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Andean weaving instruments for textile planning: The *waraña* coloured thread-wrapped rods and their pendant cords

Abstract: Recent studies on the Andean knotted threads, called *kipu*, consider their use not only as records of quantity, but also as more general recording and documenting devices, with integral planning aspects. This possibility has been explored in relation to *kipus* as finished artifacts and as composite objects under construction. However, until now, studies of Andean textiles have tended to restrict their analysis to the semiotically constituted construction of already completed artifacts, with less attention to their relation to this wider administrative domain. Here we consider textiles as part of wider productive networks, in their totalities and their constituent parts. We reconsider some archaeological and historical weaving instruments, called *waraña* in Aymara, from this point of view, using ethnographic analogies to suggest ways in which these instruments might have been used in the past in these wider planning and administrative systems overseeing textile production.

Keywords: Weaving instruments, textiles, *waraña*, *kipu*, Qaqachaka, Bolivia, Andes, pre-Columbian era - 21st century.

Resumen: Estudios recientes sobre las cuerdas andinas anudadas, llamadas *kipu*, analizan su uso no solamente en tanto sistemas de contabilidad, sino también como sistemas de registro y documentación, incluso con aspectos de planificación. Esta hipótesis ha sido trabajada en relación con *kipus* entendidos como objetos acabados y como objetos compuestos no acabados. En todo caso, hasta

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ahora, los estudios de los textiles andinos han centrado su análisis en la construcción semiótica de objetos ya completados, y han prestado menos atención a su relación con el más amplio sistema administrativo. Aquí analizamos los textiles como parte de más amplias redes productivas, teniendo en cuenta tanto su totalidad como sus partes constituyentes. Desde esta perspectiva sometemos a un nuevo examen algunos instrumentos de tejido arqueológicos e históricos, llamados en aymara *waraña*, usando analogías etnográficas para indicar la manera como estos instrumentos podrán haber sido usados en el pasado en estos sistemas más amplios de planificación y administración en la producción de textiles.

Palabras clave: Instrumentos de tejido, textiles, *waraña*, *kipu*, Qaqachaka, Bolivia, Andes, época precolombina - siglo XXI.

Recent studies on the Andean knotted threads, called *kipu*, consider their use not only as records of quantity, but also as more general recording and documenting devices, with integral planning possibilities (Urton 2003, Salomon 2004, Urton & Brezine 2007). This planning function has been explored in relation to *kipus* as finished artifacts and as complex objects under construction (Conklin 2002). In comparison, studies of Andean textiles have tended to restrict their analysis to the semiotically constituted construction of already completed artifacts, with less attention to their relation to or function within this wider administrative domain.

In particular, the exploration of textiles as forms of “text”, influenced by the wide interest in semiotics in the 1970s (Cereceda 1978), while raising interesting theoretical issues, has obscured the nature of textiles as composite objects. In practice, the diverse components of textiles often derive from quite different sources in complex systems of production, managed by diverse populations participating in a region-wide community of practice. In this operative chain, distinct natural resources (plants, ore, fleece) are converted to raw materials (dyes, mineral mordents, thread) that undergo a series of transformations (in the case of thread: spinning, plying, dyeing) before textile elaboration (warping up, weaving and finishing) even begins (Arnold & Espejo 2011).

In this paper,¹ we view textiles on a par with *kipus* as part of these wider productive and reproductive processes, in their totalities and constituent parts. Our interest is in how the different elements in textile design are assembled in phases, modified, restructured and reused with new functional and indexical associations, or indeed

¹ This work was supported by the Arts and Humanities Research Council (grant number AH/G012180/1). We thank R. Julio Ruíz, Director, Casa de la Moneda Museum, Potosí (Bolivia), for permission to refer to objects in the collection.

dismantled and recycled in new sequences (managed by archaeologists or museum curators), once their original entanglement with a human life history is over. Building on studies of the complex relations between people and things (Appadurai 1986, Dobres 2000, Descola 2002, Latour 2007), we examine how many interactions in the social life trajectories of textiles as artifacts are planned in their making, while continuing to play an integral part of the biography of textiles as finished objects.

1. Textiles and weaving instruments as part of wider administrative systems

Existing studies to date on textiles as forms of document, record, or plan, make little reference to the wider productive systems of which their composite elements formed a part. This is a serious omission, considering that textiles were as much a part of Andean economic systems as agriculture or herding, constituting a vital resource in the flow of tribute from peripheries to centres of power, possibly from the Late Intermediate Period onward. It has been argued that Late Horizon Inka tributary systems simply built on administrative systems already well-established to deal with these flows of goods (Day 1978: 191). And we know that Inka administrative structures were used well into the colonial period (Julien 2000). These complex state-administered phases of textile production were planned, documented and recorded. In some cases textiles seem to have been planned on knotted *kipus* (Ascher & Ascher 1997: 122). In others, specific instruments for planning textile production formed part of a wider repertory of secondary communication media with similar semiotic functions (Brokaw 2010: 6-7). We argue elsewhere that some of this planning information is embedded in the nature of weavings themselves (Arnold 2012). This system of knowledge continued into the colonial period, as Sophie Desrosiers shows in her interpretation of an appendix to Martín de Murúa's *Historia del origen y genealogía real de los Reyes Incas* (1946) as a list of warp counts for making a Coya's belt in double cloth (Desrosiers 1986).

Another aspect of textiles that needs further study is their relationship to wider technological systems. In her work on Andean technological systems, Lechtman (1983: 246) argues that, unlike the hardware-directed technology of the West, these systems were complex, region-wide, and directed towards the management of natural resources and the social units of production. If weaving instruments were embedded within such systems, and regional weaving hardware technologies mediated between natural and human resources in the way that Lechtman describes, then this would generate certain kinds of networks of knowledge, access and material exchange at both levels that we could examine. The dynamic nature of these interacting systems would also be a measure of changing social interactions over time.

Our understanding of this mediating role of technology, with reference to textile production and weaving instruments, also draws on Nelson Goodman's observation (1976), examined by Frank Salomon with reference to *kipu* design in his book *The Cord Keepers* (2004), that in order to understand fully the phenomenon documented, you should take into account not only the formal properties of the medium (or sign) but also the formal properties of the cultural scheme, as the set of referents (Salomon 2004: 32). The documentary uses of *kipus* have been studied much more than those of textiles. However, if we begin to study textiles from this point of view, we can sense this articulation between the formal properties of textiles as documentary supports, and the formal properties of the cultural schemes of which any one textile, as artifact, forms a part. We also have the additional challenge of understanding how the formal properties of weaving instruments (in their composition, units, sections, layouts) articulate with those of textiles, and how both sets of properties are articulated with the cultural schemes of textile planning, production and distribution.

We reconsider some archaeological and historical weaving instruments from this point of view, using ethnographic sources to suggest ways in which these instruments were used in these wider planning and administrative systems. We focus on the highland regions of Northern Potosí and Southern Oruro in contemporary Bolivia, particularly the Aymara-speaking ayllu of Qaqachaka (Abaroa province, Oruro department), once part of the historical federations of Charkas-Qharaqhara and Killakas-Asanaqi, where these instruments have been used until recent times (Arnold 1993, Arnold & Espejo 2011). See Figure 1. We examine primarily the application of these instruments to warp-faced cloth, as this is the most complex cloth in the Andes, and possibly the world.

A number of weaving instruments were used in these wider productive systems. We examine just one kind, the *waraña*, first locating their use in an ethnographic setting, where social memories still record their use within regional networks of textile production. Then we consider some archaeological examples of what seem to be similar instruments. We conclude with some general remarks about the regional dynamics of technological change.

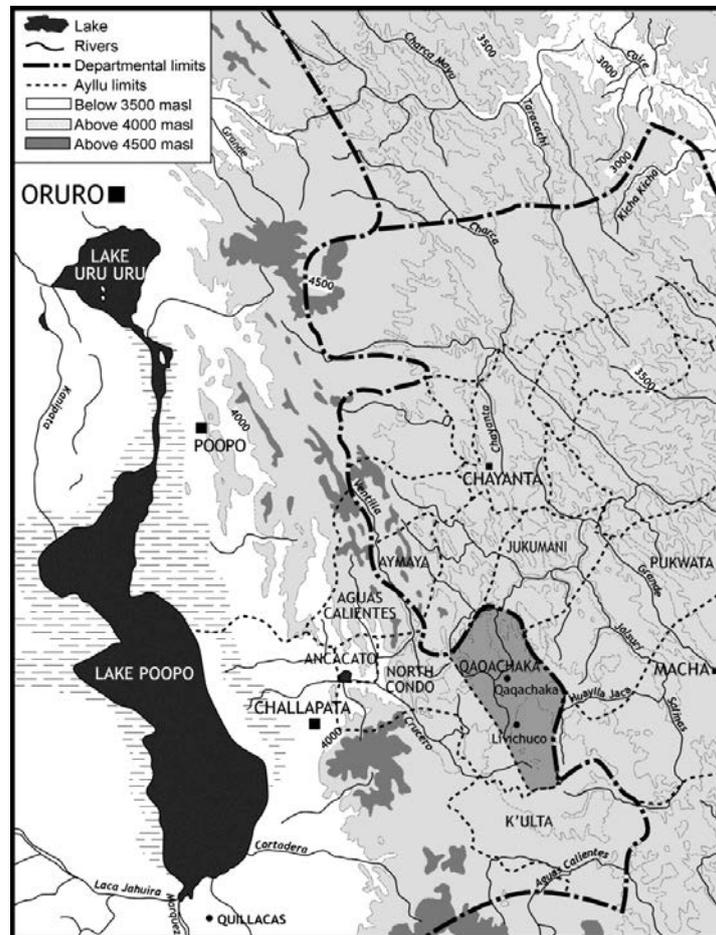


Figure 1. The region of Qaqachaka in Southern Oruro, Bolivia.

2. The *waraña* in ethnographic settings

Waraña is the Aymara verb for tipping something liquid, and by analogy copying something and transforming it into a similar form. *Waraqaña* refers to copying something down on paper, such as transcribing a historical document into a newer version, when the original is referred to as the “mother” (*tayka*) document and the copy as its “baby” (*wawa*) (Arnold & Yapita 2006: 172). *Waraqaña* as a verb also means copying something woven; *waraña* as a noun is the physical model used to make the copy. Its Quechua equivalent is *away yupana*: “the counting of textiles”.

Wondering about the possible uses of these *waraña* in the past raises several questions: How were they integrated into wider productive systems? What kind of logic was involved in their operations? And to what degree can we talk of common systems of planning certain elements of textile practice with regional variants, as opposed to unrelated variants of just local systems? The widespread use of the *waraña* implies the former option, while begging the question whether similarly patterned objects (hair braids wrapped in coloured threads, cartouche-wrapped *kipu* pendant cords, Middle Horizon wigs with pendant braids wrapped in threads) might have served similar purposes. This takes us to Salomon's point about including such seemingly diverse objects as part of any study that seeks to understand both *kipus* and textiles as a part of a wider semiosis in common (Salomon 2004: 177).

Information about the *waraña* was shared with us by Doña Nicolasa Ayca, a weaver in her fifties from Qaqachaka pueblo, who is the mother of Elvira Espejo. In our conversations, Doña Nicolasa remembered the comments by her own mother (Elvira's grandmother), Doña Gregoria Mamani (and the tales she had heard in turn from her own mother, Elvira's great grandmother) concerning the wider use of *waraña* in the past. We are talking about the memories of some four generations of weavers, taking us back into the late colonial period.

Our conversations began when Elvira was directing textile production in the local weaving association (Aptanaq: acronym for the *Asociación de Productores de Textiles Naturales de Qaqachaka*), and needed to standardize her designs, and leave a record in the community for planning certain garments. Older women, frustrated at trying to follow her drawings on the wall or squared paper in notebooks, told her how in the past they had counted threads on poles, called *musa waraña*. One day out walking, Elvira stumbled upon an older weaver using such a model, and replicated its principles with her own designs; the association still uses these simple *musa waraña* to standardize garments for sale.

3. Salta *waraña*: weaving design models

The first kind of *waraña* we consider are the *salta waraña*, used for planning woven designs. *Salta* is Aymara for a woven figure, equivalent to *pallay* in Quechua. *Salta waraña* as "models of woven figures" are life-size examples of certain designs, usually in natural colours.

Many weavers carry in their bundles of weaving instruments small woven samples of textile designs of this kind. Older women tend to make *salta waraña* in thick yarns, easily seen and counted. Young women make *salta waraña* in finer threads, or model them on thin rods, using bamboo strips from the valleys and lowlands, preferred as they do not break easily, and if they do, the splinters can be re-used. Or they use strips of lowland hardwood, either chonta palmwood or mara (see Figure 2).

The *salta waraña* woven by a particular weaver remind her how many structural levels to warp up, in simple (*ina* in Aymara) constructions of 1 or 2 levels of cloth, or more complex (*apsu*) cloth of 3 to 8 levels. Importantly, they remind her how to weave a certain figure, according to the technical patterns in odd or even counts that give form and texture to the designs, whether in the selected techniques of counting the warp threads (by 1|1 or 2|1 or 2|2 or 3|3 or 4|4), or more complex techniques of reselection or double cloth (Arnold & Espejo 2011).

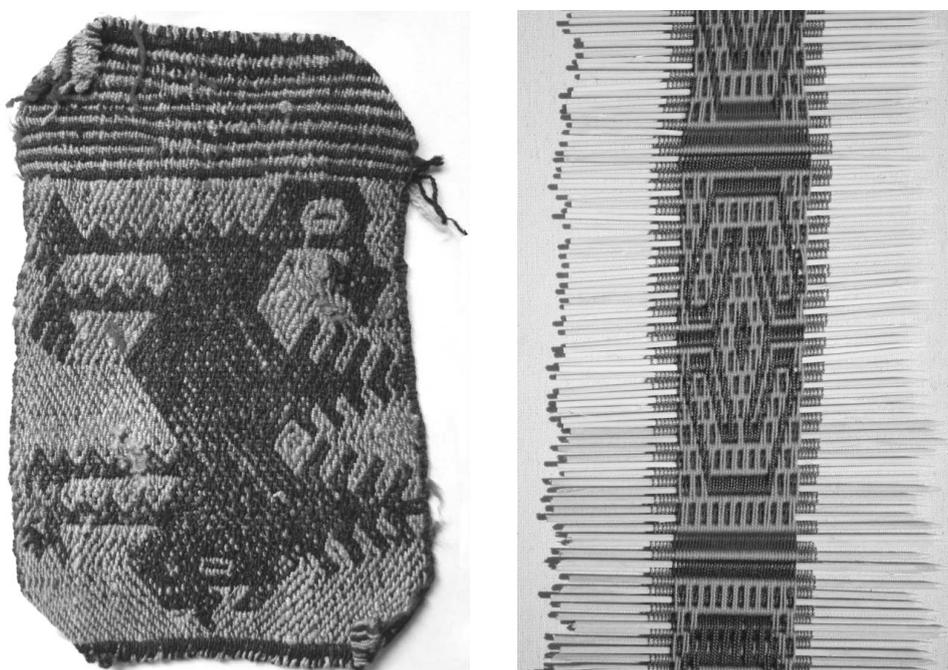


Figure 2. Contemporary *salta waraña* woven in thread (left), woven on sticks (right).²

Limited weavers keep these models throughout their lifetimes, repeating the figures in the same *salta waraña* in all the woven products they will ever make. In this case, the weaver is known by the named figure she has come to weave: viscachas, stars, hens, or whatever, and her weaving repertory ceases there. Skilled weavers use the *salta waraña* as initial models of reference, and then weave the figures without further reference to them.

² A colour version of all figures is available online: <http://www.iai.spk-berlin.de/fileadmin/dokumentenbibliothek/Indiana/Indiana_29/Indiana29-2012_figures_arnold-espejo.pdf>.

A couple of generations ago, sets of *salta waraña* were kept in certain families and passed down in the female line, in a close association between rights to designs and lineage. Their designs were inherited in that family, and other families could not use them. In Elvira's grandmother's family, just three design models were in use: *anu kayu* (dog's paw), *paqalitu* (flower or eight-pointed star) and *llallu* (cock), each in a 2|2 counted technique.

Particularly skilled weavers, known for the technical prowess of their woven figures, also rent out (*mayt'aña*) their *salta warañas* to other weavers in the community for them to copy, but at a price. It is considered shameful to plagiarize anyone else's woven figures without asking them, and it is custom still today to pay someone for borrowing their *salta waraña*, either in food products (mainly the freeze dried potatoes called *chuño*) or money. The quantity of payment is negotiated, depending on the complexity of the figure involved, and its size (small, medium or large). This system of payments also applies to designs requested for a specific garment, for example when a couple has been chosen to serve as authorities in the community for the coming year, and they have to wear special garments to carry out this task. As the use of the *salta warañas* is determined by different weavers according to their needs and levels of technical competence, each model is distinctive to the weaver who made it, or was asked to make it.

4. *Musa waraña*: models of colour combinations

This is also the case with the *musa waraña* wrapped in threads, as models of colour combinations to be used in a particular garment. The verb *musaña* refers to the action of combining colours well, specifically in the process of looming up. Like the figure models called *salta waraña*, the *musa waraña* are often prepared by skilled weavers to be used by less skilled ones in making a particular garment, or by groups of weavers working on standardized kinds of cloth. So like the *salta waraña*, each *musa waraña* is also unique, while being historically and regionally determined by distinctive community and region-wide repertoires of weaving structures and techniques, based in turn on the technological criteria in loom and loom furniture technologies available to the weavers. And like the *salta waraña*, individual variation in *musa waraña* model design is part of a range of possibilities in colour production, composition, style, and design in regionally determined garment production, structured by external and internal constraints on the rate, scale, dimensions, and quality of production for tribute purposes in the past, or for particular markets in the present.

The essence of *musa waraña* use as models for planning colour combinations is how colour patterns are organized and combined in units, in a system of wrapping coloured threads onto wooden rods. In warp-faced weaves, these units of wrapped

threads replicate the colour combinations of warp threads in warping up the textile structure on the loom. In this case, the coloured threads are wound onto a single wooden rod. The aim of the colour combination exercise is to produce textiles with sharp colour contrasts, which are most appreciated. Again, these colour combinations come to be associated with distinct family lines, and those residing at certain altitudes. Families living at higher altitudes tend to produce more natural undyed colours and use less colour contrasts in their cloth, whereas those at lower altitudes tend to produce sharper colour contrasts with more dyed wool. At marriage, a woman from a different ecological zone has to learn the new colour combinations of her husband's household.

The counts of the coloured threads on the wooden rod in the cases of minor garments, such as coca cloths (*incuña*), are sometimes literal. However, in intermediate-sized garments (such as ponchos, or the carrying cloths called *ahuayos*) the counts must be doubled, tripled or quadrupled, once, twice or several times to achieve the thread counts necessary. This practice recognizes the need to plan at a reduced scale the real size of such garments, with instruments that can be stored easily in a work basket or woven bag, together with needles and threads, and other assorted instruments. It was apparently more usual to work from baskets in the valleys and on the coast, where there were fewer animals to rear, and so you did not leave the house often. Moving around with herd animals in the highlands meant that a basket was vulnerable, whereas a woven bag (called *tapichu*), in wool or cotton, or a simple reed bag, was more practical.

Apart from these differences in scale between distinct woven products, a certain degree of standardization has led to the common practice of making three different sizes (small, medium and large) in carrying cloths, ponchos, and coca bags. Similarly the standardization of designs classifies small figures (*jisk'a salta*), intermediate figures (*taypi salta*) and large ones (*jach'a salta*). This recognition that some garments and their components are scaled down or scaled up versions of others seems to indicate the historically determined way that textile production was standardized, particularly in a tributary context, into small, medium and larger units, to which common forms of production, planning and execution could apply, much like our marketing strategies today (Arnold 2012).

Another factor to take into account in this system of standardization of measurements is that whereas a small garment, such as an *incuña* (coca cloth), is a single piece of cloth, the intermediate-sized garments of poncho or *ahuayo* tend to be made up of two similar units of cloth (*pay khallu*). These were traditionally sewn together with a central seam, in a relation of bilateral symmetry to each other (turned through 180 degrees), although in the last fifty years there are more variations on

these possibilities. These compositional criteria are integrated into the layout of the *musa waraña*, and the number of multiplications to be made.

In the three sizes of garments in warp-faced cloth, the compositional design blocks tend to be relatively standard, with just four or five units in total. In the case of an *ahuayo*, passing from one extreme of the cloth to the other across the weft, these units are the textile border (*t'irja*), the area of plain weave (*pampa*), the area of textured design (*salta*), and the groupings of wider and lesser stripes or *listas* (called *qutu*, *taniqa*, *jalsu* or *tansu* and *jalaqa* or *taniqa*), depending on the type of garment and to which of these identifiable units in the overall composition they apply. In the *ahuayo*, these units are then set out in reverse in the other half of the cloth. However, in a small *incuña* of just a single piece of cloth, the order would be border, *pampa*, *salta* and stripes, perhaps some repeats of these, and then the other border. A poncho has various repeating units of stripes across the width of the cloth.

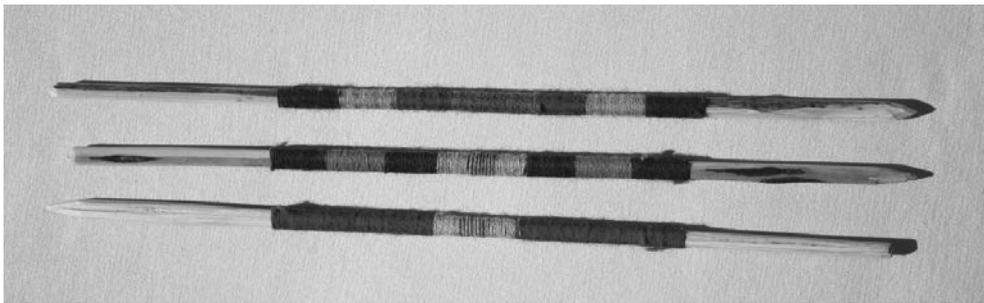


Figure 3. Contemporary *musa waraña* consisting in a colour-thread wrapped wooden rod that models the plan for one half of an *ahuayo*, or table runner.

Figure 3 shows a *musa waraña* consisting of a colour thread-wound wooden rod prepared to standardize the colour combinations in one half of an *ahuayo* to be woven by various weavers in the Qaqachaka weaving association Aptanaq, in 2009. After weaving one half, the rod is turned around for warping up the other half, and the action repeated. In practice, each weaver borrowed the rod at a convenient moment, held it horizontally, counted out the threads of each colour, “as in a bar code”, and then passed it on.

The *musa waraña*, organized in these compositional divisions, are used to plan the colour combinations in sections as they are loomed up, working from the left hand side of the weaver to the right hand side, and from the cloth border to the other side (or in the case of the larger garments to the central seam). This is usually the passage from the smaller elements of the composition, such as the border, to the larger elements of the plain-coloured and plain weave *pampa*, and *salta* design area.

In practice, if the border must have a certain quantity of coloured threads, there will be the same quantity of threads, but scaled down, wrapped around the *musa waraña* rod, followed by the thread count in the *pampa*, and finally the counts of the *salta* designs and their accompanying stripes. Each compositional block is differentiated simply on a single rod.

In more complex designs, the *waraña* is composed of a series of “steps” from a rod of short length (for the border warp counts), to middle and larger lengths for the *pampa* and *salta* warp counts respectively, giving the complex *musa waraña* their characteristic panpipe form. The *musa waraña* is read horizontally with this set of relations in mind by the weaver who intends to loom up according to the plan documented on its rods, reading from the small rod at the bottom (left to right), stepping up to the larger rods in sequence from left to right and “from small to large”.

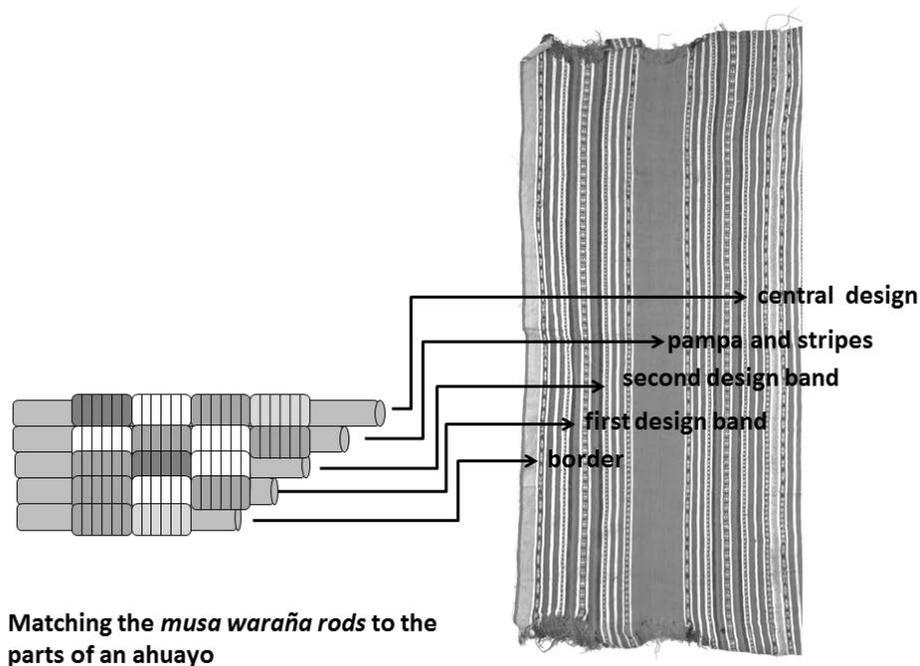


Figure 4. A complex *musa waraña* is matched to the parts of an *ahuyayo*.

Some stepped *warañas* are found in work baskets associated with weft-faced cloth. In weft-faced tapestry weaves, the design is executed by the manipulation of the weft threads, with greater freedom of choice, and in place of the 4 or 5 units of a warp-

faced cloth, there could be 10 to 20 units or more. Here, instead of organizing the colour blocks in the *warañas* in sections, as for warp-faced cloth, the colour would be worked in the compositional squares of the weft-faced designs, which can then be doubled or tripled any number of times.

5. Specialised dyers and the practice of their art

The use of the *musa waraña* colour combination models derives from a long tradition. Still a century ago, in the Charkas-Qharaqhara and Killakas-Asanaqi regions, the use of colour was highly restricted to certain classes of the population, following a common pattern throughout the Andes (Boytner 2006). Added to this, natural resources for colour production were hard to come by, and expensive to obtain.

Access to colour was controlled in specialist hands. Dyers called *tullpuycamayoc* in Quechua, and *waykuri* in Aymara (or *tiñiri* in present day Aymara) received orders from clients according to the options available. The dyers worked through their orders in batches, restricting colour use to certain sections of Andean society through their system of orders and entries, and their control of dye production and output.

The use of colours in garments was determined by the rank of the person in regional society. Doña Nicolasa identifies blues, reds and yellows as the powerful colours associated with the great lords or *mallkus* of the post-Inka Aymara and Quechua chiefdoms, called *naciones* or *señoríos* by the Spanish. Green and other colours, less associated with rank, were used as supporting colours to set off the more valued ones. The most powerful colours were the blue from indigo, and dark red from the cochineal insect, even if these were used sparingly in just a thin stripe of two warp threads, followed by yellows, also used sparingly. The whole range of colours used at that time amounted to some six colours.

According to Doña Nicolasa, the dye specialists kept records of the colours available at the time in pendant threads hanging from colour-wrapped wooden rods, also called *musa waraña*, fastened on the walls in their workshops. The requests from clients for these colours were annotated in knots on these *kipu*-like coloured threads, with some additional codification in knots for the person concerned and their community of origin. A totalizing knot on each thread, made by the dye specialist, reminded him of the number of orders for a particular colour in any one batch of dyes. See Figure 5.

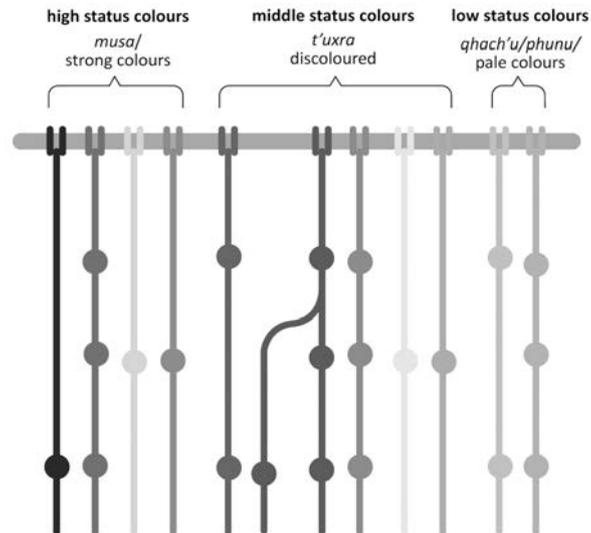


Figure 5. Possible organization of the female-domain *khipus*.

The result of this documenting process was a *khipu*-like instrument that applied to the quantities of coloured thread in the female domain of textile production. This female emphasis was evident in the use of the *musa warañã*, where warp thread counts were read with the fingernails, and not with the fingers as in the *khipus* applied to the male domain of state administration. In Andean society, women and men are considered to have their separate domains; in the region of Qaqachaka, those of men are political administration, agriculture, and music making, and those of women are weaving, herding and song making.

In practice, the dyers lived and worked in the warm valleys, where they could obtain the raw materials of dye plants (indigo and relbunium) and insects (cochineal), as well as hardwoods for modelling rods that would not bend or snap. They worked with vat dyes, using large ceramic jars to ferment and combine the colours. With sufficient requests from clients to justify a bulk process of dyeing a certain colour, they carried out blocks of work twice or three times a year. The slowest process was fermenting the raw materials before the dyes were cast, which could take months. Even then, a block of dyes undergoing fermentation could go stale, and a new batch of plants would have to be re-fermented.

The different immersions of wool in the dye vats produced distinct tones of colour. The dye mix from the first immersion produced the strongest colours (*musa*) most highly valued by the specialist's clients. The second immersion produced less

strong colours (*t'uxra*) which were valued less, and so on. So clients with fewer resources could only opt for dyed wool from the final immersions of pallid colours (called *qhach'u* or *phunu*). In the popular song line "*T'uxra jakañas mirqisi*" ("A watery colour is like life wearing out"), *t'uxra* refers to this lower status of watery colours associated with "washed out" or older people (the *mirqi*). Young people, by contrast, are associated with bright, strong colours such as red and blue, and the fullness of life and strength.

6. Textile production, colour and class

In practice, these social memories of restricting colour usage to those of a certain rank in the polities of the *señorio* period, under the control of specialist dyers at their service, imply a scenario of craft specialists tending to high status groups that is documented for other periods (Shimada 2007, Vaughn 2006). Those in power, were "select people", *apsu jaqi*, whether authorities by birth or by rotation of office, with direct knowledge of, and access to the colours available from these specialists, who provided them with these resources according to their birthrights. In contrast, a commoner from a rural herding community who wanted to use a blue or red thread, had to pay the specialist dyer. These *comunarios*, called *ina jaqi*, did not have the liberty to use the valued colours or the dyes for making them, that were compared to medicinal herbs, treasured in the same way. The same restrictions applied to access to structures and techniques, and the use of certain garments. The terminology used, of "simple" (*ina*) and "selected" (*apsu*), was applied from the textile to the social domain, to articulate the two levels into a common system.

Doña Nicolasa argued that over time the *comunarios* developed an alternative colour codification that paralleled those of the upper classes. Where the upper classes monopolized the production and use of dyed wool (called *ghatiyata* or *waykuta*, meaning literally "cooked" thread), the commoner classes came to dominate the production and use of natural raw wool colours (called *pana* or *ch'uqi*). In terms of political power relations, a chestnut brown colour (*ch'umphu*), came to be considered equivalent in status to that of a dyed blue, and an equivalent quantity of chestnut natural-coloured alpaca wool could therefore be traded directly for dyed blue wool. So chestnut coloured wool came to be valued and sought after by the commoner classes in much the same way as dyed blue wool, for example in fiestas where political power was at issue. White natural-coloured wool was considered equivalent in status to wool dyed red, and these too could be traded directly. Black natural-coloured wool was considered equivalent in status to yellow dyed wool, and natural greys to dyed greens, and these equivalents could be traded.

Apart from diminishing the status differences between elites and commoners as expressed in the use of dyed colours in the past, these colour equivalents between paired dyes and naturally coloured wool contributed to the creation of region-wide trading networks based on the need for naturally coloured wools from Altiplano herds for the dyeing processes to take place in the warmer valleys. This equivalence also contributed to the creation of an aesthetic system often expressed in a finished cloth by the location side by side of each component of the pair, for example red and white stripes are commonly found side by side. Similarly, dyed blue and natural chestnut wools are combined together in the neighbouring stripes of special garments used by regional authorities in festive settings to acknowledge political power relations. Even at the level of single threads, blue and chestnut strands, or red and white ones, are commonly combined in bichrome threads whose use over a wide area of cloth gives a pixilated effect (called *ch'imi*) to the surface of certain textiles used in marriages.

In practice, the select folk were expected to dedicate their time to these more complex weaving pursuits. They were elected as authorities with a year's, a year and a half or even two year's anticipation, to give them time to plan the garments they had to wear. Once named, they were obliged to obtain these garments, and until the outfit was complete, they could not enter the office to which they had been elected. In comparison, the *comunarios* wove as a secondary activity when they were free from chores in their main occupations of herding and agriculture, in certain months of the year, mainly from October to December. And when *comunarios* did weave, they wove simple items of dress that combined stripes with plain weave.

While the preparation and use of dyes in coloured threads was monopolized by the dyers located in the valleys, other colour specialists monopolized access to colour combinations in the warping up of certain garments, modelled in their *musa waraña*, perhaps combined with indications of the kinds of thread to be used in spinning and plying the raw materials beforehand. Doña Nicolasa insisted that these designers of colour combinations were always women, who tended to live in the highlands. Elvira compared them to the *aqlla* of the Inka period, wondering if they were perhaps their descendants. She was thinking of the women chosen from their communities at a young age to live isolated in special institutions, and dedicate their lives to weaving and making maize beer for the Inka and nobles of Inka society. Finally the weaving of complex figures was monopolized by another group of specialists, through their models of weaving designs (*salta waraña*).

Doña Nicolasa argued that these specialists limited the use of colour to certain classes in Altiplano societies through their management of style coding in elite garments, derived from their wider knowledge of the textile styles of whole regions:

Charkas, Qharaqhara and Killakas-Asanaqi for example. The style coding was expressed in the compositional designs documented in the *musa waraña*, and the weaving figures documented in the *salta waraña*.

As today, the historical *musa waraña* and *salta waraña* were obtained from these specialists for ample sums of money or else food products. Doña Nicolasa told us how it was common for a designer to charge some 50 quintals (a Spanish measure equivalent to a hundredweight) of food products, or else a whole llama, for just one model figure called *salta waraña*. In some cases, people obtained the dyes, but even then the colours were difficult to cast. Elvira recounted how the colours were so highly valued that people measured them in terms of gold. As a result, the design specialists could live the year round without carrying out any agricultural labour, simply on their income from the textile designs, which took just three months of the year to prepare.

With these trade monopolies in place, Altiplano community members were compelled to consult the specialists in long and complex journeys, following the sequence of the operational chain in textile production. First they took wool to get it spun somewhere by a skilled spinner. Then they made preliminary visit to the specialist dyers in the valleys to request an order for a certain colour. Several months later, the Altiplano dwellers returned to the dyer's workshop to collect the dyed yarn, which they had traded for the natural-coloured yarn from their herd animals. If the fermenting process had gone sour, they would have to return yet again several months later. Finally they visited the female designers in other Altiplano communities to request a particular colour combination and one of their designs. And even they had to return some weeks later to collect the *musaña* and *salta* models prepared by these specialists in the meantime.

The journeys to visit these women are still remembered today with some trepidation. Even so, these female experts were considered profound thinkers, known to contemplate their designs day and night, as planning a new design was an extremely complex task, and creation was the most valued of all human activities. The social memory of the original design specialists lives on, generations after most of them have died. Then, gradually, *comunarios* learned to take the original weaving models (*musa waraña* or *salta waraña*) prepared by these specialists and modify them in another creative act, "adding something new to the original model". This creative person could then set their own price as they negotiated the terms for passing on the modified model. The model could pass through several hands, value being added at each new creator's hands, the preferred method being to add ideas cumulatively but recognizing the genealogy of each new idea.

These female designers were probably called *warañ sawuri* “weavers of designs”. We know relatively little about them. However, a passing reference in the book *Weaving and Dyeing in Highland Ecuador* (Rowe, Miller & Meisch 2007) refers to a specialist of this kind, Doña Eliva Villacruz Vinueza, from Quero (Tungurahua province, Ecuador). Doña Eliva did spinning and warping up, but did not weave. A photo shows her proudly carrying a set of what seem to be the colour combination models called *musa waraña* (see Figure 6). Doña Eliva said she managed these rods with different patterns of stripes “so that her clients could select the colour combinations they liked”.



Figure 6. Doña Eliva Villacruz Vinueza, from Quero, Tungurahua province, Ecuador, a specialist in colour combinations with some of her models (*musa waraña*) (Rowe, Miller & Meisch 2007: 24, fig. 1.12). Slide by Leonard Evelev, 1988. Courtesy The Textile Museum Washington, DC.

7. Archaeological examples of the figure and colour combination models

These ethnographic reflections cast light on what seem to be weaving design models (*salta waraña*) and colour combinations models (*musa waraña*) in museum collections. Many of these examples are decontextualized, so studies on their use and context are made difficult. Most seem to have been found in tombs, with mummy bundles, and often in work baskets. In a few cases, we can identify the design models, called *salta waraña*, by their scale, singular use of a weaving figure, and attention to technique (see Figure 7).

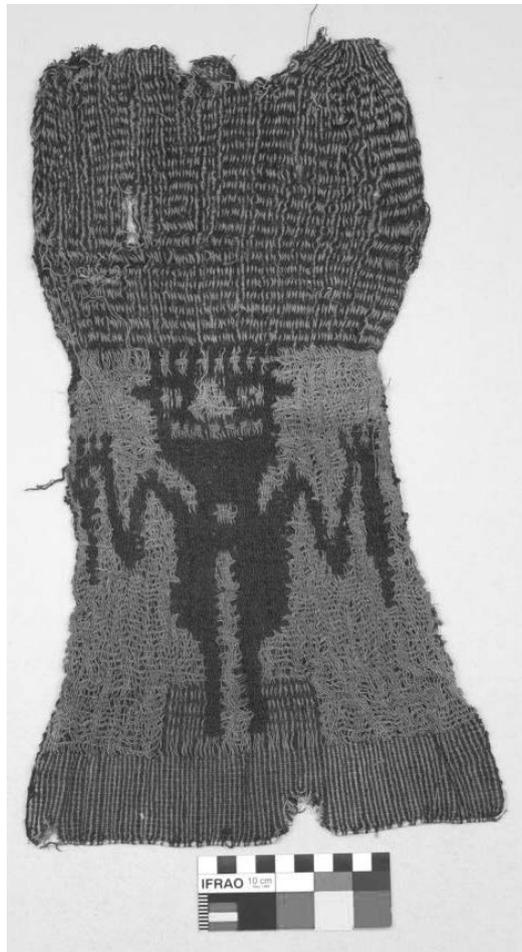


Figure 7. Possible *salta waraña*, British Museum (Am1907,0319.16).

The following decontextualized find from the Casa de Moneda Museum in Potosí, Bolivia, is a single rod *musa waraña*, probably used for warping up a warp-faced cloth. The rod is wrapped in coloured yarns of what seem to be S2Z in black (or dark blue), red and yellow:



Figure 8. Possible *musa waraña*, Casa de la Moneda Museum, Potosí, Bolivia (without register number).

In the same museum, examples of multiple and joined wooden rods, were more likely used for setting out colour combinations for weft-faced cloth. A complex colour-combination model, with what seem to be S2Z threads in black, red, white, yellow and green yarns, has six rods joined by a thicker thread interlacing between them:



Figure 9. A panpipe-like 6 wooden rod weaving instrument, Casa de la Moneda Museum, Potosí, Bolivia (without register number).

Another example from the Potosí museum consists of two larger-sized multiple rod colour-combination models (Figure 10). That on the left has 8 wooden rods in panpipe format, wrapped in coloured yarns in black, white, clear red, dark red, green and brown. The coloured blocks of yarn are placed in equal positions on each wooden rod. The model is clearly associated with weaving activities, not only by its form and possible relation to a *musa waraña*, but also by the fact that there is a large needle or bodkin attached, as well as a possible warping device, in wood, with three holes.

The model on the right has 16 wooden rods, as opposed to 8 in the first, again in a panpipe format, and wrapped in coloured yarns in black, white, red, yellow and light brown. Compared to the first example, there are fewer blocks of coloured yarn in similar positions on the different wooden rods, and the colour blocks are scattered more in position. But, as in the former example, a needle or bodkin, and a possible warping device in wood with three holes, is attached to the model. In both cases, the wooden rods are held together by a thicker beige-coloured thread that interlaces them. The likeness in the colours used and the difference between 8 and 16 rods suggests the two examples might be related. Perhaps the 8 rod example was used to plan a smaller weft-faced cloth and the more complex example a larger tapestry.



Figure 10. Two panpipe-like weaving instruments, Casa de la Moneda Museum, Potosí, Bolivia (possibly No. 59), each with a bodkin and warping instrument attached.

8. Examples from the Necropolis of Ancón

The most well-known archaeological examples of weaving instruments come from the Necropolis of Ancón, on the central Peruvian coast, found in the 19th century excavations by the German geologists Reiss and Stübel. These authors describe a series of wooden rods wrapped with coloured threads, which seem to be colour combination models (*musa waraña* in our terminology), as “weaving utensils”, adding that their purpose is unknown. Some are single wooden rods, others are sets of multiple rods, and a third type consists in sets of multiple thread-wound rods intercalated with thinner rods without any wrapping.

The first group of single thread-wound wooden rods were stuck into the ground or more rarely inserted into the mummy. Figure 11 shows a mummy with weaving rods wrapped in yarn; some have one or more tassels (in red and in yellow) hanging from one end, or conical pieces of wrapped raw cotton, which the authors call “laps”.



Figure 11. Mummy bundle with thread-wound wooden rods, from the Necropolis of Ancon (Reiss & Stübel 1880-1887: vol. 1, plate 19, fig. 1).

Some wooden rods found in the tombs have the more conventional striped blocks of coloured yarn. Others have what appear to be weaving designs, of rhomboids or braided patterns, as if to instruct users how to make these in crossed warp or braided designs of one kind or another (Reiss & Stübel 1880-1887: vol. 1, plate 19). Yet others have bicolour plied threads, wrapped in spiral form around the rod to give a barber-pole effect (vol. 1, plate 32, fig. 12).

Reiss and Stübel refer to these examples of mummy bundles with weaving instruments as “well-equipped mummies” but they do not tell us the sex of the person, and their text tends to assume the mummies are male. They also describe a child mummy with “imitation weaving instruments”, in this case with no wrapped yarns, just the wooden rod with an imitation lap attached to the end, also in wood:



Figure 12. “Imitation weaving instruments”, found with a child mummy, with just the wooden rod and an imitation lap attached to the end, in wood (Reiss & Stübel 1880-1887: vol. 1, plate 28, fig. 4).

Other examples in Ancón are sets of wooden rods, examined by Reiss and Stübel, oval in section but roughly the same length, “wound round with many-coloured wool, and connected at one end by a strip of cloth to which they are stitched” (1880-1887: vol. 3, plate 87). Although these have certain resemblances to the sets of rods in panpipe form, found in the Casa de la Moneda Museum in Potosí, it is more probable that the strip of cloth is for grouping together a set of single wooden rods as similar instruments:

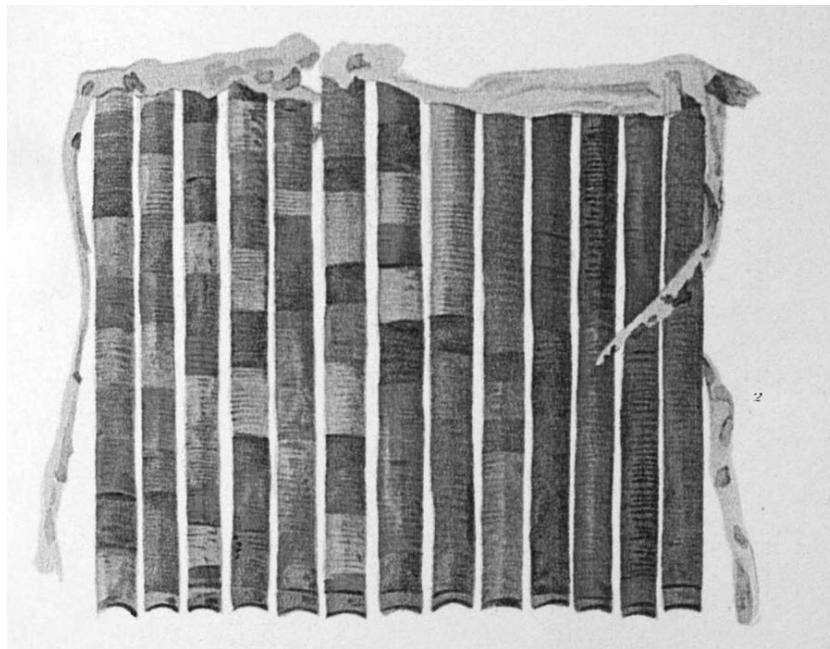


Figure 13. Weaving utensil formed of oval-section wooden rods “wound round with many-coloured wool, and connected at one end by a strip of cloth to which they are stitched” (Reiss & Stübel 1880-1887: vol. 3, plate 87, fig. 2).

A final example from Ancón combines the wooden rods with intermediate groupings of a lattice around 10 thin rods of chonta palmwood bound together with threads above, below, and in the centre (see Figure 14). For Reiss & Stübel (1880-1887: vol. 3, plate 87), this is a “weaving utensil formed of rather wide sticks spun round with wool and a lattice of thin chonta rods evenly spaced as in a carding comb”. In this case, the thin rods might have indicated the number of multiplications of each design unit. However, it is more likely that they permitted greater flexibility in rolling up the whole set of wooden rods into a bundle, easy to transport.

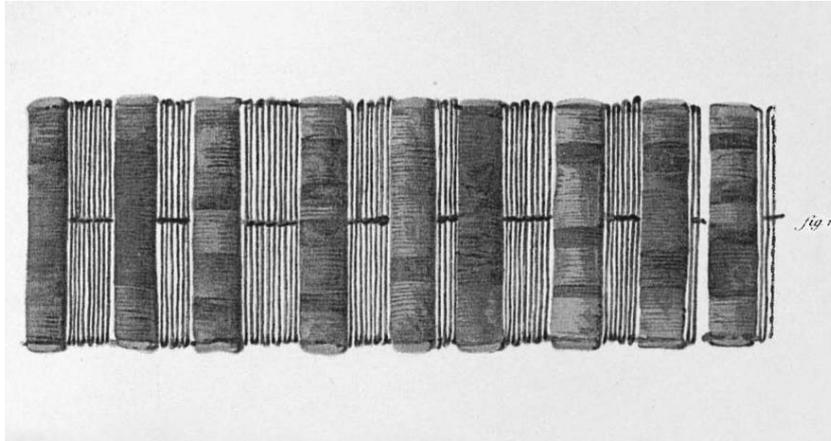


Figure 14. Weaving utensil formed of rather wide rods spun round with wool and a lattice of thin chonta rods evenly spaced as in a carding comb (Reiss & Stübel 1880-1887: vol. 3, plate 87, fig. 1).

Other weaving instruments from Ancón, such as the “winding rods” (Reiss & Stübel 1880-1887: vol. 3, plate 85, figures 9-17), “mostly embellished with elegant designs, either simply painted on, burnt on, or incised”, take up the same kinds of designs, as if to express the textile domain semiotically across a range of weaving instruments.

Examples of *musa waraña*, unrecognized, lurk in many museum collections. As a vital part of the biography of objects, they still have a lot to tell us, and they might help us work backwards to rediscover the kind of weavings planned from their instructions.

9. Conclusion

In order to go beyond the idea of a finished textile as text, we have broadened our analysis to view textiles not only as complete artifacts but also as complex composite objects in a state of dynamic construction, and then in dynamic decomposition and possible reuse. As part of such wider processes of dynamic construction in the past, textiles were essential resources in state-wide productive and tributary cycles, where textile production processes were carefully controlled, planned and documented. This documentation process was carried out in instruments closely associated with the textile domain, such as the *waraña*. In this sense, we locate textiles with *kipus* in this wider set of instruments concerned with documenting particular spheres of activity, such as the production phases of the textile domain. New finds in Caral

(Peru), with some 4000 years of antiquity, suggest that *kipu* origins, with *waraña*-like features, owe as much to planning the textile domain as any other (Mann 2005).

A key facet of this reconsideration is the practical way that the formal properties of the instruments used to document textile processes were articulated with the formal properties of the cultural schema to which they applied. The ethnographic evidence presented here suggests how the formal properties of the *waraña* as historical media for documenting textile production (in colour organization and coding of warp counts in the design blocks of particular garments) were intercalated with referents in the cultural domain (in colour equivalences in raw and dyed wools, relations between colour and class and age groups, or between tonality and altitude).

The overall impression given by this former system of organization is one of control, hierarchy and specializations to serve that hierarchy. As a corollary, a series of restrictions prohibited commoner populations access to colour dyes, use of colour or figuration. This would suggest that only in the last fifty years or so has weaving practice become “democratic”, with access to colour dyes, colour use, and design figuration available to all.

In part, these changes from an elite system to a more democratic one occurred internally, through the accumulated experience of disseminating technical knowledge gradually at a community level rather than in specialist hands. Other changes occurred as part of world-wide technological trends, with the introduction from outside of artificial dyes from Europe in the nineteenth century, and their lowering in price in the twentieth century, undermining the former elites and the specialists under their charge. In parallel, the costly and powerful colours dyed with indigo and cochineal gave way to the welcome introduction of new colourfast aniline ranges we know today, where reds, blues and yellows are available to all, despite class or age. Finally, in the last two generations, the introduction of acrylic wool from Mexico has banished natural dyes, and even the need for dyeing knowledge at a communal level, to social memory. Meanwhile the former region-wide trading systems of raw for dyed wool, and food products for design knowledge, has been undermined irredeemably. Even the camelid herds are becoming scarce, their uses for yarn having been on the wane for decades. Only a few NGO efforts, seeking to reverse the environmental damage caused by industrial dyes, have introduced projects in the region to recuperate the natural dyes of the past. However, this *novoandino* trend now takes the pale for the beautiful. And, interestingly, most of these efforts take for granted that weaving knowledge is widely disseminated communal practice.

This situation calls into question the recent trends, from the 1970s onward, in the lexicon of textile collectors and other experts on the region to speak of “Aymara” or “Quechua” textiles, as if there were generalized weaving traditions practiced by

all. This trend arises as a part of anthropological jargon, combined with a leftist turn of the times towards rural Andean communities, in search of communal values lost elsewhere. From the evidence presented here, this recent trend, with textiles being perceived of as a part of “communal practice” is as much a product of modernity as are the aniline dyes and acrylic wools they seek to replace.

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