

How *kipus* indicated labour contributions in an Andean village: An explanation of colour banding, seriation and ethnocategories

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Abstract

New archival and ethnographic evidence reveals that Inka style *kipus* were used in the Andean community of Santiago de Anchucaya to record contributions to communal labour obligations until the 1940s. Archival testimony from the last *kipu* specialist in Anchucaya, supplemented by interviews with his grandson, provides the first known expert explanation for how goods, labour obligations, and social groups were indicated on Inka style Andean *kipus*. This evidence, combined with the analysis of Anchucaya *kipus* in the Museo Nacional de Arqueología, Antropología y Historia Peruana, furnishes a local model for the relationship between the two most frequent colour patterns (colour banding and seriation) that occur in *kipus*. In this model, colour banding is associated with individual data whilst seriation is associated with aggregated data. The archival and ethnographic evidence also explains how labour and goods were categorized in uniquely Andean ways as they were represented on *kipus*.

Keywords

Andes, ethno-accounting, Inkas, *kipus*, Peru, writing systems

Introduction

In recent years, scholars have begun to analyse the materiality of writing and other forms of graphic inscription in an effort to expand our understanding of the relationship between material culture and memory (Coe and Kerr, 1998; Houston, 2014; Küchler, 2002). These efforts have possessed a particular relevance in the Andes, where semiotic

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practices have been spread across an array of textile forms, from fibre-wrapped batons (Splitstoser, 2014), to wrapped bundles (Brown Vega, 2016) to burial textiles and garments (Arnold, 2014; Dransart, 2014; Lau, 2014) and to the fibre recording devices known as *kipus* (Hyland, 2010).

Khipus – knotted multi-coloured cords used for both narrative and accounting records – remain one of the enduring mysteries of the Andes. How did these knotted cords encode the information necessary to run the Inka Empire, a highly bureaucratic state with over 18 million inhabitants stretched over a nearly 3000-mile expanse of rugged terrain. Spanish colonial sources explain that one of the khipus' central functions was to record the amount and kind of labour tribute (*mit'a*) demanded of various groups in the state, along with the degree to which each group had completed their required assignments (Brokaw, 2010; Urton, 2003). Despite advances in interpreting some of the structural elements on khipus, including knot placement (Locke, 1923) and knot and ply direction (Hyland, 2014; Hyland et al., 2014; Urton and Brezine, 2007, 2011), we still do not understand how khipus indicated labour contributions from groups and individuals. Scholars have found considerable evidence that the use of khipus for recording tribute contributions continued into the Spanish colonial era (e.g. Curatola Petrocci and De la Puente Luna, 2013; Murra, 1975; Pärssinen and Kiviharju, 2004; Platt, 2002), yet we simply do not know how information about the different types of labour, contributing groups and individual workers were indicated on the knotted multicoloured cords. Such an understanding would be an important step on the path towards the eventual decipherment of Andean khipus. It would also reveal aspects of how khipu accountancy served as a social practice in the Andes (see Urton, 2015a). Historians such as Armstrong (1987), Boland (1987) and Gomes (2008: 479) have noted that accounting practices have 'pervasive and enabling characteristics' in relation to state power and colonial expansion. A better understanding of the grammatology of khipu accounting practices would further our comprehension of how peoples, things and tasks have been conceptualized during the differing phases of Andean history, from Inka imperialism to Spanish colonialism to the modern era.

Recently discovered evidence about khipu accounting practices in the village of Santiago de Anchucaya (Huarochiri Province), Peru, can shed light on the question of how khipus indicated contributions of labour and goods. Unpublished testimony gathered in 1935 from Mariano Pumajulka, a village khipu expert, supplemented by interviews in 2015 with Mesias Pumajulka, Mariano's grandson, provide detailed explanations of how khipus in Anchucaya recorded the contribution of each kinship group (*ayllu*) to communal obligations in the early 20th century. Anchucaya is one of four communities (Collata, Casta, Anchucaya and Tupicocha) in Huarochiri Province where villagers continued to use khipus into the 20th century.¹ When the Pumajulkas' testimony is compared to actual khipus from Anchucaya in the Museo Nacional de Arqueología, Antropología y Historia Peruana (MNAHP), we can ascertain how certain khipus indicated the contribution of each group to specific tasks, whilst others recorded the contributions of each individual within a specific group. We can also see how a particular type of tasselled marker on khipus registered a domain of meaning about the contributions of individuals and their households.

Mariano Pumajulka's testimony about the khipus of Anchucaya

On 22 March 1935, a curious interview took place in the elegant sitting room of Julio C Tello's Miraflores home on the cliffs overlooking the Pacific Ocean. Tello, already famous as the 'Father of Peruvian Archaeology', held a lengthy conversation on that day with Mariano Pumajulka, an indigenous farmer from the hamlet of Anchucaya in the mountains east of Lima. According to Tello's unpublished notes, Pumajulka explained how the people of Anchucaya celebrated the yearly *Watancha* festival. During the *Watancha*, an annual ceremony focused on public accountability, adult members of the six village *ayllus* came together to examine each ayllu's contribution to the community obligations. Each year, two designated *kipucamayos* were in charge of each creating a khipu that indicated the contributions of all the ayllus to the communal tasks. Tello took detailed notes on how the features of the khipu indicated each ayllu and its payments –whether in labour or in goods – to each community obligation. The great scholar left behind two sets of notes on his interview with Pumajulka; however, as with many items in his archive, Tello never published this material.

Tello's longstanding interest in khipus is attested to by the presence of over 1000 manuscript pages about khipus in his papers in the Archivo Tello (Casa Cultural de San Marcos). The folders on khipus in the archive include coloured drawings of archaeological khipus, selections from Spanish chroniclers and Tello's own commentaries. Tello's unpublished writings about khipus follow the insights of his mentor and friend, Ricardo Palma. In 1906, 17 years before Locke revealed how khipu knots encoded decimal numbers, Palma published a *tradición* about khipus and the decimal system of the Inkas (Palma, 1906). Noting that the Inkas organized their military and their population decimally, Palma argued that khipus recorded numbers in the base ten system, with the knots representing ones, tens, hundreds and thousands. Palma penned his essay in response to recent claims by a member of the French Academy of Science in Paris that the native Peruvians did not know decimal numbers until the Spanish introduced them to the Andes. In his handwritten notes in the Tello archive, Tello similarly criticized the Swedish anthropologist, Erland Nordenskiöld, who argued that a khipu from Nasca (VA16636) in the Berlin Museum für Volkerkunde expressed the mystical astronomical data of Inka priests (Nordenskiöld, 1925). Specifically, Nordenskiöld stated that the 'primitive' mind of the Indian received a spiritual satisfaction from carrying khipus whose cords represented astronomical cycles, such as the lunar month. Tello, however, wrote that he considered this to be nonsense. Following Palma, Tello asserted instead that khipu VA16636 described by Nordenskiöld contained decimally organized numerical data on Inka demography (Archivo Tello, Khipus, Paquete XXXVI).

When Tello met with Pumajulka on that autumn afternoon in 1935, the archaeologist had already been feted by a delegation from Anchucaya 5 years earlier. Tello was from an indigenous Quechua-speaking family in the town of Huarochiri (Burger, 2010), a 3-hour walk from Anchucaya. In August 1930, Tello returned briefly to his hometown of Huarochiri to great acclaim – a local boy who had achieved national fame as an archaeologist. Anticipating his arrival, the Anchucaya JC Tello Youth Education Society sent him a letter welcoming him back to his ancestral land. The Anchucaya delegation

addressed their Society's namesake, Tello, as 'the valiant champion of our aboriginal race'; 'we will never forget', the letter continued, 'your caring and brilliant figure ... full of patriotic pride we beg you to accept this testimony of our gratitude and tribute of our admiration.'² Although Mariano Pumajulka did not sign this letter from the Youth Education Society, another member of his family, Yldefonso Pumajulka, did. It is likely that Mariano or one of his relatives had met Tello in 1930 before Mariano visited the archaeologist in Miraflores in 1935.

In his notes about the Anchucaya khipus, Tello indicated that in 1914 he was informed 'that Anchu Kaya still preserved the old custom of the *Watancha*, a ceremony that took place once a year and whose principal purpose was to settle the accounts, services, [and] communal tasks provided during the year by the different ayllus'.³ According to Pumajulka, the *Watancha* occurred in a large shed that belonged to the community.⁴ Every year, the governing council (*consejo directivo*) of the community chose two individuals to serve as *kipucamayos*. Each *kipucamayo* was responsible for keeping a khipu that demonstrated the contributions of all six ayllus to each of the 10 annual communal tasks. Ideally, the two khipus maintained by the *kipucamayos* were identical; any discrepancies between the two would be discussed during the *Watancha* until an agreement was reached on the correct figures. Pumajulka explained that each ayllu also had its own *controlador* or controller who kept track of the contributions of his ayllu. Additionally, the governing council chose two *kuimeres* (accountants). During the *Watancha*, after an ayllu's contributions had been agreed upon, the *kuimeres* would calculate the ayllu's debts for work left undone. These calculations were made on the ground using maize kernels; the process of making these calculations was called *morochay* from the Quechua word *muruch'u*, referring to a very hard variety of maize.⁵

In 1935 there were six ayllus in Anchucaya: Primo (30 persons); Suni-sika (30 persons); Xulka-tampu (40 persons); Rimak (100 persons); Llamaiko (100 persons); and Tayllapa (15 persons); the total population of the village therefore was 315 men, women and children. The 10 communal tasks were:

1. *Runa Wacho*: the service given by a member of the community as a messenger or postman to carry official correspondence from the village to the capital of the province, Matucana, to Lima and to other distant places.
2. *Mula Wacho*: this designates the obligation of a community member community to provide transportation to carry construction materials for public buildings or to transport government officials, engineers, school teachers, etc.
3. *Runa Pariakaka*: in the past, Pumajulka explained, this referred to every community member's obligation to haul goods sent by the government in Lima to Cusco by the route of Pariakaka, from the village to the last point on the route; now, he said, this task consists of transporting maguey from Kechuawayta to Anchucaya for the roofs of public buildings.
4. *Mula Pariakaka*: once this referred to the transportation, such as mules, necessary to carry items sent by the government to Cusco via the route of Pariakaka; now, Pumajulka stated, it refers to bringing the Champakara (a type of agave used for rope) from Cocha (Lake) Wayce to Anchucaya.
5. *Kama Chikuy*: this is a type of village official who carries correspondence to nearby towns, and who also assists with communal works.

6. *Runa Plata*: this refers to the expenditures of individual ayllu members for goods or tools necessary for public works.
7. *Mula Plata*: this refers to the transportation necessary to carry loads destined for the community.
8. *Costal*: this refers to the obligations to bring palms from Chilca for the Holy Week ceremonies, and also to bring the white earth that is used to paint the walls of the Church and the public buildings.
9. *Pollo*: this is the obligation to provide chicken and eggs to feed the priest.
10. *Papel*: this is the obligation to provide official stamped paper for use in all political and judicial matters related to the community. Ayllu members would travel to either Matucana or Lima to purchase this expensive item.

This list of tasks provides a fascinating snapshot of the village life in a small Andean community in the early 20th century. As we shall see, the sequence in which these obligations were listed was crucial to how they were recorded on the Anchucaya khipu. Although Murra (1975) once suggested that items given in tribute were ordered on khipus by their importance, with the most valued items coming first, it does not appear that these tasks were necessarily listed in order of importance. Nor are they listed by how demanding they are. The responsibilities of the Kama Chikuy, for example, which are mentioned halfway down the list, are certainly as demanding as those of the Runa Wacho, the messenger who is first on the list. Both labour service, such as transporting officials and goods, such as chickens for the priest, are recorded on the same khipu. It is interesting to observe how an obligation's name could remain the same even as the service provided changed over time. So, for instance, the Runa Pariakaka, which once referred to the hated obligation to haul goods along the Pariakaka route, became the term for transporting maguey for roofing public buildings. Six of the ten tasks, however, are clearly paired with another task, such that the first task refers to something done by a person while the paired task refers to the animals needed for transport. Thus, Runa Wacho (Orphaned person) is followed by Mula Wacho (Orphaned mule); Runa Pariakaka (Pariakaka person) is followed by Mula Pariakaka (Pariakaka mule); and finally, Runa Plata (Money person) is followed by Mula Plata (Money mule). Pumajulka stated that when assigning value to the labour of each individual for one of these tasks, the work of women was worth only half of the work of men; however he did not elaborate on how, exactly, this was calculated.

To create the khipu that recorded each ayllu's contributions to these communal obligations, the kipucamayo prepared a main cord from which the pendant cords would hang; the main cord was thicker than the thinner pendant cords. This resulted in a khipu structurally similar to those used during the Inka period (see Urton, 2003). The main cord was read from left to right, and a 'thick button or duster called the large *cayt*' indicated the beginning of the khipu.⁶ The term 'cayte' is derived from a Quechua word meaning 'wool thread, spool of wool, ball of wool' (Lira, 1982 [1941]: 127). This

large button ... was sometimes a tassel of two or more colours, with wool or a tuft of hair ... in reality this button served as an introduction to reading the khipu ... and at the same time it indicated the purpose of the type of material or materials registered on the khipu.⁷

At the end of the khipu was a much smaller ‘button’ known as the ‘little cayte’, indicating ‘the end of the register’.⁸ Carmen Arellano has speculated that markers identified the subject matter of the khipu (Arellano, 1999: 226), but Pumajulka’s evidence is the first confirmation of this hypothesis. In addition, Pumajulka’s testimony clarifies that the large cayte marked the beginning of khipu text, a matter which has been shrouded in uncertainty until now.

To register the work by the ayllu, each ayllu was associated with a colour; unfortunately, Tello did not record the colour associated with each ayllu in Anchucaya. The kipucamayo tied six pendant cords onto the main cord in the order of ayllu listed below, with each coloured cord representing an ayllu: Primo, Suni-sika, Xulka-tampu, Rimak, Llamaiko and Tayllapa, creating a group of six coloured cords. This sequence of colours was repeated nine more times with a space between each group of six cords, resulting in a khipu with 60 pendant cords organized into 10 groups of 6 coloured cords. The first group of 6 cords had knots on the pendant cords indicating what each ayllu had contributed to the Runa Huacho, that is, to carrying messages for the village to Matucana, Lima or elsewhere. According to Tello, the types of knots tied onto the pendant cords were the same as those on Inka khipus, organized in the same decimal manner.⁹ The knots on the second group of pendant cords demonstrated what each ayllu had contributed to the Mula Huacho, that is, to providing transport animals to bring agave fibres to the village. The position of the group of pendant cords, whether the first group, the second group, the third group, etc., along the main cord indicated which of the labour tasks was being registered – whether the first, the second, the third, etc. The last group of six cords, for example, indicated the final labour task, ‘Papel’ – providing the expensive official stamped paper for village business. The resulting khipu, therefore, exhibited a sequence of the 6 different colours repeated 10 times. This type of repetitive pattern, of the same sequence of coloured cords over and over, is known as ‘seriation’, and occurs with some frequency on Inka and colonial khipus (see Figure 1). While scholars have speculated on its significance, no one has ever before encountered a khipukamayoc capable of explaining its meaning for a specific khipu (Salomon, 2004: 167–171; Urton, 2003: 105–107).

The pendant cords on the Anchucaya khipus were long enough so that each cord would have space for two sets of numbers. The knots on the top half of each pendant nearest to the main cord

registered the quantities that correspond to the work that was done and the lower [half] the quantities corresponding to work that was not carried out; ... what was done [was] on the upper half of the pendant in the part closest to the main cord, and what was owed on the other part [of the pendant], further away.¹⁰

During the Watancha, each kipucamayo would read out the information on his khipu in a loud voice. If the controller from a particular ayllu disagreed with the kipucamayo’s figures, a discussion would ensue before the final figures were agreed upon. Then the kuimeres would use maize kernels on the ground to calculate what the ayllu owed if there had been work left undone. It is unclear if the kuimeres took into account how greatly the ayllus varied in population when determining the obligations of each. In consultation with the kuimeres, the kipucamayos knotted any remaining debts onto the blank khipu



Figure 1. Example of a khipu showing a pattern of seriation. RT 05727, MNAAHP. © Photo by author.

prepared for the next year, so that the obligation for any undone work would be carried over into the New Year.

Tello wrote that the use of khipus in the Watancha began to diminish around 1910, explaining that, ‘upon asking Pumajulka why the khipu had disappeared, he answered: because of the intervention of the young people who imposed the use of writing to keep the accounts in books and notebooks’.¹¹ Today, there are no longer any khipus in Anchucaya. The only villager who claims to have any knowledge about how khipus were used in the past is Mariano's grandson, Mesias Pumajulka (see Figure 2). Mesias, who is in his late 70s, joined Suni-sika as an adult member when he was 14 years old, which would have been around 1950. By that time, the only yearly accounting ceremony that occurred in Anchucaya was performed by each ayllu individually. In other words, the six ayllus no longer came together to examine what each ayllu had contributed during the year. Instead, each ayllu held (and continues to hold) a meeting at the end of the year for the ayllu members alone to see what each person had contributed. Mesias told me that his grandfather had described to him how they once had used khipus for accounting within the ayllu of Suni-sika. These khipus, presumably, would be equivalent to the ones that Mariano Pumajulka described for the ayllu ‘controllers’ in his testimony to Tello. Significantly, Mesias said, the ayllus did not carry the debts for work that was not done into the next year. Nor did the ayllu officials punish delinquents. Instead the ayllu president and his officers demanded a fine from those who had not fulfilled their work obligations. Once this fine was determined, the knots on the khipus



Figure 2. Mesias Pumajulka, grandson of Mariano Pumajulka. © Photo by author.

were untied so that the khipus could be re-used, and thus the accounts were made ‘clean’ (*limpia*) for the New Year. Thus, according to Mesias Pumajulka’s testimony, the knots on the khipus at the ayllu level ceremony were untied to indicate that the accounts had been settled. This contrasts with Mariano Pumajulka’s description of the village level Watancha festival, in which the remaining debts were knotted onto blank khipus prepared for the forthcoming year.

Mesias explained to me that Suni-sika now records its accounts in notebooks, where every member’s contributions to the annual group labour tasks are listed. The members’ names are written down in the order in which each person joined Suni-sika, with the oldest listed first.¹² When I spoke with members of other groups, such as Primo and Rimak, they said the same – the groups keep their accounts in notebooks in which the membership is listed according to when the individual joined. Today, these groups are never referred to as ayllus, although older villagers, such as Mesias and his wife, were familiar with the term. Primo, Suni-sika and Rimak are called communities (*comunidades*). Xulka-tambo (now Fulcatambo) and Llamaiko are referred to as factions (*parcialidades*)¹³. Tayllapo, the smallest ayllu, has disappeared. It has been replaced by two additional groups, known as societies (*sociedades*). Each group has its own meeting place, its own patron,¹⁴ and its own ceremonial functions, although the latter are becoming less frequent. Very restrictive rules concerning intermarriage among the groups once existed but, according to Mesias, these rules died out in the 1950s, sometime after the all-village Watancha ceased. Now, members of the different groups can intermarry freely, and the children belong to their father’s group.

It is difficult to know for certain, but, after a period of decline, khipu usage appears to have died out completely in Anchucaya by the 1940s, around the time that the all-village Watancha disappeared and the ayllus were transformed into *comunidades*, *parcialidades*, and *sociedades*. It is tempting to accept Mariano Pumajulka’s statement at face value that

the khipus disappeared simply because the young began pushing for writing. However, khipu use existed alongside alphabetic writing in Anchucaya for centuries. A former schoolteacher who is a member of Primo, for example, told me that his group maintains an archive of papers that includes 18th-century manuscripts in Spanish. Other villages in Huarochiri Province, such as Collata in the north, maintain archives of handwritten documents going back to the 17th century, including signed petitions by native leaders, such as Collata's Don Pedro Caxayauri.¹⁵ In Collata, community members store these precious documents in an antique wooden box together with their two 'sacred' khipus, said to be epistles prepared by local leaders about an earlier rebellion. In Anchucaya, Pumajulka's khipus themselves, which recorded the purchase of stamped paper for official documents, suggest the co-existence of these two forms of graphic inscription.

Salomon and Niño-Murcia have studied the community of Tupicocha, near Anchucaya, where villagers continue to use patrimonial khipus in the ceremonial investiture of new officials, although no one can 'read' the khipus any longer. These two authors have suggested that active khipu use there began to decline sometime after the War of the Pacific (1879–1884) (Salomon and Niño-Murcia, 2011: 84). They point out that the 'diffusion of literacy' had little to do with the decline of the cords, since literacy 'was already an old tradition' when the khipus fell into disuse. Rather, they argue, two primary factors led to the abandonment of khipus as a medium of communication: (1) the acquisition of written devices, particularly charts, that 'could match the strengths of the khipus'; and (2) the national government's recognition of 'Indian' communities from the 1920s onwards which would provide 'added impetus to the ayllus' absorption of book-writing norms'. It is likely that similar factors led to the disappearance of the khipu traditions in Anchucaya in the early 20th century.

Anchucaya khipus in the MNAAHP

Alejo Rojas, who created the descriptive inventory of the khipus in the MNAAHP, has identified three woollen khipus from Anchucaya in the museum collection (Schreiber et al., 2011). Tello had donated these khipus to the museum before his death in 1947. Unfortunately, no additional information about these khipus exists in the Museum archives, and all three are incomplete. Two of the Anchucaya khipus are fragments with only 34 (RT 31170) and 16 (RT 22020) pendant cords. The largest of the three, RT 21287, contains 71 pendant cords, yet it is not complete either (see Figure 3). In general, most khipus conclude with a long 'tail' of the main cord without any pendants; however, RT 21287 terminates abruptly at the frayed end of the main cord. Many of the pendant cords on the three khipus are relatively long – the longest pendant on RT 21287, for example, is 39¾ inches.

The top cord of RT 21287 is 21¾ inches long and is composed of dark brown, Z plied animal fibre. It begins with a knot and a bright tassel of orange and yellow fibres (¾ by ¾ inch) that matches Pumajulka's general description of the caytes on Anchucaya khipus (see Figure 4).

The Anchucaya cayte is an open tassel made of animal fibres, either from alpaca or vicuña. Before it was conserved and sewn onto the canvas, the bright coloured tassel projected out of the main cord, with its fibres parallel to the main cord. By way



Figure 3. Terminal end of Anchucaya khipu, RT 21287, MNAAHP. © Photo by author.

of contrast, the sacred patrimonial khipus of Collata, said to be letters about warfare, contain a *cayte* – a needlework bundle with fine wire thread, very distinct from the Anchucaya *cayte* on RT 21287 (see Figure 5).

Mariano Pumajulka described the Watancha khipus as possessing a colour scheme of seriation, with a repeating sequence of coloured pendant cords. However, RT 21287 is not seriated. Rather, its pendant cords are arranged in a series of 14 groups along the main cord in which each group is predominantly of one colour. Khipu scholars refer to this pattern, in which groups of same-coloured pendants occur along a main cord, as ‘colour banding’ (Salomon, 2004: 167–169). The sequence of colour groupings along the main cord is: white, dark brown, light brown, grey, white, dark brown, light brown, white, black, grey, dark brown, dark brown, medium brown and grey. Eight of the groups have five pendants of the same colour, three groups have six pendants of one colour, and three of the groups are missing pendants. Virtually all of the pendant cords are S plied; however, one group of light brown cords is entirely Z plied.¹⁶ Is it possible that this khipu could represent the only other type of khipu alluded to in Mariano Pumajulka's testimony – the khipus kept by the ‘controller’ of each ayllu, recording the contributions made by each ayllu member to the different tasks? If this were the case, how would each band of



Figure 4. 'Cayte' tassel on Anchucaya khipu, RT 21287. A conservator has sewn the tassel onto the canvas underneath; originally the tassel fibres were parallel to the main cord. Note the colour banding on the khipu. © Photo by author.



Figure 5. Needlework bundle on Collata Khipu B. © Photo by author.

colour and each pendant within the band represent the contributions of the individual ayllu members to communal work?

According to Pumajulka, the khipus kept by the ayllu controller would have to represent the ayllu members and each member's contribution to the communal labour, in addition to any other possible information. These two variables would have to be registered by



Figure 6. White rectangular insert on RT 21287, MNAAHP. © Photo by author.

the bands of colour and by the sequence of cords within each colour band. If the pendants on RT 21287 represented a series of individuals, and the colour bands represented the labour tasks, it would imply an ayllu of only 5 or 6 members responsible for 14 or more labour tasks. Such an interpretation does not make sense ethnologically. The only interpretation that fits the data is that each band of colour represented an individual member of the ayllu, and the cords within the band represented the labour obligations in a memorized sequence. The sequence of colour bands along the main cord would have followed the sequence of membership, with those individuals who had joined earliest coming first on the khipu; this is the sequence of members as they are listed today in the ayllu notebooks. If the pendants represent the labour tasks, it would imply that by the time this khipu was made, the number of communal tasks had been reduced to 5 or possibly 6, the number of pendants in each colour band. RT 21287 would therefore list the labour contributions of the oldest 14 members of the ayllu. Most of the cords on RT 21287 have no knots, suggesting that this is a ‘clean’ khipu whose accounts were settled.

Support for this interpretation of the pendant cords on RT 21287 is provided by the fourth group on the main cord, a set of grey pendants. A small rectangle of white cloth is tied onto the last pendant of the set (Figure 6).

The inner side of this rectangle contains a drawing in pencil of a curved line followed by two ovals (which I was not permitted to photograph). This appears to be a representation of the official stamped paper that was required by Peruvian law for any legal or government document until its use was abolished in the 1980s (Peralta, 2007; Vidal, 1929). The official *papel sellado* (stamped paper) used in Peru in the early 20th century usually had two round seals with a line at the side. If the drawing on this rectangle of fabric does represent the stamped paper, then presumably this pendant cord indicates the purchase of this paper by a community member, the last obligation on the earlier list of



Figure 7. White rectangular insert, RT 022020, MNAAHP. © Photo by author.

10 tasks. An identical inclusion of white cloth occurs in another khipu from Anchucaya, RT 022020 (Figure 7).

This very deteriorated and partial khipu is in two pieces, one with ten pendants and the other with six pendants. These khipu pieces seem to exhibit a pattern of colour banding similar to that in RT 21287. The smaller piece contains a band of four dark brown and beige pendant cords followed by two dark brown pendants. The last dark brown and beige pendants has a white rectangle of cloth tied onto it. The drawing on this cloth of a curved line and two ovals which are almost closed at the bottom is identical to the one in RT 21287. On RT 022020 the white rectangle of cloth that I believe represents the purchase of stamped paper – the final obligation on Pumajulka's list – occurs on the last pendant of the colour band. There is a satisfying irony that the Anchucayans used woolen cords to record the purchase of paper for written documents.

In Anchucaya today, the *comunidades*, *parcialidades* and *sociedades* record contributions to the communal labour task at the level of the individual, although other members of the household often assist the member in his or her communal obligations. The work of adult women continues to be valued at half of the work of adult men, as it was in Mariano Pumajulka's day. One would expect, therefore, that the band of light brown cords that are all Z plied, in contrast to the S ply of most of the pendant cords, may have represented the less valued work of a woman (for the lower value assigned to Z ply, see Hyland, 2014). Tello acquired these khipus from Mariano Pumajulka, a member of the *Suni-sika ayllu*, and so these khipus must come from that ayllu, which had 30 members in 1935. There are only 14 colour bands on RT 21287, but the khipu is incomplete, so we do not know how many colour bands it possessed originally. When carrying out their various community labour obligations, members often have assistance from children or parents/grandparents who do not owe labour in their own right. Occasionally, one of the

cords in a colour band is Z plied in the midst of an S plied colour band; this may represent the labour of someone very young or old or female from the member's household who performed a task on behalf of the member.

In nearby Tupicocha, where Frank Salomon conducted ground-breaking research on each ayllu's cherished khipus, most (9 out of 10) of the khipus exhibit a pattern of colour banding (Salomon, 2004: 167). In this community, the khipus themselves are referred to as either *quipucamayos* or *caytus*, the latter being a version of the Pumajulkas' word for the distinctive markers (*caytes*) on the beginning of the corded texts. The beginning markers on the Tupicocha khipus are quite distinct from the one on Anchucaya khipu RT 21287. Rather than being open fibre tassels, the Tupicocha markers are round or oval bundles covered with woven cloth; some even incorporate fine metallic wires (Salomon, 2004: 145, 154–155, 206) similar to the wire in the cayte from Collata (Figure 5).

Although Tupicochans can no longer understand their khipus, one villager, Nery Javier Rojas, learned some basic principles of khipu interpretation from his great-grandfather, Tobías Javier (Salomon, 2004: 212–221). Tobias Javier, a member of the Primera Satafasca ayllu, was considered the last master of the khipu arts. According to Salomon's summary of Nery's insights, Primera Satafasca's colour banded khipu was used to record information for the ayllu of Satafasca only, not for the village as a whole (p. 217). Nery stated that each band of colour on the Satafasca khipu referred to a specific subject, such as 'collective foodstuffs' or communal workdays, with each subject coded by colour. Nery seems to have viewed the khipu primarily as a form of inventory. For example, he said that 'several black cords' indicated 'the livestock the [ayllu] had'; 'the white [cords]] represented "varieties of seed"', and so forth (p. 218). The Tupicochan's primary explanation for colour banding – that each band refers to an inventory item – is different from my suggestion for the colour banding on the Anchucaya khipu. However, if Pumajulka is correct that the caytes indicated the subject matter of the khipu, we would expect the Anchucaya khipus and the Tupicocha khipus to treat different subjects, given the differences in their respective caytes.

Gary Urton (2015b) has provided an explanation for colour banding on a series of colonial-era khipus that supports the hypothesis that the bands of colour on the Anchucaya khipu RT 21287 represent individual ayllu members. In a remarkable piece of anthropological detection, Urton has found a correspondence between a colonial document and a set of six colonial era khipus found together in a tomb in the Santa Valley. The document, dated 1670, is a census of tributaries from the Recuayes ethnic group located in the Santa Valley, stating the tribute they owe. This census lists a total of 132 adult male tributaries divided into six ayllus. The pendant cords of the six khipus that were found together follow a pattern of colour-banding; altogether, they have 132 six-colour bands. The number of colour bands on each khipu roughly matches the number of tributaries listed on the census for each ayllu. So, for example, the Cuyuchin ayllu has nine tributaries, which is a close match to one of the khipus that possesses ten colour bands. Urton very reasonably argues that each khipu represents an ayllu, and that each colour band indicates an adult male tributary and his household. The organization and meaning of the Santa Valley khipus appear to be similar to the Anchucaya khipu RT 21287.

The largest of the six Santa Valley khipus, UR 87, begins with a cayte or tassel comparable to the tassel on the Anchucaya khipu (see Figure 8). Both caytes are open fibre



Figure 8. Tassel at the beginning of the Santa Valley khipu, UR87. © Photo courtesy of Gary Urton.

tassels of bright orange and yellow wool projecting out from the main cord. There are some slight differences between the two, namely the orange and yellow fibres in UR 87 are longer and more separated than in the cayte on RT 21287. However, given that the two khipus were created approximately 260 years apart, their closeness is striking. Pumajulka's explanation that the beginning cayte indicated the subject matter of the khipu, suggests that UR 87 and RT 21287 must contain similar types of information. This in turn implies a possible domain of meaning – the labour contributions of each member/household of an ayllu – for this particular type of orange and yellow marker.

Conclusions

The testimony of the Pumajulkas, combined with the study of the Anchucaya khipus in the MNAAHP, demonstrate how khipus recorded data about contributions of labour and goods in an Andean village. Mariano Pumajulka's words, as recorded by Tello, provide the first known explanation by a khipu expert of a seriation pattern on a khipu. Each group of pendants along the main cord represented an obligation in a memorized sequence; each coloured pendant represented a social group, in this case an ayllu. This type of khipu recorded information at a village-wide level.

Mariano Pumajulka referred to another kind of khipu in Anchucaya: those kept by ayllus to record the work of each ayllu member. Khipu RT 21287 and RT 022020 appear to pertain to this class of khipu. The pendant cords on these khipus exhibit a pattern of colour banding, not seriation. The white rectangular cloths tied onto the pendant cords of the Anchucaya khipus apparently indicated a labour task: the purchase of government issued stamped paper for written documents. In light of the Pumajulka's testimony, each colour band represented an individual ayllu member, listed in the order of his or her

induction into the group, while the pendant cords indicated labour tasks in a series of five or six.

The Pumajulkas' evidence provides an example of how the data on the two kinds of khipus – seriated and colour banded – were linked in the Watancha. Information from the ayllu level colour-banded khipus was summarized on the village level seriated khipus. This data from Anchucaya and Tupicocha suggests that ayllu level khipus in Huarochiri province were more likely to be colour banded, whilst higher level khipus were more likely to be seriated. In other words, colour banding is associated with individual contributions, whilst seriation is associated with aggregated data. This seems to be the case as well for the 1670 khipus from the Santa Valley, to the north of Huarochiri Province. Each of these six khipus, which are colour banded, pertained to a specific ayllu; each colour band represented an individual tributary. In the future, it will be important to find ways to test these findings amongst Inka and Spanish era khipus. Does colour banding generally pertain to the lowest level information, such as that from an ayllu, while seriation is found amongst higher level summaries combining information from different groups?¹⁷

A key feature of Mariano Pumajulka's evidence is his explanation for the distinctive markers on the ends of the khipu top cords; significantly, he testified that the large caytes signalled the beginning of the khipus. Pumajulka confirmed Arellano's hypothesis that these markers signify the khipus' subject matter. It is significant that Anchucaya khipu RT 21287 and Santa Valley khipu UR 87, which encode similar sets of information, have similar caytes, very different from those of the Casta khipu epistles. As yet, no one has conducted a comprehensive analysis of the beginning markers on khipus; such a study would help to provide a better context for understanding the similarity of the caytes on RT 21287 and UR 87.

Finally, what are the implications of Pumajulka's list of 10 obligations for understanding how tribute information was encoded on khipus? Transcriptions of khipu testimony presented in Spanish colonial courts often provide amounts of items given in tribute, such as loads of maize, salt, chaff, etc. If one assumes a one-to-one correspondence between the khipus and the testimony, it would seem that khipus listed amounts of tribute goods in a straightforward manner. However, khipus may have recorded information in a somewhat different manner, from which the khipucamayoq extracted the tribute data. For example, in the Anchucaya khipu described by Mariano Pumajulka, the khipucamayoq would be able to calculate how many loads of maguey had been transported for use in public buildings (#3 Runa Pariakaka). Yet the recorded information concerned how many trips each ayllu had made to transport the material. Knowing the standard load per carrier, the kuimeres could easily calculate how many loads were provided; however, this is not the same as a khipu that only recorded loads of maguey. In Pumajulka's Anchucaya khipu, actions and goods are inextricably intertwined whilst, in some cases, human labour formed a pair with animal labour. Such an emic understanding of khipu data is not only essential for developing our ability to interpret khipus; it can also reveal an ethno-accountancy whereby goods, people and labour are expressed in a profoundly Andean manner.

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Notes

1. In 2015 I conducted ethnographic research in Collata, Casta, and Anchucaya on their khipu traditions, funded by the National Geographic Society (GEFNE120-14).
2. 'Esforsado paladín de nuestra raza aborigina ... jamás olvidaremos la cariñosa y brillante figura de vos ... lleno de patriótica urgullo os rogamos llevais el testimonio de nuestra gratitud y el tributo de nuestra admiración' (Archivo Tello, Grupo XXX, Bulto 99, Paquete 2, Correspondencia, 1928–1940).
3. 'Me informó que Anchu Kaya todavía se conservaba la vieja costumbre de la Watancha, ceremonia que se realizaba una vez al año y cuyo objeto principal era la rendición de las cuentas, servicios, tareas comunales, prestadas durante el año por los diferentes aillos' (Archivo Tello, 'Información suministrada por Mariano Pomajulka', Miraflores, 22 March 1935, Paquete XXXIV; Archivo Tello, Khipus, Paquete IX, 'Kipu de Anchucaya', misplaced in Paquete III) (for transcriptions of these manuscripts, see the Supplemental Material).
4. This large shed no longer exists in the village. It is likely that it was similar to the *Colleca* (storehouse) in Tupicocha where the annual *Huayrona* occurs in early January. During the *Huayrona*, the yearly accounts are settled, new officials for the following year are selected, and each ayllu's patrimonial khipus are worn by the new officers as emblems of authority (Salomon, 2004).
5. For an explanation of how grains were manipulated to perform calculations in the Andes, see Leonard (2011).
6. 'Gruoso boton o belleta [bayete] denominado cayte mayor' (Archivo Tello, Paquete IX 'Kipu de Anchucaya').
7. 'Boton grande' ... unas veces era una borla con dos o mas colores, con lana o mechoncito de pelo ... en realidad este boton servia como introduccion a la lectura del kipu ... y señalaba al mismo tiempo el proposito a la calidad de la materia o materias registradas en el kipu' (Archivo Tello, Paquete IX 'Kipu de Anchucaya').
8. 'El termino del registro' (Archivo Tello, Paquete IX 'Kipu de Anchucaya').
9. Tello's statement about the types of knots implies that he observed one of the actual khipus as Pumajulka explained its use to him.
10. 'Se registraban las cantidades que corresponden a los trabajos realizados y en la inferior las cantidades correspondientes a los trabajos no realizados ... el haber en la mitad superior del cordón en la parte que se aproxima al cordón matriz; y el debe en la otra parte más alejada' (Archivo Tello, Paquete 'Kipu de Anchucaya').
11. 'Al preguntarle a Pomajulka el porque desaparecieron los khipus, me contestó: por la intervención de los muchachos que impusieron el uso de la escritura para llevar las cuentas en libros y libretas' (Archivo Tello, Paquete XXXIV 'Información suministrada por Mariano Pomajulka').
12. In the 20th century, the Huarochiri town of San Pedro de Casta used khipus attached to wooden boards, 'khipu boards', to keep track of labour contributions by villagers. According

- to the unpublished secret ritual manuscript of the village, the Entablo, these khipu boards were used until the 1940s. The names were listed on the khipu boards according to how hard individuals worked, with the names of the hardest workers first, whilst the delinquents were relegated to the end of the list.
13. During the Spanish colonial era, the term '*parcialidad*' often was used to signify ayllu.
 14. For example, the patron of Llamaiko is the Infant Jesus of the Circumcision.
 15. In Collata, the village assembly graciously allowed me to examine the 37 goat hide covered packets of manuscripts in their community archive, along with the two khipus that have been carefully guarded by the village men. In the Huarochiri town of Tupicocha (Salomon and Niño-Murcia, 2011), the archives contain proof of the co-existence of khipus and alphabetic writing for many decades.
 16. The direction of ply refers to whether the two or more strings that comprise a cord were twisted together in such a way that the direction of the strands mimics the middle bar of the letter 'S' (S ply) or the letter 'Z' (Z ply).
 17. The khipus of the three-tier accounting khipu hierarchy in Puruchucu all exhibit a pattern of seriation. If the Anchucaya model is applicable to Puruchuco, then presumably the lowest level of Puruchuco khipus summarized information from an even lower level of khipu, the lowest of which exhibited colour banding (see Urton and Brezine, 2007).

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