representatives of the upper Hanan moiety to which the emperor belonged.

Originally, before the silver sheathing on the thread wore away to reveal its creamy core, the most notable other colour on the Collata kayte was the deep crimson found on the zigzag stripes, on the top of the ball, and in the base, where the red mingles with brownish-grey alpaca. According to the colonial chronicler, Antonio de la Calancha, crimson on khipus signified the Inka Emperor (Radicati 2006, 79). In the papers that Felipe carried with him, the description of Emperor Topa Inca's heraldic shield referred specifically to the significance of a "red tassel" as the symbol of Inka kingship ("Inventory of papers" 1783). (9) The artist Topa Inca would have been well aware of the colour red's imperial symbolism; it seems likely that he incorporated red threads into the Collata kayte to reinforce the royal nature of the khipu's message.

When it was new, the Collata kayte must have shimmered with an almost unearthly beauty and significance. Wax droplets scattered across the khipus suggest that these objects were "read" and displayed by flickering candlelight. Helen McCook, one of Britain's leading experts on goldwork, has described how metallic threads, in contrast to silken embroidery, "create a delicate shift in the way the textile reflects the light and can alter it from simply being a flat embroidery to a piece which interacts with the light. The light -- and therefore the viewer's eye -- should dance across the surface" (McCook 2012, 8). The gleaming silver threads braided into fine zigzags, broken by strips of crimson and topped by a dangle of flowing red threads

emphasised that this delicate epistle concerned the Emperor and his chosen emissary. The combined use of silver threads, of zigzags, and of crimson revealed the divinely royal purpose of these cords. This analysis of the silver threaded kayte demonstrates that the khipu's subject matter almost certainly concerned the highest level of Inka royalty, and quite possibly the descendant of Emperor Topa Inca Yupanqui specifically. It certainly corresponds to what we know about the supposed khipu "letters" that Ciriaco Flores created and sent in June 1782, announcing the alleged survival of Emperor Tupac Amaru and the arrival of his imperial emissary.

5.0 KAYTES, MUTABLE MEANINGS, AND KHIPU SEMIOSIS

This method for identifying the meaning of a kayte by analysing a combination of ethnographic and archival data can be applied to other colonial and modern kaytes, with the goal of slowly building a lexicon of signifiers through trial and error. The meanings on Inka era kaytes can be revealed through a similar multimodal approach, one that combines a study of the kaytes' physical correlations (such as the relationship between kayte form and pendant color patterns), analogies with post-Inka kaytes, and, when possible, associations with grave goods (see Ramos Vargas 2016). Given the continuity between Inka and post-Inka khipus, it is reasonable to expect that Inka kaytes would have signified genre as their later descendants did,

although the particular subject matters, materials, and the designs by which they were indicated may have changed over time.

Urton and Brezine have stated that "perhaps no challenges are more fundamental and daunting [to the study of khipus] than those concerning typology" (Urton and Brezine 2013). Urton and Brezine have made important progress in analysing the formal characteristics of khipus in Harvard's khipu database, while Medrano has examined the typology inherent in transcriptions of khipu testimony in colonial Peruvian courts (Medrano 2019), but the identification of typological distinctions on actual khipus has eluded scholars. Understanding kaytes as subject markers provides a starting point for determining such emic classifications.

Urton has theorised that khipus function as a type of flow chart, with multiple levels of information indicated through a series of choices at each level (Urton 2003). The first signs that are 'read' are the most general, signalling the genre or subject of the khipu. The interpretation of successive elements, such as colour, varies according to the genre and to the information in the higher levels -- in other words, meanings are mutable depending upon the context of the sign. For example, knot direction may indicate moiety affiliation on one khipu (Hyland, Ware and Clark 2014), whereas on another it signals a cow's milking status (Hyland 2014), depending on the context of the sign within the khipu. This understanding of khipu symbolism fits with Mannheim's "allocentric" approach to Quechua "ontology", in which

perceptions are attained relationally, rather than in a fixed manner (Mannheim 2019).

Many indicators of significance, such as knot and ply direction, are binary, while others, such as colour, may signal one of a range of multiple possibilities. (10) Numerous studies have found evidence in support of Urton's theory of khipus as "flow charts" with binary signifiers (Clindaniel 2019; Medrano and Urton 2018; Hyland 2016; Hyland 2014; Hyland, Ware and Clark 2014). Pumajulka's assertion that kaytes indicated a khipu's genre corroborates Urton's theory of khipu semiosis by demonstrating how the most general level of information may have been encoded.

It is worth noting that only one of the six Santa Valley khipus analysed by Urton has a kayte; the other five khipus lack this particular indicator, presumably because the kayte on the largest khipu was understood to denote the subject of the entire set. While kaytes appear on many Inka and post-Inka khipus, a large percentage of khipus lack them. Some of the surviving khipus without kaytes may come from sets of khipus in which only one bore an identifying introductory bundle. It may also be the case that the primary cord contains information about the khipu's genre. However, for many khipus it appears that their location also may have indicated their subject matter. For example, Alejandro Chu, Urton, and Clindaniel have studied khipus from the site of Inkawasi where each khipu was discovered atop a storage pit of a particular crop, such as chili peppers (Urton 2017; Clindaniel 2019). The

location of each khipu indicated that it recorded information about the transfer and storage of the associated crop. During the Inka era, specialists stored khipus in archives which presumably were arranged according to the subject matter of the different khipus; the placement of the khipu within the archive may have indicated its general subject. It is as yet unclear under which circumstances some khipus would be given kaytes and not others.

6.0 CONCLUSIONS

In 2007, Eric Demaine, one of the world's leading computer scientists, led a research group at MIT that attempted to decipher khipus by applying computational techniques to Harvard's Khipu Database (projects.csail.mit.edu/khipu/). The MIT project did not succeed for numerous reasons; however, a contributing factor for their lack of success was a failure to appreciate the central role of kaytes in khipu decipherment. Because the meaning of variables changes according to the type of khipu, it is necessary to first understand Andean khipu typology, which is most clearly expressed in the kaytes, before the computational analysis of large datasets can make progress in khipu decipherment.

The analysis presented here demonstrated how a multimodal methodology to examine a specific kayte can reveal the subject matter indicated by the associated khipu. Scholars need to develop a catalogue of kayte and primary cord descriptions which can be analysed for meaning

according to this multimodal methodology. This research should be augmented by gathering data on the construction techniques, designs, and symbolism of Andean slings. Highly sophisticated and heavily decorated, Andean slings apparently have a close structural relationship with kaytes and may help to reveal the significance of kayte designs, materials, and colours (eg Splitstoser 2014).

The past twenty years have seen tremendous advances in our understanding of khipus, in which Urton's "flow chart" theory of hierarchical levels of significance within the khipu has been confirmed by recent studies. Pumajulka's and Salas's testimony provides compelling evidence that kaytes functioned as subject indicators, a key feature of khipu semiosis whose understanding is crucial to futhering khipu decipherment.

NOTES:

1. The Vatican Ethnology Museum possesses a modern khipu (MV 107759) sent to Pope Pius XII in the 1920s from the Cuzco region. This khipu awaits further study; however, an initial survey reveals several unusual features, including bright yellow and pink colouration, non-standard hitches of the pendants to the top cord, and an absence of the flemish or long knots usually found on Inka khipus.

2. "El kipu tenia un cordón matriz que se comenzaba a leer de izquierda de derecha, guiado por la presencia de un botón grande en uno de los extremos de este cordón matriz. Unas veces era una borla con dos o más colores, con lana o mechoncito de pelo que simbolizaban o recordaban diferentes materias. En realidad este botón servía como introducción a la lectura del kipu o indicador y señalaba al mismo tiempo el propósito y la calidad de la materia o materias registradas en el kipu... este botón se denomina kayte mayor. En el otro extremo hay otro menor, que se llama kayte menor y significa el término o apéndice del libro". ("Información suministrada por Mariano Pomajulka" and "Kipu de Anchucaya", in the section "Kipus", Archivo Tello).

3. " de muchos cordones juntos, tejidos de diversos colores, i los ciñen por una parte con un botón ... i este botón cae sobre la frente i en medio de ella... les servían de Quipos, que es lo mesmo, que en las demás naciones los libritos"; Rocha, 1681, f. 55ab. (In the 1988 edition of Rocha's work, Marin is misspelled Martín).

4. Salas believed that sons of the biblical patriarch Noah had populated the Andes, and that the Aymara language represented the original Adamic tongue spoken in the Garden of Eden. His biblical interpretations of Aymara language and culture, his abstruse writing style, and bizarre additions to the text in 1888

by someone named Father Pandolffi, have led many scholars to view Salas's work with skepticism. Yet as a missionary among Aymara people, Salas did witness daily life and ritual activities, including the use of khipus. To fully appreciate the significance of his chapter on "Ovillos", it is essential to pay close attention to the indigeneous titles and phrases in the text. Some scholars have assumed that Salas's term "ovillos" referred to the entire khipu rather than to the needlework bundles found on some primary cords. However, Salas is clear that "ovillo" is synonymous with "chympu" (meaning a sign that allows things to be classified) and with "kayte", but not with khipu, which he called "kypu".

5. Slings generally were wrapped around the head when not in use, with the cradle on the forehead (Splitstoser 2014). This is how khipus apparently were worn in Andajes, with the kaytes in the middle of the forehead.

6. "devían servir para identificar fácilmente el quipu en los respectivos archivos o repositorios" (Radicati 2006, 334).

7. I am indebted to Dr Christine Lee for identifying the braiding technique used to create this kayte.

8. "*que tenían comunicación secreta en diversas partes, y que no gastaban tinta, sino carta blanca que sólo se leía de noche*" (Testimony of Andrés Mendigure, 1783). Mendigure, who recounted this information under interrogation, did not participate in the 1783 revolt and appears to have known nothing about this communication system other than what Felipe told him. In the 18th century, "*blanca*" served as a common adjective to denote anything imperial or, relatedly, anything made of silver. The association derived from European heraldry, where a white tincture represented imperial silver. Drops of beeswax on the Collata khipus indicate that they were read at night by candlelight.

9. "*Una borla colorada que solía tener por armas Atavalipa vuestro hermano*". This refers to the famous *maskapaycha* that was considered to serve as the ruler's "crown" in the Inka Empire.

10. If rebus symbols exist in Inka khipus, it would presumably be in instances where the possible meanings of a symbol are multiple rather than binary.

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References Cited:

Acosta, José de. [1590] 2002. *Natural and Moral History of the Indies*. Edited by Jane Mangan and translated by Frances López-Morillas. Duke University Press.

Archivo Tello, Centro Cultural de la Universidad de San Marcos, Lima, Peru.

Arellano, Carmen. 1999. "Quipu y tocapu: sistemas de comunicación inca". In: Pease, F et al (eds). *Los Incas: Arte y símbolos*. Lima, Peru: Banco de Crédito del Perú, 214-261.

Arnold Denise and Elvira Ayca. 2006. "On drinking cups and constellations" *Journal of Latin American Cultural Studies*, 15(2), 183-213.

Bertonio SJ, Ludovico. 1612. *Vocabulario de la lengua aymara*. Chucuito, Peru: Francisco del Canto.

Brokaw, Galen. 2010. *A History of the Khipu*. Cambridge: Cambridge University Press.

Burns, Kathryn. 2010. *Into the Archive: Writing and Power in Colonial Peru*. Durham: Duke University Press.

Cahlander, Adele. 1980. *Sling Braiding of the Andes* (Weavers Journal Monograph IV). St Paul, MN: Dos Tejedores.

- Clindaniel, Jon. 2018. *Toward a Grammar of the Inka Khipu: Investigating the Production of Non-numerical Signs*. Doctoral Thesis, Department of Anthropology, Harvard University.
- Cobo, Bernabe. 1979 [1653]. *Inca Religion and Customs*. Translated by Roland Hamilton. Austin TX: University of Texas Press.
- Conklin, William. 2002. "A Khipu information string theory". In: *Narrative Threads*. J Quilter and G Urton, eds. Austin: University of Texas Press, 53-86.
- D'Harcourt, Raoul. 1962. *Textiles of Ancient Peru and their Techniques*. University of Washington Press.
- Floyd, Emily C. 2016. "Medium Study-- Tears of the Sun: The Naturalistic and Anthropomorphic in Inca Metalwork". *Conversations: An Online Journal of the Center for the Study of Material and Visual Culture of Religion* (mavcor.yale.edu).
- González Holguín, Diego. 1608. *Vocabulario de la lengua general de todo el Peru llamada lengua Qquichua, o del Inca*. Lima.
- Guaman Poma, Felipe Ayala de. 1615. *Nueva corónica y buen gobierno*. Digital online version, Det Kongelige Bibliotek, Copenhagen, Denmark. www.kb.dk/permalink/2006/poma.
- Heard, Kate. 2016. "Ecclesiastical Embroidery in England from 1350 to the Reformation", IN: *English Medieval Embroidery: Opus Anglicanum*. Ed

- by Clare Brown, Glyn Davies and MA Michael. New Haven CT: Yale University Press, 77-90.
- Hyland, Sabine. 2014. "Ply, markedness and redundancy: New evidence for how Andean khipus encoded information" *American Anthropologist*, 116(3): 643-648.
- Hyland, Sabine. 2016. "How khipus indicated labour contributions in an Andean village: An explanation of colour banding, seriation and ethnocategories". *Journal of Material Culture* 21(4), 490-509.
- Hyland, Sabine. 2017. "Writing with Twisted Cords: The Inscriptive Capacity of Andean Khipus", *Current Anthropology*, 58(3): 412-419.
- Hyland, Sabine, Gene Ware and Madison Clark. 2014. "Knot direction in a Khipu/alphabetic text from the Central Andes" *Latin American Antiquity*, 25(2): 189-197.
- Hyland, Sabine, Sarah Bennison and William P Hyland. In Press (2021). "Khipus, Khipu Boards and Sacred Texts: Towards a Philology of Andean Knotted Cords", *Latin American Research Review*, vol 56, no 2.
- "Inventory of Manuela Marticorena's store and workshop". 1783. Cuaderno 2, Lima 1047, *Archivo General de las Indias*, Seville.
- "Inventory of papers on Felipe Velasco Topa Inca Yupanqui", 1783. Cuaderno 1, Lima 1047, *Archivo General de las Indias*, Seville.

- Járó, M. 2003. "On the History of a 17th century nobleman's dolman and mantle based on the manufacturing techniques of the ornamental metal threads", *Ars Decorativa* 22, 27-57.
- "Levantamiento de Topa Inca en Huarochirí". 1783. Lima 1047. Three notebooks in the *Archivo General de las Indias*, Seville, Spain.
- Lira, J. 1982 [1941]. *Diccionario kkechuwa-español*, 2nd edition. Bogotá: Secretario Ejecutiva del Convenio 'Andrés Bello'.
- Lucca D, Manuel de. 1983. *Diccionario Aymara-Castellano, Castellano-Aymara*. La Paz, Bolivia: Comisión de Alfabetización y Literatura en Aymara.
- Mackey, Carol. 2002. "The Continuing Khipu Tradition" In: *Narrative Threads*, ed by J Quilter and G Urton. Austin TX: University of Texas Press.
- Mannheim, Bruce. 2019. "Ontological Foundations for Inka Archaeology", In: *Andean Ontologies*, M C Lozada and H Tantaleán, eds. Gainesville: University of Florida Press.
- McCook, Helen. 2012. *Goldwork*. London: Royal School of Needlework, Search Press.
- Medrano, Manuel. 2019. *Toward a Khipu Transcription "Insistence": A Corpus Based Study of the Textos Andinos*. Honours Thesis, Department of Mathematics, Harvard University.

- Medrano, Manuel and Gary Urton. 2018. "Toward the Decipherment of a Set of Mid-Colonial Khipus from the Santa Valley, Coastal Peru", *Ethnohistory*, 65(1): 1-23.
- Melo, Sebastian. [1761] 2012. *El Diario histórico de Sebastián Franco de Melo*. Preliminary study and edition by Karen Spaulding. Lima: Centro Peruano de Estudios Culturales.
- Milillo, Lucrezia. 2020. *Andean Khipus in Italian Collections: Morphological Description and Ethnohistorical Investigations*. Unpublished Masters Thesis, University of Bologna.
- Murúa, Martín de. [c 1600] 2004. *Códice Murúa: historia y geneología de los reyes incas del Perú*. Study by Juan Ossio. Madrid: Testimonio Campaña Memorial.
- Murúa, Martín de. [c 1600] 2008. *Historia General del Piru: Facsimile of J Paul Getty Museum Ms. Ludwig XIII*. Los Angeles: Getty Research Institute.
- Núñez del Prado, O. 1950. *El Khipu Moderno*. Cuzco, Peru: SCC.
- Phipps, Elena. 2010. "Woven Silver and Gold: Metallic Yarns in Colonial Andean Textiles". *Notes in the History of Art*, 29 (3), 4-11.
- Pimentel, Nelson. 2005. *Amarrando colores: la producción del sentido en khipus aymaras*. La Paz, Bolivia: CEPA, Latinas Editores.
- Puente Luna, J. C. de la. 2019. "Calenders in Knotted Cords: New Evidence on How Khipus Captured Time in the Andes", *Ethnohistory*, 66(3): 437-464.

- Radicati di Primeglio, Carlos. 2006. *Estudios sobre los quipus*. Edited and with an introduction by Gary Urton. Lima: Universidad Nacional Mayor de San Marcos.
- Ramos Vargas, Mario. 2016. "Quipus y quipucamayos en el registro arqueológico: una evaluación desde Huaycán de Cieneguilla" *Cuadernos del Qhapaq Ñan*, 4 (4), 36-65.
- Rappaport, Joanne and Tom Cummins. 2012. *Beyond the Lettered City: Indigenous Literacies in the Andes*. Durham: Duke University Press.
- Rocha, Diego Andrés. 1681. *Tratado Unico y Singular del Origen de los Indios Occidentales del Piru, Mexico, Santa Fé y Chile*. Lima: Joseph Contreras.
- Sala i Vila, Núria. 1995. "La rebelión de Huarochiri de 1783". In: *Entre la retórica y la insurgencia*. Charles Walker, ed. Cuzco, Peru: CBC; 273-308.
- Salomon, Frank. 2004. *The Cord Keepers: Khipus and Cultural Life in a Peruvian Village*. Duke University Press.
- Salomon, Frank. 2017. *At the Mountain's Altar*. Routledge.
- Salomon, Frank and Mercedes Niño-Murcia. 2011. *The Lettered Mountain: A Peruvian Village's Way with Writing*. Durham NC: Duke University Press.
- Silverman, Gail P. 2008. *A Woven Book of Knowledge: Textile Iconography of Cuzco, Peru*. Salt Lake City: University of Utah Press.

- Splitstoser, Jeffrey C. 2014. "Practice and Meaning in Spiral Wrapped Batons and Cords from Cerrillos, a Late Paracas Site in the Ica Valley, Peru", IN: *Textiles, Technical Practice, and Power in the Andes*. Edited by Denise Arnold and Penelope Dransart. London: Archetype Publications.
- Szeminski, Jan. 1987. "Why Kill the Spaniard?" In: *Resistance, Rebellion, and Consciousness in the Andean Peasant World*. S Stern, ed. Madison: University of Wisconsin Press, 166-192.
- "Testimony of Andrés Mendigure". 1783. Cuaderno 3, Lima 1047, *Archivo General de las Indias*, Seville, Spain.
- "Testimony of Ciriaco Flores". 1783. Cuaderno 2, Lima 1047, *Archivo General de las Indias*, Seville, Spain.
- "Testimony of Felipe Velasco". 1783. Cuaderno 2, Lima 1047, *Archivo General de las Indias*, Seville, Spain.
- "Testimony of Lorenzo Lopez". 1783. Cuaderno 2, Lima 1047, *Archivo General de las Indias*, Seville, Spain.
- Tun, Molly and Filomeno Zubieta Núñez. 2016. "Quipus funerarios y tributarios de Cuspón y Chiquián". *Arqueología y Sociedad* 31: 403-421.
- Urton, Gary. 2003. *Signs of the Inka Khipu: Binary Coding in the Andean Knotted-String Records*. Austin: University of Texas Press.
- Urton, Gary. 2017. *Inka History in Knots: Reading Khipus as Primary Sources*. Austin, TX: University of Texas Press.

- Urton, Gary and Carrie Brezine. 2013. "Khipu Typologies" In: *Their Way of Writing*, E H Boone and G Urton, eds. Cambridge, MA: Harvard University Press.
- Vírhuez, Ricardo. 2017. Personal communication.
- Viscarra, J. 1901. *Copacabana de los Incas*. La Paz, Bolivia: Palza Hermanos.
- Walker, Charles. 2014. *The Tupac Amaru Rebellion*. Cambridge MA: Harvard University Press.
- York, Robert and Gigi York. 2011. *Slings and Slingstones: The Forgotten Weapons of Oceania and the Americas*. Kent State University Press.
- Zorn, Elayne. 1982. "Sling Braiding in the Macusani Area of Peru". *Textile Museum Journal*, 19-20, pp41-54.