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The Origins and Development of Textile Writing in Peru

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THE ORIGINS AND DEVELOPMENT OF TEXTILE WRITING IN PERU

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THESIS

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The Origins and Development of Textile Writing in Peru

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Abstract

Scholars once considered Inka khipus (14th-16th CE) to be a technological development unique to the Inka Empire. We now know that the earlier central Andean Wari (6th-11th CE) also made use of khipus, calling into question the Inka primacy of the technology. Understanding the origins and transformation of khipu notation in the Andes sheds light on the ways that information technologies figured into Andean state formation and administration, and impacts larger understandings of how tactile notational systems develop into writing and information storage. This study articulates how, just as the Inka inherited khipu technology from the Wari, the Wari were themselves heirs to technological traditions deriving from textile-based means of information storage and transmission originally from the South Coast Paracas and Nasca area (c.800BCE – 800CE). Here, I trace the physical evidence and processes by which specialized weaving aids from very early times may have been modified into more generalized information carriers.

Table of Contents

Table of Contents

I. Introduction

In the years since the first Spanish contact with the Inkas, scholars have marveled at the ingenuity of the Inca invention of khipu knotted string records; a highly accurate, albeit, unusual way of recording information. <Figure 1. Inca Khipu> The Inkas were generally assumed to have been unique among their Andean neighbors in having such a system of information storage and exchange, even if the exact scope and nature of that system remained a subject of debate. The majority of khipu feature regularized rows of knots that seem to reflect a decimal arrangement of numerical values. Some khipus however, particularly those featuring bright thread wrapping at the tops of their pendant cords do not seem to use a decimal system of organization. Over the past several decades scholars have come to realize through a combination of radiocarbon dating and archaeological finds that some khipus belong not to the Inka empire but to that of the earlier Wari.[1] <Figure 2. Wari Khipu>. This raises serious questions about the primacy and singularity of Inka khipus as a technological innovation.

I hypothesize in what follows that the technological foundation of Inka khipus, as carriers of specific kinds of information can be traced deep into the cultural history of the Peruvian South Coast and South-Central Highlands to what was essentially a specialized class of weaving tool. These weaving tools can be related not only to khipus and similar forms of notation, but also to weaving aids still in use among Andean peoples. The development of these weaving aids into a more complex system of information storage and exchange, what I refer to as 'textile writing',

[1] William J. Conklin, "The Information System of Middle Horizon Quipus," *Annals of the New York Academy of Sciences* 385, no. 1 (1982): 267-268, 271.
Gary Urton, "From Middle Horizon Cord-keeping to the Rise of Inka Khipus in the Central Andes," *Antiquity* 88 (2014): 207-209.

are tied to a suite of social pressures that arose in the Andes during the same long period of time. By textile writing, I mean a tradition and technological matrix that encompasses not only the relatively well-known Inca khipu and the earlier Wari, but also related objects such as wrapped batons, staffs and other devices that made use of color, cords, knots, and loops, in order to contain information. All of these elements of textile production came to assume great socio-cultural importance in Peru at an early date, as I shall explain.

Textile based systems of information storage and transfer show great antiquity in the Andes and Coastal Regions of Peru and surrounding nations of South America. Textiles predate ceramic production in Peru by millennia. Fiber and textiles were adapted to a wide range of functional tasks in the Early Formative Period. During the Cotton Pre-ceramic Period complex chiefdoms constructed large ceremonial complexes on the arid Peruvian coast without the aid of ceramic technology. For example, they adapted fiber arts at an early date as an element of architecture, in the form of *shicra* construction.[2] This technique involved the use of stone fill held together as a larger unit by a textile netted bag.[3] <Figure 3. Shicra bags> Such bags created 'bricks' of fill and thus enabled easier construction of massive ceremonial architecture. Knotting, looping, twining, sewing and basic weaving all were textile forms mastered in antiquity, setting a cultural precedent for how textile arts later developed.[4]

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[2] Michael E. Moseley, *The Incas and Their Ancestors: The Archaeology of Peru,* Revised edition (London: Thames and Hudson, 2001), 118.
Rebecca R. Stone, *Art Of The Andes: From Chavín To Inca,* Third edition (London: Thames and Hudson, 2012), 28.
[3] Moseley, *The Incas*, 118.
[4] José Antonio de Lavalle and José Alejandro González García eds., *The Textile Art of Peru* (Lima: L.L. Editores and Industria Textil Piura S.A., 1991), 17-19.
Rebecca Stone-Miller, *To Weave For The Sun* (New York: Thames and Hudson, 1992), 13-14.
Stone, "Art of the Andes," 21-26.

As early as 800 BCE on the South Coast of Peru, with the emergence of Paracas culture, wrapped batons and staffs appearing in the archeological record suggest the deliberate use of patterning as a communication medium. I argue that wrapped batons used as parts of complex weaving in early South Coast Paracas were the original textile information carriers, an outgrowth of specialized craft production that changed and evolved over time to ultimately become the knotted string records for which the Inka are famous. At some point, likely between the Early and Middle Horizon (roughly 6th C. CE), the technology of textile planning and design made an adaptive jump to being used as a technology for the encoding of other potential information. This sparked off the evolutionary development of textile writing technologies eventually arriving at the khipu of the Wari and Inka periods.

My argument therefore rests on the following assertions: Textile based carriers of information are visible in the archaeological record as early as the Paracas Period on the South Coast, precedents for the development of non-phonetic notational device exist elsewhere in the world, and certain kinds of social pressures may account for this particular technological evolution in the South-Central Andes at this particular moment in time.

II. Inka and Wari Khipus and Their Predecessors

The earliest Spanish conquistadors to arrive in Peru as well as virtually all of the early 16th and 17th century chroniclers of the history and society of pre-Colonial Peru made note of the Inka use of knotted string-based recording devices which the Inka referred to as khipu in Quechua,

meaning knot.[5] Those who read or interpreted these string records were referred to as quipucamayoc which the Spanish chroniclers usually glossed as "contador".[6] <Figure 4. Quipucamayoc> These administrators made use of khipus, we are told by the Spanish, for various purposes including but not limited to: keeping records related to taxation and tribute, census information, and even to record historical and biographical information.[7]

Khipus were therefore of great interest to the Spanish of the early- and mid-colonial periods for several reasons. They held the records of the Inka administrative system including information concerning taxation and tribute collection which would have been of importance to the new overseers of Peru.[8] They also represented both a potential means of evangelization as well as the threat of "idolatry" and religious non-compliance.[9] It is no surprise then that khipus figured frequently in many early colonial legal cases as evidence. Quipucamayocs were often called upon as witnesses to consult quipus to provide information in such cases.[10]

In later centuries khipus came to be an object surrounded by an aura of mystery. In 1827 James Phair would write, *A prospectus of a Quipola* concerning khipus as objects which could potentially convey a great deal of lost information concerning the Inka but that could also convey

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[5] Galen Brokaw, *A History of the Khipu* (New York, NY: Cambridge University Press, 2010), 128-143.
Gary Urton, *Signs Of The Inca Khipu* (Austin, TX: University of Texas Press, 2003), 1-4.
[6] Viviana Moscovich, "El Khipu Kamayuq: ¿Mito O Realidad?," in *Sistemas De Notación Inca: Quipu Y Tocapu; Actas Del Simposio Internacional Lima 15-17 De Enero De 2009,* ed. Carmen Arellano Hoffmann (Lima: Ministerio De Cultura, 2009), 101, 104-105.
[7] Brokaw, *History of the Khipu,* 184.
Sabine Hyland, "Writing with Twisted Cords: The Inscriptive Capacity of Andean Khipus," *Current Anthropology* 58, no. 3 (June 2017): 412.
Urton, *Signs*, 14, 30.
[8] Brokaw, *History of the Khipu,* 178-179, 183-198, 204-206.
[9] Brokaw, *History of the Khipu,* 220-234.
[10] Brokaw, *History of the Khipu*, 196, 198, 200-204.

"nothing", presumably because Europeans had no way to read them.[11] By the early 20th century when scholars like Locke and Nordenskiöld were investigating the khipu the scholarly consensus had swung more decisively to the conclusion that khipus were mnemonic devices rather than true examples of "writing'' or record keeping as the Spanish of the early colonial period had considered them.[12]

The Inka use of the khipu was highly organized and deeply tied into the administration of their vast empire.[13] Accordingly, and as a consequence of this, expertise surrounding the usage of khipus disappeared relatively quickly after the Spanish conquest, their usage being largely supplanted by alphabetic writing within several generations.[14] This process of forgetting was probably hastened by the specific way in which the Inka had tied together learning to read the khipu with inculcation into imperial propaganda, by teaching elite quipucamocs at a special school in Cusco that did not survive the Spanish conquest.[15]

The Inka Empire's use of khipu as a key part of their administration has been documented since the earliest days of contact with the Spanish. The Inka trained many elite users of the

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[11] Veronica Lysaght, "Knotted Numbers, Mnemonics, and Narratives: Khipu Scholarship and the Search for the "Khipu Code" throughout the Twentieth and Twenty First Century" (Master's Thesis, University of Toledo, 2016), 20-21.
[12] Lysaght, "Knotted Numbers," 21-34.
[13] Although there were presumably regional and ethnic differences in khipu conventions throughout the vast Inka Empire.
Gary Urton and Carrie J. Brezine, "Khipu Typologies," in *Their Way of Writing : Scripts, Signs, and Pictographies in Pre-Columbian America*, ed. Elizabeth Hill Boone and Gary Urton (Washington D.C.: Dumbarton Oaks Research Library and Collection, 2011), 319, 326-328, 334-337, 340-344.
[14] Brokaw, *History of the Khipu*, 22-23.
[15] Moscovich, "El Khipu Kamayuk," 114.

khipu, quipucamayoc, in a centralized and standardized way.[16] Khipus containing detailed records of crops, herds, population census, tax levies and other kinds of imperial information were borne across the length and breadth of Tawantinsuyu by *chasqui* couriers.[17]In addition to adopting textile writing technologies from earlier cultures their administration emulated other aspects of earlier cultures, including the use of centralized storage complexes. Much of the famous Inka road system was grafted onto earlier Andean travel routes.[18] In addition, Inka religion resembled earlier Peruvian systems in various ways, including the veneration of ancestors, sacred *huaca* sites and the cultural importance of staffs as symbols of authority.[22]

According to Gary Urton, Inka khipu operated as a 7-bit binary array.[19] This means that each pendant cord contained seven binary bits or kernels of information that could either be ”on” or ”off”. <Figure 5. Inka Khipu Diagram> Accordingly, Inka khipu would have contained information in at least the following elements of their construction. The attachment direction of their pendant cords, recto or verso; the spin/ply of the pendant cords; the coloration of the pendant

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[16] Moscavich, “El Khipu Kamayuk,” 114.
Viviana Ruth Moscovich, “La Educación de los *quipucamayocs* ¿Formación de una idealogía imperial común entre los señores del Cuzco y las élites provincianas?,” in *El Inca y la huaca: La religión del poder y el poder de la religión en el mundo andino antiguo*, ed. Marco Curatola Petrocchi and Jan Szeminski (Lima: Fondo Editorial, Pontificia Universidad Católica del Perú, 2016), 209-211.

[17] This practice was possibly inherited from North Coast cultures following the Inka conquest of the Chimu State in the 1470s.
Tarmo Kulmar, “On the Writing Systems of Ancient Peru: the Possibility of the Quellca and the Quipu as an Instrument of Power of the Incas,” *Electronic Journal of Folklore* (2008), 136-137.
Rafael Larco Hoyle, *Los Mochicas Tomo II* (Lima: Empresa Editorial “Rimac” S.A., 1939), 86-88, 95, 106.
Rafael Larco Hoyle, *Los Mochicas: (Pre-Chimu, de Uhle y Early Chimu, de Kroeber)* (Buenos Aires: Sociedad Geografica Americana, 1945), 42.

[18]Katharina J. Schreiber, “The Association Between Roads and Polities: evidence for Wari roads in Peru,” in *Ancient Road Networks and Settlement Hierarchies in the New World,* ed. Charles D. Trombold (Cambridge: Cambridge University Press, 1991), 251-252.

[19] Urton, *Signs*, 114.

cords with individual colors belonging to color groups of associated colors; the material used in a given pendant cord, cotton or wool; the directionality of a given knot, either Z or S construction.[20] The spin or ply of the pendant cords of a khipu and their knot direction can be characterized as either Z or S spun depending on what letter the cords resemble when looked at; either an S or a Z. Inka cultural norms as they related to khipu construction would usually dictate one value as the normal or unmarked value and the other as the exceptional or marked value.[21] In addition to these binary or otherwise non-numeric elements of khipu construction such as color and ply, Inka khipus contained both numeric information in their knots according to the familiar base 10 system of numbers as well as ”extra-numeric” information.[22]

Inka khipu always consist of a primary cord with various pendant cords suspended from it. Inka khipus also featured top cords which often provided a summation of the values of several pendant cords.[23] In addition, the pendant cords of Inka khipus could themselves feature pendant cords suspended from them rather than from the main cord. These cords are referred to as subsidiary cords.[24] As I mention above, various elements of these pendant cords in addition to their knots decimal values could have held data. In addition, the numbers recorded on a given pendant cord or set of pendant cords may have operated in certain contexts as labels rather than

[20] Urton, *Signs*, 60-88.
[21] Urton, *Signs*, 46-48, 144-147.
[22] Brokaw, *History of the Khipu*, 3.
[23] Urton, *Signs*, 4-6.
[24] Urton, *Signs*, 4-6.

numbers of objects.[25] This is similar to the way in which a ZIP code stands in for a place or that an ISBN represents a given book.[26]

Wari khipu, like their later Inka period counterparts, were highly developed and intricate tools of information storage and exchange. In contrast to Inka khipus, Wari khipus could take 2 basic forms rather than the singular format used by Inka khipu makers. These were a format resembling the Inka khipu with pendant cords suspended from a primary cord and another format called a "loop and branch" khipu which consisted of a looped primary cord which formed a circle and one or more pendant cords with subsidiary cords grouped together on one end of the loop.[27] Wari khipus do not make use of the decimal organization scheme of Inka khipu.[28]

The Inka were not the first multiethnic conquest-based Andean empire. They were proceeded by the earlier Wari who influenced, and in many cases seem to have directly administered, a large swathe of Andean and Coastal Peru during the Middle Horizon Period during the later half of the first millenium CE.[29] In the 1970s and 1980s evidence began to emerge that confirmed that the Wari administered their domains with the aid of the khipu. While Wari style khipu differ from Inka khipus in formal characteristics they shared a vast potential "inscriptive"

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[25] Urton, *Signs*, 32.
[26] Marcia Ascher, "Labels, Structure, and Format," in *Narrative Threads : accounting and recounting in Andean Khipu*, ed. Jeffrey Quilter and Gary Urton (Austin: University of Texas Press, 2002), 87-89
[27] Urton, "From Middle Horizon cord-keeping," 210-215
[28] Urton, "From Middle Horizon cord-keeping," 205, 216
[29] Katharina J. Schreiber, *Wari Imperialism in Middle Horizon Peru* (Ann Arbor: Museum of Anthropology, University of Michigan, 1992), 94-112.

capacity with their later cousins. Wari khipu enter the archaeological record in the 7th or 8th century fully formed as it were as information storage devices.

The Wari originated in the Central Andes roughly simultaneously with the beginning of the Middle Horizon Period or circa 600 CE. They are usually considered to have been a conquest state that exercised territorial control over a wide swathe of the Andean region like the later Inka.[30] Both their appearance in the archaeological record and their evident decline and the abandonment of many of their centers of settlement and storage were quite rapid occurring over a span of only 2 to 4 centuries.[31] They are known to have had cultural ties to the coastal Nazca culture as well as being an influence on the later Inka civilization.[32] Many Inka roads run nearby to Wari sites and settlements.[33] A variety of primary Wari sites such as Pikillacta and Virakochapampa have been excavated as well as sites with evidence of Wari settlement or contact like Pataraya on the South Coast.[34]<Figure 6 Pikillacta> Despite what we know about the Wari as a religious, military, and economic power engaged in widespread territorial expansion, long distance trade, and religious innovation and expression on a grand scale many questions about how they arose remain unanswered.

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[30] Schreiber, *Wari Imperialism*, 3-26, 82-83, 85-94.
[31] Dorothy Menzel, "Style and Time in The Middle Horizon," *Ñawpa Pacha: Journal of Andean Archaeology*, no. 2 (1964): 72.
Schreiber, *Wari Imperialism*, 275-276.
[32] Menzel, "Style and Time," 66, 68-69, 71-73.
Schreiber, *Wari Imperialism*, 107-112, 281-283.
[33] John Hyslop, *The Inka Road System* (New York: Institute of Andean Research, 1984), 249, 270-272.
Schreiber, "The Association Between Roads and Polities," 247, 249.
[34] Matthew J. Edwards and Katharina Schreiber, "Pataraya: The Archaeology of a Wari Outpost in Nasca," *Latin American Antiquity* 25, no. 2 (2014): 219.

As the administrators of a vast empire, the Wari, would have needed tools to aid in planning and administering their domains. This would have included the management of large warehouses and storage complexes, military outposts, and trade networks and systems of exchange. This requirement for information management was met by the Wari use of khipu. It remains a subject of debate to what extent the Wari were a relatively "secular" state in contrast to earlier presumably more theocratically minded civilizations of the region such as Chavín.[35] Also subject to no small degree of confusion is the relationship between the Wari state and their southern neighbors the Tiwanaku civilization centered on its eponymous type site at the Southern end of Lake Titicaca.[36] Yet, regardless of the exact relationship, it seems clear that Wari was able to subjugate a large territory in the South and Central Ands, probably including the South Coast area of Paracas and Nasca by around the 7th or 8th century.[37] Archaeological evidence indicates widespread military installations, evidence of centralized control, and regional administrative centers.[38] The art of the early Wari of the Middle Horizon in the 6th through 8th centuries were highly influenced by Nasca art and culture.[39] Menzel argues that this influence began seemingly as a veneration for the Nasca as a kind of "high culture" viewed by the Wari as having value

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[35] Jonathan Haas, "The exercise of power in early Andean state development," in *The origins and development of the Andean state*, edited by Jonathan Haas, Shelia Pozorski, and Thomas Pozorski (Cambridge: Cambridge University Press, 1987), 34-35.
[36] Schreiber, *Wari Imperialism*, 72-74, 76, 78-79, 279-281.
Patrick Ryan Williams, "Cerro Baúl: A Wari Center on the Tiwanaku Frontier," *Latin American Antiquity* 12, no. 1 (2001): 67-70.
[37] Christina A. Conlee, "Nasca and Wari: Local Opportunism and Colonial Ties During the Middle Horizon," in *Beyond Wari Walls*, ed. Justin Jennings (Albuquerque: University of New Mexico Press, 2010), 98.
Menzel, "Style and Time," 68-73.
[38] Brokaw, *History of the Khipu,* 77-83.
[39] Conlee, "Nasca and Wari," 96.
Menzel, "Style and Time," 66, 68-70.

and importance, seen as a kind of ancestor culture.[40] Later the Wari would come to assert direct and indirect influence on the Nazca region as part of their imperial expansion.[41] Both phases of Wari interaction with the South Coast could have yielded the exchange of important ideas and technologies as well as the documented exchange of goods and iconographic schemes and preferences.

While the Wari were a highland society, they had a great deal of interaction with the Central Coast and especially the South Coast of Peru. Early on the Wari seem to have been greatly influenced by the culture, ideology, and iconography of the Nasca. This is evidenced in several aspects of Wari society from the practice of trophy head taking to a major influence on early Wari ceramics from those of the late Nasca.[42] These influences seem to have had their origin in shared ideological and possibly religious precepts held in common between the Nasca and the Wari.[43] Wari textiles also are closely related to the textiles of the late Nasca.[44] This influence is worth noting when exploring the question of a transmission of textile writing technologies from the Nasca to the Wari.

The colorful Wari khipus do not feature knots recording numeric information in the decimal and hierarchical placement scheme for knots exhibited by Inka khipus.[45] Most distinctively,

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[40] Conlee, "Nasca and Wari," 96.
Menzel, "Style and Time," 66-67.
[41] Conlee, "Nasca and Wari," 98.
Menzel, "Style and Time," 70-71.
[42] Menzel, "Style and Time," 66.
Tiffiny A. Tung and Kelly J. Knudson, "Social Identities and Geographical Origins of Trophy Heads from Conchopata, Peru" *Current Anthropology* (October 1, 2008): 915
[43] Menzel, "Style and Time," 66.
[44] José Antonio de Lavalle Vargas and Rosario de Lavalle de Cárdenas eds., *Tejidos Milenarios del Peru* (Lima: Integra AFP, 1999), 144.
[45] Urton, "From Middle Horizon cord-keeping," 207, 217.

Wari khipus feature thread wrapping around the top segments of their pendant cords.[46] This ties them visually and conceptually to earlier forms of textile notation, like wrapped batons and staffs which also used thread wrapping in the storage of information, a feature that seems to place them at a transitional phase between wrapped sticks as special use weaving tools and later Inka multi-purpose recording devices.

Most Wari pendant khipus seem to be non-numeric containing no knots or only lone overhand knots, in contrast to Inka khipus, signaling perhaps a different set of informational tasks. Among those Wari khipus with apparent numeric content, that information seems to be recorded using a quinary system.[47] This is mainly the case in loop and branch type khipus. This represents a major difference between Wari and later Inka khipus and suggests a distinctively different socio-linguistic base for Wari society than that of the later Inka and may give a clue to the language family which the Wari elite spoke.

Quechua, the lingua franca of the Inka empire, and Puquina, the likely original language of the Inka ruling class, both are base 10 number systems.[48] In Colonial and Modern times, Aymara languages also use a base 10 number system.[49] However, number words in Aymara for numbers from 6 to 8 are loan words and the word for 9 is ”almost 10” implying that Aymara was in earlier times the language of a people using a quinary number system.[50] This implies that the Wari elite spoke an Aymara language and may also represent an additional connection between the Wari and the South Coast of Peru. While we do not know what language was spoken

[46] Conklin, “The Information System,“ 267.
[47] Urton, “From Middle Horizon cord-keeping,“ 205, 213-215.
[48] Urton, “From Middle Horizon cord-keeping,“ 217-219.
[49] Urton, “From Middle Horizon cord-keeping,“ 217-218.
[50] Urton, “From Middle Horizon cord-keeping,“ 218.

by the Nazca Culture it is clear that Aymara languages once had a much wider, and more northerly distribution that they have at present.[51] It is possible that the Nazca could have spoken a language related to that of the Wari which would in part explain some of their ties to the highland people. In addition, it would render the ”translation” of the communicative medium of textile writing easier if it was not being repurposed to work for a completely different language family.

While this may have been the case for the transmission of textile communication technology from the Nazca to the Wari, it was not the case for the transmission of textile communication systems to the Inka in the post-Wari highlands of Peru. In the several centuries between the fall of the Wari state and the rise of the Inka Empire, a switch must have been made in khipu technology from a quinary Aymara number system to a Puquina/Quechua decimal system.[52] It is not known precisely when this switch was made, nor when khipus lost their thread wrapping, but at some point during these centuries khipus came to be more focused on the presentation of numerical data.

Although the Inka may have obtained their basic understanding of khipus from Wari predecessors, the Wari themselves were heir to a long history of information technology based on textiles. This cultural trajectory can be seen as early as 800 BCE on the South Coast of Peru. A

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[51] It is also possible that the Wari spoke Quechua.
Mathias Urban, “Is There a Central Andean Linguistic Area? A View from the Perspective of the “Minor” Languages,” *Journal of Language Contact* 12, no. 2 (14 August, 2019): 276.
Urton, “From Middle Horizon cord-keeping,” 220.
[52] Urton, “From Middle Horizon cord-keeping,“ 218-220.

well-studied area of the south coast is the very dry Paracas Peninsula and its surrounding environs. The Paracas culture, which flourished between 800 BCE and 100 BCE are known for their exemplary textile production. Preservation of these textiles has been made possible by the extremely arid climate of the region. Weavers of the Paracas culture and the succeeding Nasca culture of the South Coast were pioneers in weaving and embroidery.[53] Status and symbolism came to be attached to certain colors and patterns for the Paracas and later Nazca peoples. The textile virtuosity of the Paracas and Nazca people built on deep cultural and technological foundations in Peru.

The earliest textile production in Peru consisted of reed mats.[54] Later during the Cotton Pre-Ceramic Period spun cotton became the primary material for textile production.[55] It is during this period that textiles greatly increased in complexity. A variety of dyes began to be used as well as camelid fiber thread.[56] Among these dyes is the earliest documented use of indigo as a dye, discovered at the site of Huaca Prieta and dated to approximately 4,000 BCE.[57] From an early time, textiles were used for the expression of iconography. Many of the earliest textile fragments with surviving figural imagery depict animals.[58] Near the end of the Initial Period, an increasing emphasis seems to have been placed on the accumulation of individual wealth and

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[53] Stone-Miller, *To Weave*, 25, 27.
[54] de Lavalle Vargas and de Lavalle de Cárdenas, *Tejidos Milenarios*, *15*-16.
[55] Stone, *Art of the Andes*, 24-26.
Stone Miller, *To Weave*, 13-14.
[56] Stone Miller, *To Weave*, 14.
de Lavalle Vargas and de Lavalle de Cárdenas, *Tejidos Milenarios*, 16-17.
[57] Jeffrey Splitstoser, "Early pre-Hispanic use of indigo blue in Peru," *Science Advances* 2, no. 9 (14 September, 2016): 1-4.
[58] Stone, *Art of the Andes*, 25-26.

status objects by the elite.[59] This shift is reflected in increased complexity of textile production both in terms of imagery and technical aspects in the textiles of the Early Horizon.

It is with the Early Horizon Period that textiles greatly increase in complexity and enter the archaeological record in greater numbers as is exemplified by the Chavín style or Chavín influenced textiles from the South Coast site of Karwa.[60] <Figure 7. Karwa Textile> Early Horizon textiles of the Chavín style make use of painting on the surface of the textile to create complex iconographic schemes similar to those of the monumental art of the primary Chavín center of Chavín de Huantar.[61] In addition to painting, Early Horizon textiles also make significant use of thread wrapping in their construction.[62] With the innovations of thread wrapping and painting, Early Horizon textile artists could make large textiles with complex designs relatively quickly when compared to the textile artists of earlier eras.

While no khipus are known from the Early Horizon, it is clear that Early Horizon cultures of the South Coast placed great importance upon loops, wrapping, and knots. As mentioned, they utilized wrapping in their textile production. Loops were a well-established element of their canon of artistic modules.[63] It has been proposed by Conklin, that it is in the Early Horizon

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[59] Tom D. Dillehay, "Economic Exchange, Mobility, and Order in the Andes," in *Merchants, Markets and Exchange in the Pre-Columbian World*, eds. Kenneth G. Hirth and Joanne Pillsbury (Washington D.C.: Dumbarton Oaks Research Library and Collection, 2013) 288-289.
[60] Katherine A. Kosearas, "The Staff Bearer: Chavín to Karwa in Peruvian Textile Art" (MA thesis, California State University Las Angeles, 2013), 4, 33.
[61] William J. Conklin, "The Culture of Chavín Textiles," in *Chavín: art, architecture, and culture*, ed. William J. Conklin and Jeffrey Quilter (has Las Angeles: Cotsen Institute Of Archaeology, 2008), 264-265, 267-268.
[62] Conklin, "The Culture," 263-264.
[63] Conklin, "The Culture," 275.

Period in which lay the foundations for the later development of textile-based information storage media with its use of wrapping and knots.[64] Early Paracas art was highly influenced by the artwork of the preceding Early Horizon Period.[65]

During the late Paracas period stratigraphically corresponding with the Ocucaje ceramic sequence Phase 9 we find the first archaeological examples of textile information tools.[66] <Figure 8. Paracas Wrapped Batons> This is in the form of wrapped batons from the site of Cerrillos discovered in 2003 by the excavators Mercedes Delgado and Dwight Wallace and studied in detail by Jeffrey Splitstoser.[67] Consisting of 7 complete wooden batons and the remains of what could represent 2 or 3 other examples, the group was found in a funerary context with an adult individual buried nearby.[68] The batons were discovered in association with round baskets and combs and other weaving implements.[69]The batons have an average length of 47cm and an average diameter of 4cm with a pointed end that is slightly thicker than the other end.[70] Only one of the batons was painted, in a gunmetal blue color.[71] This baton was wrapped in pieces of textile that possible represent the earliest known example of the use of complementary wefts.[72] The

[64] Conklin, "The Culture," 275.
[65] de Lavalle Vargas and de Lavalle de Cárdenas, *Tejidos Milenarios*, *143*-144.
[66] Jeffrey Splitstoser, "Practice and Meaning in Spiral-wrapped Batons and Cords from Cerrillos, a Late Paracas Site in the Ica Valley, Peru," In *Textiles Technical Practice and Power in the Andes,* ed. Denise Y. Arnold and Penny Dransart (London, England: Archetype Publications, 2014), 47-49.
[67] Splitstoser, "Practice," 46.
[68] Splitstoser, "Practice," 46-58.
[69] Splitstoser, "Practice," 51, 53.
[70] Splitstoser, "Practice," 49.
[71] Splitstoser, "Practice," 49.
[72] Splitstoser, "Practice," 49.

other 6 batons were spiral wrapped in camelid-hair yarns.[73] Suspended from these wrapped batons were pendant cords, themselves constructed using techniques of wrapping and with long fringes at their ends, up to half the length of the pendant cord.[74]

Paracas and Nazca textiles and embroidery are among the most complex in the world. The production of such intricate textiles would have required a high degree of planning and counting in terms of counting threads and the maintenance of symmetry and pattern in terms not only of size but also color. Nazca weavers used patterned symmetry to endow the figures in their textiles with motion according to schemes of categorization according to typologies of animals and humanoid beings.[75] Nazca weavers used a range of directional oppositions in the production of their textiles.[76] This granted Nazca textiles a kind of inherent binary structure or syntax similar to that evident in later khipus. In addition the format of the ancient looms used by cultures like the Nazca or Wari and the process by which those looms were used themselves resemble khipus. <Figure 9. Wari Loom> When weaving the heading cord is analogous to the main cord of a khipu and the warp, where the image on a textile is created, is analogous to the pendant cords of the khipu which is the primary information bearing component of the khipu.

The Cerrillos baton groups are at the present moment unique survivals within the archeological record. Similar objects are however depicted in Paracas art which seem to be related to

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[73] Splitstoser, "Practice," 49.
[74] Splitstoser, "Practice," 50-54.
[75] Mary Frame, "Motion Pictures: Symmetry as Animator, Classifier, and Syntax in the Nasca Embroideries of Peru," in *Symmetry Comes of Age*, eds. Dorothy K. Washburn and Donald W. Crowe (Seattle: University of Washington Press, 2004), 133, 137-166.
[76] Frame, "Motion Pictures," 164-168.

other classes of objects. Wrapped staffs and batons were also associated during the Paracas period with trophy heads, slings, and fans.[77] Numerous Paracas textiles also depict wrapped batons of a similar description to those found at Cerrillos.[78] These Paracas examples seem to be more akin to the size of the Cerrillos wrapped batons rather than larger staffs as are shown in the Chavín style artwork.[79] Later depictions of wrapped batons also exist within the corpus of Nazca art. Figures shown carrying wrapped batons in Paracas art are often also carrying a sling, a fan, or a trophy head.[80] Slings and fans could have represented a authority symbols and like wrapped batons made use of spiral wrapping in their construction.[81] The precise associations of trophy heads for the Paracas and later Nazca and Wari people is still a subject of some debate as to whether they constitute part of a cult of head-taking or ancestor veneration. It is important to note that in a study of the origins of trophy heads found at Conchopata and dating to the later Wari period, it was found that the majority of trophy heads recovered were not individuals native to the area suggesting that head taking was probably from defeated enemies rather than revered ancestors.[82]

There seems to be an association between the Paracas wrapped batons with weaving practice and weaving tools known in later times.[83] Later weaving forms such as Wari khipu and the weaving aids called musa waraña may offer insight into Paracas/Nazca weaving practice.

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[77] Splitstoser, ”Practice,” 60-61.
[78] Splitstoser, “Practice,“ 59-60.
de Lavalle Vargas and de Lavalle de Cárdenas, *Tejidos Milenarios*, 210, 212, 224.
[79] Splitstoser, “Practice,“ 59.
de Lavalle Vargas and de Lavalle de Cárdenas, *Tejidos Milenarios*, 109, 133.
[80] Splitstoser, ”Practice,” 60-62.
[81] Splitstoser, “Practice,“ 61.
[82] Tung and Knudson, “Social Identities,” 915, 921, 923.
[83] Splitstoser, “Practice,“ 46, 62-63, 66, 73.

Like the earlier Paracas wrapped batons, Wari khipus make extensive use of thread wrapping.[84] Like musa waraña the paracas batons relied on a straight wooden core or substrate upon which their wrapping and pendant cords depend. Given the sectioned or segmented distribution of elements, the Paracas wrapped batons could have conveyed information in discrete modules.[85] Wrapped batons could also have featured initial segments in the form of wrappings on the baton itself or the primary attachment cord, which presumably might have been read before the pendant cords.[86] Some Inka khipus were attached to wooden bars or suspended from wooden batons.[87] Both Wari and Inka khipus were rolled up when not in use for storage and ease of transport into a format which would have fit easily into the hand like a baton.[88] Like khipus, it is possible that the Paracas wrapped batons contained information that could be read by one familiar with their system of encoding information. The Paracas wrapped batons have structural similarities with both weaving aids like musa waraña and (Wari style) khipus.[89]

Wrapped batons like those of the Paracas period continued to be documented in art during the succeeding Nasca period on the South Coast of Peru. Good examples of wrapped batons can be found on Nasca textiles.[90] Another interesting depiction of what appears to be a wrapped baton is to be found held in the hand of a small golden statuette of a kneeling figure from the Nasca period.[91] While it is possible that this individual holds a weapon rather than a baton it is

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[84] Splitstoser, "Practice," 64, 66.
[85] Splitstoser, "Practice," 66.
[86] Splitstoser, "Practice," 66.
[87] Gary Urton, "The Iconography of Inebriation" Engraved and Sculpted Khipu Bars," in *Inka History in Knots: Reading Khipus as Primary Sources*, ed. Gary Urton (Austin: University of Texas Press, 2017), 125.
[88] Conklin, "The Information System," 264, 273.
[89] Splitstoser, "Practice," 62-64, 66.
[90] de Lavalle Vargas and de Lavalle de Cárdenas, *Tejidos Milenarios*, 264-265, 276.
[91] Splitstoser, "Practice," 59.

unclear what that weapon would be. The implement that he holds in his hand is too small to be a war club and it is neither held like a spear thrower nor does it have the characteristic hook of Andean spear throwers.[92]

Wrapped batons and staffs constituted relatives of the khipu. Staffs are of great antiquity as a symbol of authority and power in the Peru.[93] They are widely documented in artwork in various mediums as far back as the middle of the Early Horizon/Chavín Period.[94] Batons would have been an easier to transport format than longer staffs. As early as the Karwa textiles and Chavín influenced early Paracas period there are hints of the existence of wrapped batons in artwork indicating the antiquity of the baton format as one almost as ancient as the longer staff if not coequal with it. Khipus remain an important symbol in traditional communities like San Andrés de Tupicocha where Frank Saloman has documented their continuing importance in annual ceremonial/patrimonial administrative use.[95] The people of Tupicocha also make continuing use of staffs for symbolic communication of annually assigned roles in the community.[96] Wrapped batons and staffs are wooden rods which have been wrapped in lengths of thread. This is done deliberately and often involves the use of complex sequences of colors.[97] These objects can easily be distinguished visually from pre-Columbian Peruvian spindles used for drop-spinning cloth

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[92] Zachary R. Critchley, "The Art of the Spearthrower: Understanding the Andean Estólica through Iconography" (MA thesis, Binghamton University, 2018), 32-34.
[93] Frank Salomon, *The Cord Keepers: Khipus and the Cultural Life in a Peruvian Village* (Durham: Duke University Press, 2004), 77-79.
[94] Moseley, *The Inka,* 167-169.
Stone, *Art of the Andes,* 53-54.
Anita G. Cook, "The Coming of the Staff Deity," in *Wari: Lords of The Ancient Andes,* ed. Susan E. Bergh (New York: Thames and Hudson, 2012), 103-108.
[95] Salomon, *The Cord Keepers*, 79-90.
[96] Salomon, *The Cord Keepers*, 77-79.
[97] William Conklin, "Antes del *quipu* inca: La evolución de los sistemas informativos basados en cuerdas," in *Atando Cabos*, ed. Carmen Arellano Hoffmann and Gary Urton (Lima: Ministerio de Cultura, 2011), 82-88.

which are both narrower and typically pointed on both ends. Some of these wrapped batons and staffs like the baton groups from Cerrillos feature pendant cords very much like those of a khipu.[98] They continued to be used by the Nasca Culture after the Paracas being documented in Nasca art.[99] Later they continue to be depicted in the art of the Wari and they seem to have still been in use for certain applications during the Late Horizon period when the chronicler Miguel Cabello Balboa documented that the Inka ruler Huayna Capac had his will recorded on a staff prior to it being transferred to a set of khipus.[100]

A modern weaving tool known as "musa waraña" offers insight into how complex design information may have been encoded into wrapped sticks.[101] <Figure 10. Musa Waraña diagram> These weaving aids consist of 1 or more thread wrapped sticks or batons which provide the trained weaver with a simulacrum of the color and weave pattern of a complex weaving project.[102] This aids in the execution of complex woven designs, the traditional weaving of Peru includes some of the most complex weaving found anywhere in the world.[103] The waraña devices also allow complex woven designs to be communicated between weavers more easily and readily than would be possible through the laborious medium of verbal communication.[104] In this

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[98] Splitstoser, "Practice," 48.
[99] Splitstoser, "Practice," 59-61.
de Lavalle Vargas and de Lavalle de Cárdenas, *Tejidos Milenarios*, 264-265, 276.
[100] Galen Brokaw, "Semiotics, Asthetics, and the Quechua Concept of Quilca." In *Colonial Mediascapes: Sensory Worlds of the Early Americas,* ed. Matt Cohen and Jeffrey Glover, 167-202 (Lincoln: University of Nebraska Press, 2014), 188-189.
[101] Denise Y. Arnold and Elvira Espejo, "Andean weaving instruments for textile planning: The waraña coloured thread-wrapped rods and their pendant cords," *Indiana* 29 (2012): 176-178, 180-184.
[102] Arnold and Espejo, "Andean weaving instruments," 182-183.
[103] Arnold and Espejo, "Andean weaving instruments," 176.
[104] Arnold and Espejo, "Andean weaving instruments," 180.

way they can be said to represent a kind of notational system with information storage and exchange capacities. This is analogous to semasiographic notational systems like those used for dance or musical notation in that it involves the transmission of information concerning a specific frame of reference without relying on words in order to do so.[105] Devices similar to colonial and modern musa waraña exist in the archaeological record at least as far back as the Wari period.[106] It is of course during the Wari period that khipu proper enter the archaeological record.

Weaving instruments like the musa waraña would have been essential for the planning and communication of complex textile designs in ancient Peru. These weaving aids share many structural and formal characteristics with khipus and wrapped batons and staffs. In addition to these formal similarities they also share essential elements of their production and use with khipus and related technologies. Both involve essential elements of planning and weaving practice in their production encoding of information and both can be "read" in order to decode and recover or communicate the information encoded within them.

While the Nasca Culture was centered slightly to the south of the Paracas Culture, around the area of the Nazca river valley, the famous Nasca geoglyphs and the monumental complex of Cahuachi, it is clear that in many respects Nasca Culture was a direct continuation of the Paracas Culture. Many of the same iconographic subjects of Paracas artwork abound in that of the Nasca. Among these are the presence of "floating" or "flying" humanoids often interpreted as shamans,

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[105] Elizabeth Hill Boone, "Introduction: Writing and Recording Knowledge," in *Writing Without Words: Alternative Literacies in Mesoamerica and the Andes*, eds. Elizabeth Hill Boone and Walter D. Mignolo (Durham: Duke University Press, 1994), 9-10.
Elizabeth Hill Boone, "Beyond Writing," in *The First Writing: Script Invention as History and Process,* ed. Stephen Houston (Cambridge: Cambridge University Press: 2008), 317-333.

[106] Bernd Herrmann and Roelf-Dietrich Meyer, *Südamerikanische Mumien aus vorspanischer Zeit: Eine radiologische Untersuchung (*Berlin: Museum für Völkerkunde, 1993), cover.

depictions of wrapped batons, and trophy heads.[107] All of these subjects were of importance to both the Paracas and Nasca cultures as is evidenced by their frequent occurrence within the corpus of art produced by both traditions.

Looking forward, what becomes important for purposes of the present study is the nature of Nazca's later relationship with highland neighbors, given the temporal overlap and geographic proximity between south-coast nasca and the rapidly coalescing southern highland polity of Wari. The interactions between the two and the resultant shifts in social structures may have generated particular kinds of pressures that proved catalytic for production of art and material culture, a subject to which we will return.

III. Writing and Societal Development

Wrapped batons used as parts of complex weaving in early as South Coast Paracas (or earlier) were likely the original textile information carriers, an outgrowth of specialized craft production that changed and evolved over time. A development cycle for a writing system wherein preexisting technologies are adapted is not unique to the Andes. Its development is analogous in some ways to the trajectory by which writing emerged in the Ancient Near East, for example,

[107] These figures have also been interpreted as dancers
de Lavalle Vargas and de Lavalle de Cárdenas, *Tejidos Milenarios*, 222, 278, 282, 284, 288.

where the Sumerians adapted ceramic technology to the purpose of writing.[108] In ancient Sumer, writing did not first emerge with the initial purpose of reproducing speech, it was originally a rudimentary accounting system.[109] Clay tokens eventually became abbreviated signs, which then evolved to inscribed tablets, which then were further adapted to include phonetic and notational values. A similar pattern can be observed in pre-Columbian Peru where, even during the Inca period, khipus continued to be used primarily, if not altogether exclusively, to encode ideas without the intermediation of speech sound signaling.[110] How does this kind of "writing without words" to quote Frank Salomon or Elizabeth Boone work?[111] When I refer to textile writing how am I defining writing? When authors like Boone and Salomon refer to "writing without words", they mean writing and notational systems that do not directly replicate spoken language. Boone defines writing without words as encompassing those notational systems capable through pictorial or other conventions of the conveyance of complex information, potentially concerning diverse topics.[112]

In world history, specialized visual notational systems are surprisingly numerous, as is the human urge toward 'writing' (according to Boone's definition of it). In ancient Mesopotamia

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[108] Denise Schmandt-Besserat, "The Earliest Precursors of Writing," *Scientific American* 238, no. 6 (1978): 53-59.
Denise Schmandt-Besserat, "Tokens and Writing: The Cognitive Development," *Scripta* 1 (September 2009): 149-154.
[109] Boone, "Introduction," 6, 13.
Schmandt-Besserat, "The Earliest Precursors," 59.
Schmandt-Besserat, "Tokens," 148-154.
[110] Boone, "Introduction," 20-22.
Hyland, "Writing," 412.
[111] Boone, "Introduction," 3-4.
Frank Salomon, Hilda Araujo, Roy Harris, Walter D. Mignolo, and Gary Urton, "How An Andean 'Writing without Words' Works," *Current Anthropology: A World Journal of the Human Sciences* 42, no. 1 (February 2001): 1-2.
[112] Boone, "Introduction," 3-4.

writing technologies famously evolved out of preexisting technological matrices related to ceramics and accounting that had longstanding cultural prominence and widespread adoption. In Sumer, clay had cultural prominence and importance for being used in construction as well as the production of utilitarian and decorative goods.[113] The emergence of cuneiform and alphabetic writing in the Ancient Near East provides a model that is instructive for the development of Andean communication technology for the ways in which it demonstrated how familiar technologies can change over time depending on the kinds of tasks for which they are employed.

In Sumer writing emerges circa 3,000 BCE from a longstanding prior system of using at first simple, and then later more complex and representational tokens to monitor and control the exchange and trade of goods.[114] <Figure 11. Sumerian Clay Tokens> These tokens first came into use around 6,000 BCE and were initially very simple and abstract.[115] As social complexity increased so did the variety and complexity of these tokens culminating in the use of a much greater variety of more complex and directly representational tokens in the 4th millennium BCE.[116] Relatively soon thereafter, tokens began to be represented on the outside of the clay bolus envelopes within which they were placed.[117] It is these representations of tokens which then came to be adapted into the sign set for the early phases of the cuneiform writing system that would endure more than 3,000 years.[118] <Figure 12. Proto-cuneiform Tablet>

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[113] Schmandt-Besserat, “The Earliest Precursors,” 58.
Schmandt-Besserat, “Tokens," 151.
[114] Schmandt-Besserat, “Tokens,” 147-149.
[115] Schmandt-Besserat, “Tokens,” 145.
[116] Schmandt-Besserat, “The Earliest Precursors,” 56-59.
[117] Schmandt-Besserat, “The Earliest Precursors,” 52-53.
[118] Schmandt-Besserat, “The Earliest Precursors,” 50.

This sketch of the evolution of writing in Sumer tells us several important things about the way in which writing systems develop. First, it is clear that writing systems do not necessarily develop from more representational and pictographic to less so.[119] In the case of Sumer the opposite is true as the earliest tokens are geometric and largely non-representational rather working as abstract notation. It is only later as the system of tokens begins to turn into a writing system capable of more complex expression than the mere documentation of exchange that the symbols thereof become more, rather than less, representational of the goods and objects to which they refer.[120] While many of these symbols later underwent a process of abbreviation and abstraction as cuneiform developed over time the simple fact that they did not progress from pictures or pictographs into abstract representations of sounds denies the validity of one of the most oft repeated cants in the historiography of linguistics.[121] Second, it is important to note that the development of writing from out of the trade token system in Ancient Iraq did not initially prioritize the reproduction of speech sounds. Instead, the task of the token system was essentially as an aid to accounting. Early forms of cuneiform remain largely undeciphered precisely because they represent a largely ideographic system.[122]

Instead of considering writing as a means for reproducing speech it is more useful in the case of the pre-Columbian Americas, and Peru in particular, to view writing as means of information storage and exchange through the use of a conventionalized and rules-based set of sys-

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[119] Boone, “Introduction,” 6-7.
Schmandt-Besserat, “The Earliest Precursors,” 50.
[120] Schmandt-Besserat, “Tokens,” 150-151.
[121] Boone, “Introduction," 6-7.
[122] Schmandt-Besserat, “The Earliest Precursors,” 50.
Urton, *Signs*, 15-16.

tems of semiotic information storage. These systems of Peruvian textile-based writing encompass khipu as well as wrapped batons and staffs. The border between notation and writing is a blurry one in general but nowhere more so than when one is considering an ideographic or otherwise non-language-based system of writing, such as khipu and other systems of textile writing were. The border between notation and writing in this case largely lies in cultural convention and in terms of the role and use of the systems.

In pre-Columbian Peru according to the model that I outline in this paper, writing emerged according to a similar pattern in the sense that the social purpose and task of the technology changed over time, and that it followed from similar social pressures and concerns. Textile writing emerged from an ancient and widely established technological matrix. It emerged from a system of visual notation used for a concrete and limited practical purpose. It did not at first replicate speech. Where Musa waraña and related devices like early wrapped sticks may have existed largely as communication aids for a single specialized purpose -- encoding complex textile designs. Khipus did not at first or primarily replicate speech.[123] Knotted string khipus, when freed from the strictures of baton weaving format, eventually developed permutations allowing them to encode a wide variety of information, from the mathematical to the biographical.

[123] Urton, *Signs*, 31, 114-118.

IV. Societal Motivations for the Transition from Weaving Aid to General Information Carrier

The *de facto* processes that backstrap loom weaving technology must employ have changed very little over time. Yet, at some point along the way, wrapped sticks, with their implicit connection to known color associations, grid structures and familiar sequences, were adapted to serve other social tasks.

While ethnographic analogy can be a tenuous means for drawing conclusions, again, looking at the Ancient Near East a model of the development cycle of a writing system is illustrative for thinking about the way in which writing could have emerged and developed in pre-Columbian Peru. A key element of the development of writing in the Ancient Near East was the increase in complexity as social complexity increased culminating in writing emerging hand-in-hand with a complex possibly state level system of socio-political organization.[124] This was probably also the case in pre-Columbian Peru.

Complex chiefdoms capable of undertaking large-scale architectural projects have existed in Peru since the cotton pre-ceramic period during the 3rd millennium BCE.[125] Around the end of

[124] Schmandt-Besserat, "The Earliest Precursors," 58.
[125] Haas, "The exercise," 32.

the Initial Period or the very beginning of the Early Horizon Period, these monumental construction projects exponentially increased in scale and complexity.[126] This implies a change in social organization from complex chiefdoms to state-level societies.[127]

There are a variety of theories concerning state formation that have been put forward by historians and cultural anthropologists.[128] Frequently these theories consider the foundation of the state to lie with one of 3 bases of power; economic, religious, or military.[129] The combination or presence or absence of one or another of these bases of state authority and control can and does vary between developing societies.[130] In the case of the Initial Period origination of state development in Peru on the coast the most significant factors seem to have been economic control of irrigation agriculture.[131] In the highlands it is possible that the most significant factor was control over long distance trade routes.[132] In both cases religious factors were also of importance.[133] In some coastal areas such as the Nepeña valley it is possible that military factors, either conquest or self-defense from predation, also played a part in state formation.[134] With a variety of potential bases for state power coming into play in the formation of the Andean state it is difficult to pin down the precise origin of a given state-level society.

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[126] Haas, "The exercise," 31-32.
[127] Haas, "The exercise," 32.
[128] Haas, "The exercise," 34.
[129] Haas, "The exercise," 34.
[130] Haas, "The exercise," 34.
[131] Haas, "The exercise," 33.
[132] Haas, "The exercise," 33.
[133] Haas, "The exercise," 33-34.
[134] Haas, "The exercise," 33.

Maize utilization and cultivation has been considered by scholars such as Hastorf, as an index for the cultural development trajectories of societies in the Andes.[135] It is possible to see textile production and style in a similar light. According to this model, elements of style and the development of techniques such as complementary weft weaving and other advanced weaving techniques can be seen as markers of cultural differentiation and culturally and temporally specific styles.[136] Going further one can look specifically at textiles as a medium of information storage and exchange in the context of South Coast and Central Highlands societies as a kind of index of societal development and differentiation as social complexity increased in the region from complex chiefdoms to state-level societies.

The interactions of Wari with other regions outside their highland center of influence are less understood than their relationship with the South Coast. On the Center Coast they are known to have established the pilgrimage center of Pachacamac.[137] Wari interactions with the Center Coast seem to have intensified from this point on eventually largely eclipsing their interactions with the South Coast.[138] How the Wari interacted with their southern neighbors in the Tiwanaku Culture is less clear. Early interpretations of the Wari viewed them as largely emerging from the socio-religious matrix established by Tiwanaku.[139] More recently however, more nuanced views have emerged of the relationship between the Tiwanaku and Wari cultures, which stress cultural

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[135] Christine A. Hastorf and Sissel Johannessen, "Pre-Hispanic Political Change and the Role of Maize in the Central Andes of Peru," *American Anthropologist* 95, no.1 (1993): 115-117, 119, 121-134.
[136] Timothy Earle, "Style and Iconography as Legitimation in Complex Chiefdoms," in *The Uses of Style in Archaeology*, eds. Margaret Conkey and Christine Hastorf (Cambridge: Cambridge University Press, 1990), 75.
[137] Menzel, "Style and Time," 70.
[138] Menzel, "Style and Time," 71.
[139] Schreiber, *Wari Imperialism*, 73-75.

interchanges in both directions.[140] The nature of the Wari's relationship with the North Coast society of the Moche is still murkier, with even less data to give insight.[141]

In addition to their archaeologically well attested use of khipus, the Wari seem to have also continued the use of wrapped staffs and batons. While no certain Wari wrapped staffs or batons have survived, these objects continued to be represented in Wari artwork as they were by earlier societies.[142] These representations are often associated with staff bearer or profile attendant iconography.[143]

A possible previously largely unremarked upon instance of Wari wrapped staffs in the archaeological record is in the form of objects recovered by Reiss and Stübel during the course of their excavations at the necropolis of Ancón in the late 19th century. They found many specimens of wrapped sticks or thin batons associated with and sometimes "held" by mummy bundles.[144]< Figure 13. Mummy bundle from Ancón> In interpreting these objects, Reiss and Stübel considered them to be weaving implements of uncertain use.[145] While they do bear an obvious visual similarity with musa waraña it is possible that these objects can also be associated with khipus. The funerary context of their deposition relates them to both the Paracas wrapped batons as well as many finds of Wari and Inka khipus. In addition, some of them featured pendant cords

[140] William H. Isbell, Mauricio I. Uribe, Anne Tiballi, and Edward P. Zegarra eds., *Images in Action: The Southern Andean Iconographic Series* (Las Angeles: UCLA Cotsen Institute Of Archaeology Press, 2018), 427-428, 631-638.
[141] Claude Chapdelaine, "Moche and Wari during the Middle Horizon on the North Coast of Peru," in *Beyond Wari Walls*, ed. Justin Jennings (Albuquerque: University of New Mexico Press, 2010), 225, 229.
[142] de Lavalle Vargas and de Lavalle de Cárdenas, *Tejidos Milenarios*, 375, 377.
[143] Cook, "The Coming of the Staff Deity," 103-108.
[144] Arnold and Espejo, "Andean weaving instruments," 193.
[145] Arnold and Espejo, "Andean weaving instruments," 193.

and other attachments that relate them to depictions of wrapped batons as featured in Paracas art as well as the batons from Cerrillos themselves.[146]

It seems likely the Wari developed the use of khipus in response to growing social demands. Once freed from the constraint of being strictly conveyors of textile related information, Wari khipus seem to have been pressed into service for a wider range of information carrying tasks, judging by their archaeological associations. In turn, the imposition of a much greater degree of social complexity during the Inka period seems to have generated additional pressure for technology capable of retaining and transmitting information. It was also accompanied by the need for specialists to maintain such systems.

While they made extensive use of khipus for a range of record keeping on a diverse set of topics, it is also clear that the Inka continued to make use of earlier forms of textile writing; most notably wrapped staffs. <Figure 14. Inka or Early Colonial Wrapped Sticks or Staffs>. As I mentioned earlier, when the Inka Huayna Capac lay dying in Quito, he had his will recorded by a quipucamoc on a wrapped staff which was only later transcribed to khipus.[147] This lets us know not only that the Inka continued to make use of wrapped staffs but also something about the way in which they were used. It is important to consider that the wrapped staff was used in this case in a context of great solemnity and importance associated with the demands of the highest level of Inka society and official government business. This business, the passing of rulership, would also have held great religious importance for the Inka for whom, contrary to some suggestions of a ”secularized” Wari/Inka society, all business of the ruling elite and administration was closely

[146] Arnold and Espejo, “Andean weaving instruments,” 193-195.
[147] Brokaw, “Semiotics,” 188-189.

tied to religion.[148] While khipu were used for both ”everyday” and higher-level aggregated record keeping and information recording it is possible that the Inka reserved the use of wrapped staffs for matters of greater socio-religious importance.[149]

Further evidence for this hypothesis emerges when other chronicler's references to the Inka use of wrapped staffs are considered. In his *Relación de antigüedades de este reyno del Perú* of 1613, Juan de Santa Cruz Pachacuti Yamqui refers to a staff with painted on colored bands used a semiotic medium.[150] The same text also includes another reference to a stick with stripes being used to convey information about religious/moral teachings.[151]

Beyond these elements of cultural continuity with earlier periods the Inka innovated greatly in their use of textile writing. They converted a system meant to use a quinary numerical system to their own decimal one. In addition, they modified a technology that had relied since the earliest days of wrapped batons and staffs on color as a primary means of communicating information into one that was primarily based on knots and the recording of numerical information.[152]

The shift in the importance of color and knots from Wari to Inka khipus implies a dramatic shift in the way in which the Inka were using textile writing in comparison to earlier cultures. This shift may have been one from a medium primarily suited to the storage and communication of ideological and non-numeric concepts to one more adapted to the recording of numerical data as a component of state control and administration. If so, this would be part of a general

[148] Moseley, *The Inka*, 67-68.
[149] Brokaw, “Semiotics,” 189-190.
[150] Brokaw, “Semiotics,” 190.
[151] Brokaw, “Semiotics,” 190-191.
[152] Urton, ”From Middle Horizon cord-keeping,” 219.

trend of change in the power base of state level societies in pre-Columbian Peru from one centered primarily upon ritual and religious concepts to one more firmly associated with economic control and military power.[153]

V. Conclusions

The Inka and Wari khipu traditions were extraordinary technological achievements. As I have demonstrated, these khipu traditions built on long standing technological streams in Andean and South Coast Peruvian culture. These technological matrices were transmitted through time and space by shared ideological concepts and other ties between cultures including conquest and the need for administrative tools. The textile writing traditions of Peru probably had their origin in weaving aids in use by South Coast people's like the Paracas more than 2,000 years ago. The process by which weaving aids became tools of administration and empire was a long one and one that has been little explored or documented in the Andes. By using ethnographic analogy to the process by which writing systems developed in the Ancient Near East I have sought to better explain this technological trajectory. By investigating the cultural links between the Paracas/Nasca and the Wari and between the Wari and the Inka, I have documented a pathway along which the technology of textile writing was transmitted as it developed and was elaborated on.

[153] Haas, "The exercise," 34-35.

The textile-based writing systems of pre-Columbian Peru represent a set of interrelated systems of information storage and exchange. These systems included integral aspects of planning and weaving practice in their construction. Unlike related notational systems like musa waraña, khipus and other forms of textile writing were capable of containing large quantities of information of diverse types in the form of different khipu or other genres. This information could be either quantitative or ideological, including ideogrammatically encoded concepts. With the Inka khipu it is also possible, according to recent research by Sabine Hyland that more directly linguistically related information could also be encoded in strings and knots.[154] A key part of this system of encoding, one that can be related to the ”royal khipu” genre of histories, poetry, and other subjects as outlined by Blas Valera would have been color and the Andean concept of quilca.[155]

Throughout its history color played a key and little understood role in textile writing. Scholars have tried to penetrate this nexus of meaning since the early days of the Colonial period to later scholars like Prescott who followed the Spanish chronicler Garcilaso de la Vega in glossing meanings of different colors in khipu construction as being concrete referents.[156] We now know that this system of reference was not universal between khipu genres so such glosses are only of limited use to khipu decipherment, even assuming their partial validity. A better route to understanding the role of color in textile writing lies in the Andean concept of quilca.[157]

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[154] Hyland, ”Writing,” 412.
[155] Sabine P. Hyland, “Woven Words: The Royal Khipu of Blas Valera,” in *Narrative Threads*, eds. Jeffrey Quilter and Gary Urton (Austin: University of Texas Press, 2002), 153-154, 160-164.
[156] William H. Prescott, *The Works of William H. Prescott vol. 5* (Philadelphia: J. B. Lippincott, 1904), 133.
[157] Brokaw, “Semiotics,” 169-172, 194-196.

While the Spanish glossed quilca variably as meaning "drawing", "painting", "coloring", or other ways, it is better understood as a whole system of color associations and color meanings and meanings in color.[158] For the peoples of pre-Columbian Peru color and color groupings could hold ideographic meaning.[159] While this seems an alien system of associations it is not altogether unfamiliar to us when one considers the meaning implied in the red of a stop sign.

Quilca was potentially a much deeper and more variegated system of meanings than the kind of short-hand icons and non-verbal symbols that surround us today and make up our own most familiar system of visual/pictorial icons.[160] Quilca, existed not as a parallel with other systems of semasiography but as an essential component of both textile writing as well as other diverse aspects of Andean culture.[161] Potential examples of information bearing objects that may have participated in a quilca based system of knowledge could be the tocapu designs of the Inka and some hats of the Paracas, Nazca, and Wari that feature pendant cords and color patterns.[162]

As a pan-Andean concept with deeply ancient historical roots, quilca also can explain the ease with which textile writing was adopted by different groups of people throughout the Andes. If a key part of their understanding of the system laid on shared ideas and ideological concepts it would explain the transmission of textile writing from Paracas, to Nazca, to Wari, and lastly to the Inka. Ideological systems and belief systems have had wide diffusion in pre-Columbian Peru at least since the Early Horizon or before. Textile writing can be considered to be a component of

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[158] Brokaw, "Semiotics," 169-170.
[159] Brokaw, "Semiotics," 188-196.
[160] Brokaw, "Semiotics," 194-196.
Boone, "Intoruction," 16-17.
[161] Brokaw, "Semiotics," 194-196.
[162] Splitstoser, "Practice," 62.
Brokaw, "Semiotics," 185-187.

this cultural package of ideas and technologies that includes shared religious and technological components.

Textile writing of the type that I am describing, a writing system that is more ideographical rather than word based, is not unique to pre-Columbian Peru. Similar systems have existed in various parts of the world.[163] The key similarities between notational systems for textile planning and the textile writing systems of Peru lay in their shared elements of planning and counting. Planning and counting are of key importance for textile production. This is particularly true for more complex textile designs or if such designs need to be reproduced, copied, or communicated to others. Planning and counting are also key elements of the administration and ordering of a complex society. Populations, taxation, and other things must be counted and planned out in advance. In pre-Columbian Peru people adapted notational technologies suited to the planning and documentation of textile designs into something which much greater "inscriptive" capacity; a writing system that would power empires and endure for hundreds of years even after the Spanish Conquest.

As I have shown, the khipu, and the larger tradition of textile writing and textile based carriers of information to which Andean khipu belong was not an Inka invention. Even the preceding Wari Empire was in many ways the heir to a preexisting tradition or set of traditions in which number, color, and thread direction and wrapping played a key role in encoding information in textile form. The process by which what were originally complex weaving aids analogous to modern devices like musa waraña came to be more generalized information carriers by Inka and perhaps Wari times was a long one covering 2,000 years at least. This process, and the

[163] Cyrus L. Day, "Knots and Knot Lore: Quipus and Other Mnemonic Knots," *Western Folklore* 16, no 1 (January, 1957): 13-14.

long time period in which it took place was dictated by social and economic pressures and the development and preservation of khipu likely went hand in hand with the emergence of state level modes of socio-political administration and control as are exemplified in the Andean region by the Wari and Inka empires. The way in which the peoples of the South Coast and Highlands of Peru iteratively developed weaving technology into information technology can be analogized with the equivalent process by which the people of the Ancient Near East adapted clay and tokens into what ultimately became cuneiform writing. By the end of the Inka Empire the textile writing tradition and its many manifestations including, most notably, the base 10 Inka khipu had become a formidable tool of what was one of the world's largest empires.

Figures

Figure 1. Inka khipu from the collection of the Maxwell Museum of Anthropology at the University of New Mexico. (photo by author)

Figure 2. Wari khipu displaying the intricate thread wrapping on the top of its pendant cords characteristic of khipus of the Middle Horizon. (https://caralperu.typepad.com/files/urton-mh-khipus-antiquity.pdf)

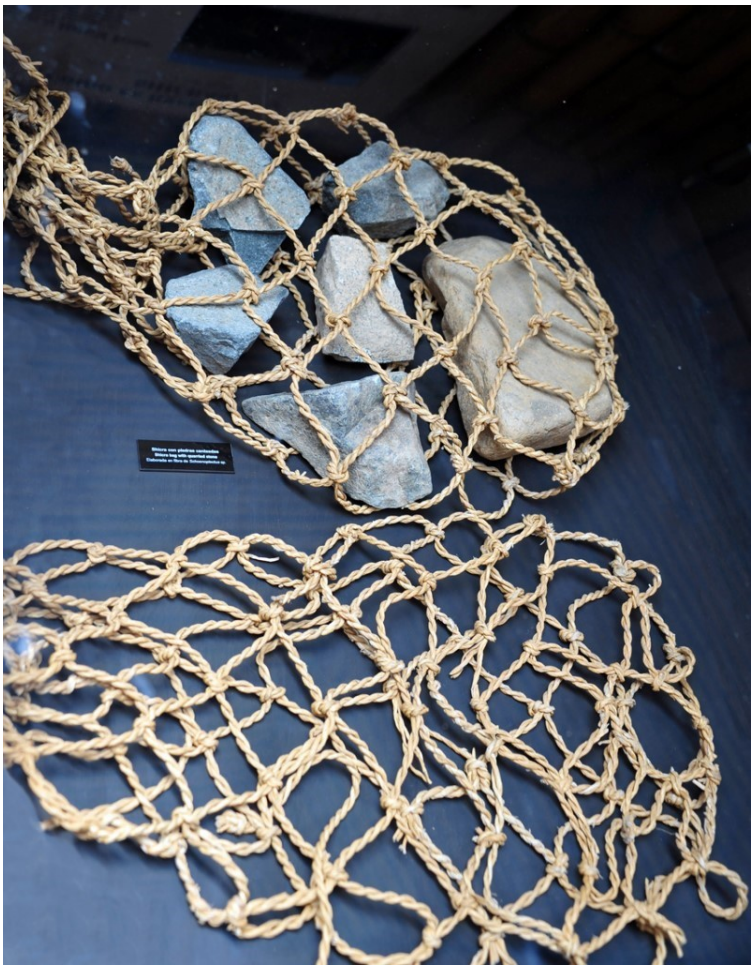

Figure 3. Example of shicra bags of the type used at Caral and other Sites of the Pre-Ceramic Period. (http://www.latinamericanstudies.org/caral-architecture.htm)

Figure 4. An Inka quipucamayoc illustrated by Guaman Poma de Ayala. (https://commons.wikimedia.org/wiki/File:Nueva_corónica_y_buen_gobierno_(1936_facsimile)_p360.png)

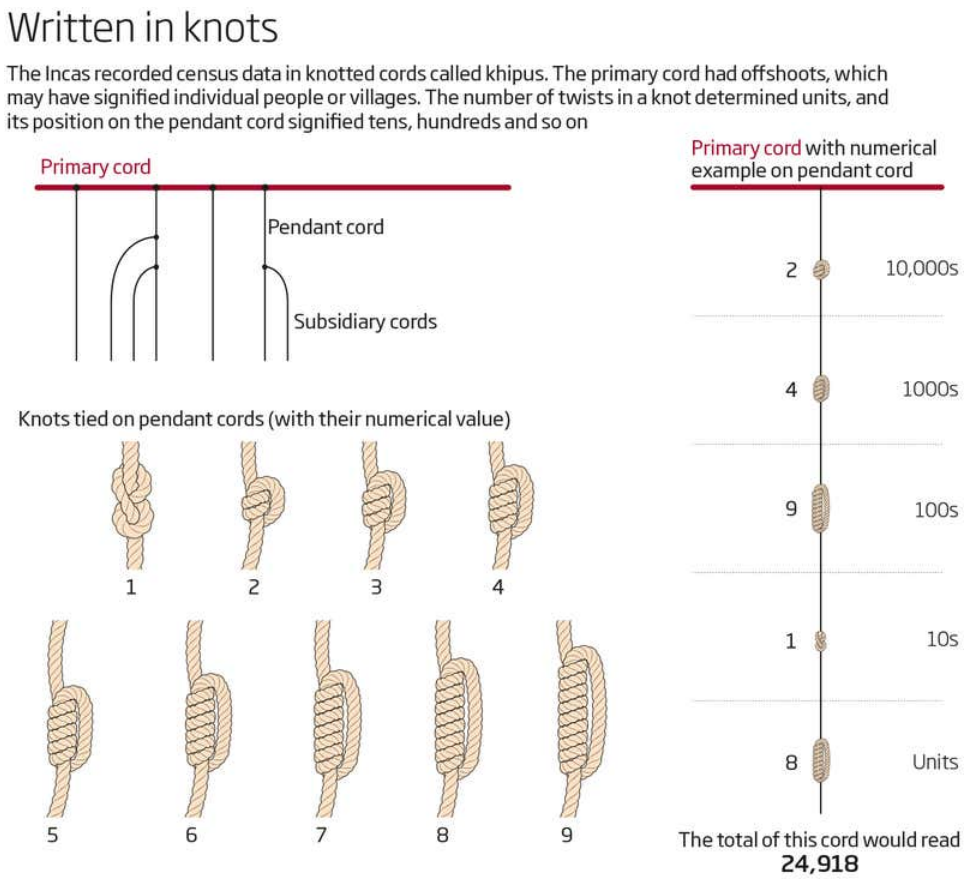

Figure 5. Diagram of an Inka style khipu. (https://www.newscientist.com/article/mg23931972-600-we-thought-the-incas-couldnt-write-these-knots-change-everything/)

Figure 6. A view of part of Pikillacta, a Wari administrative site (https://en.wikipedia.org/wiki/Pikillaqta#/media/File:Piquillacta_Archaeological_site_-_street.jpg)

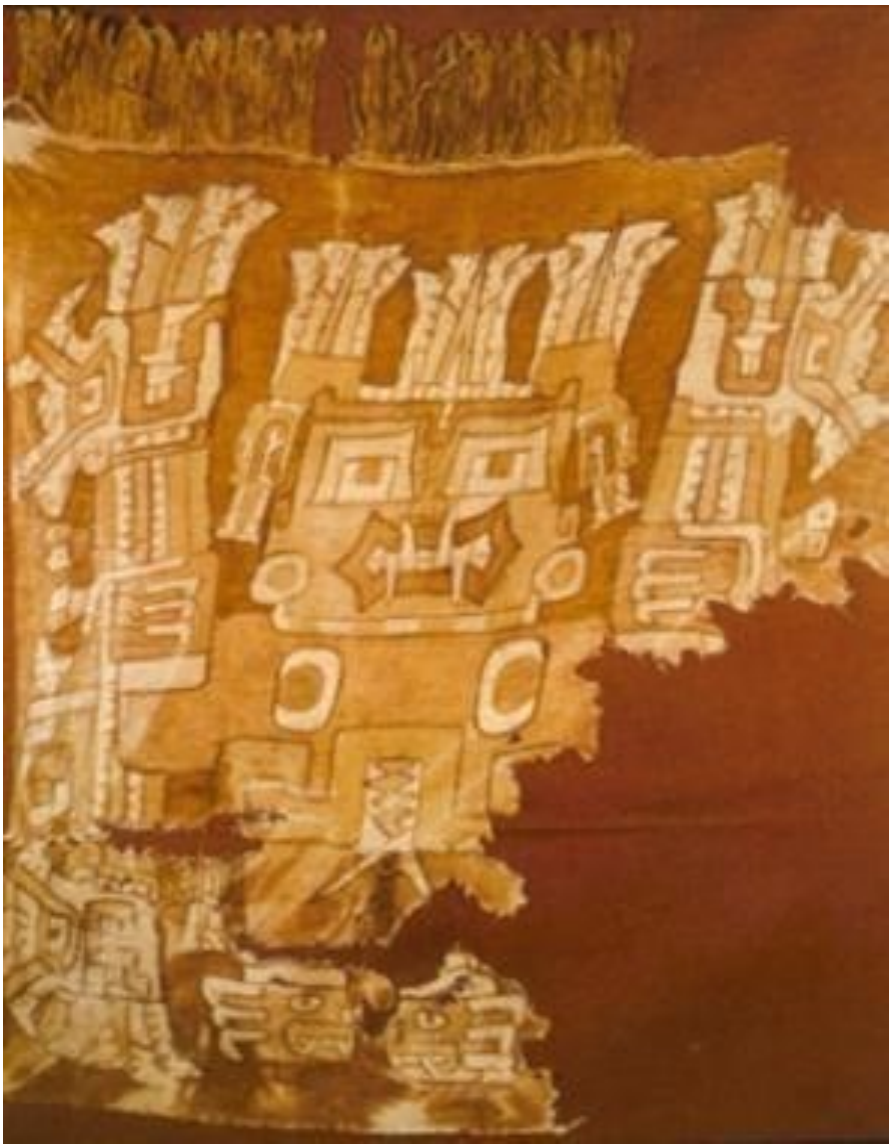

Figure 7. A Chavin style textile fragment from Karwa in the Ica Valley of the South Coast. (https://www.koofers.com/flashcards/arthi-art-hist-130d-final/review)

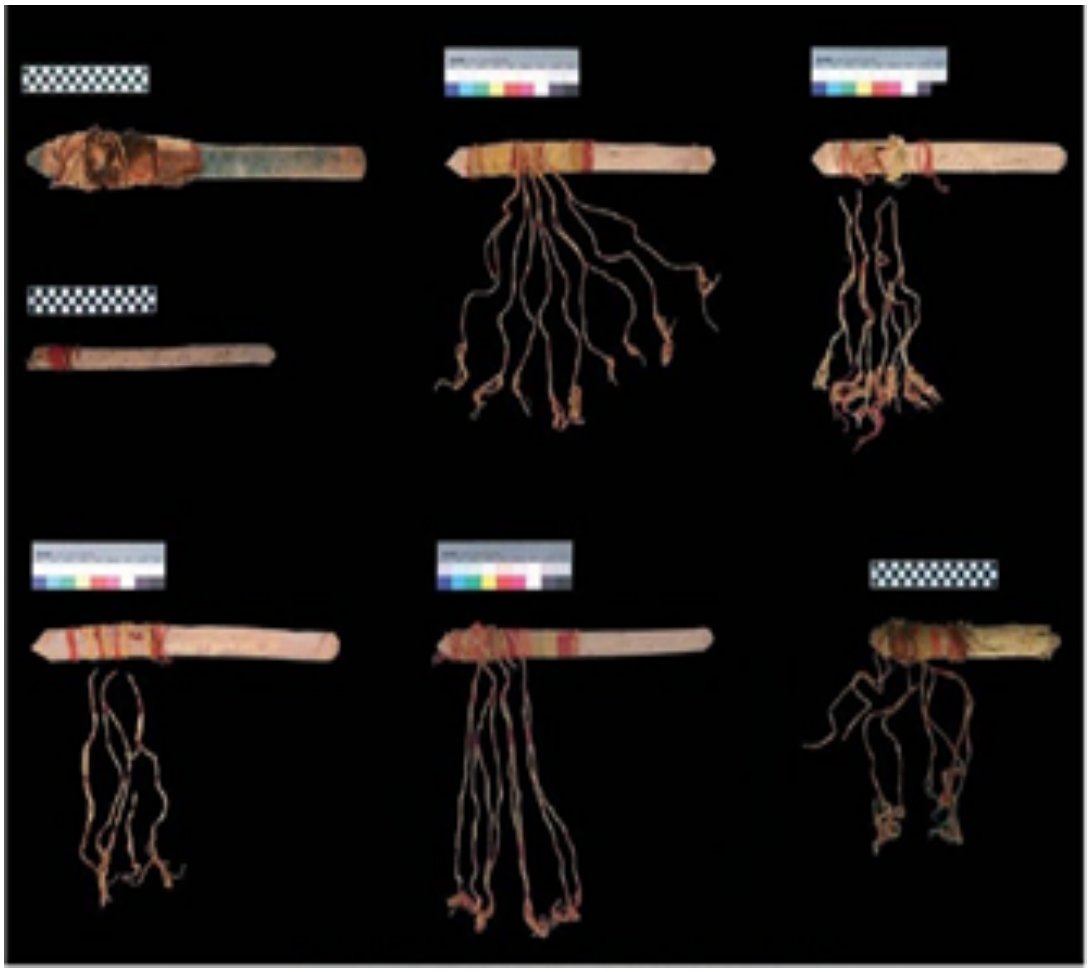

Figure 8. Paracas wrapped baton groups from Cerrillos. (https://www.academia.edu/8603822/Practice_and_meaning_in_spiral-wrapped_batons_and_cords_from_Cerrillos_a_Late_Paracas_site_in_the_Ica_Valley_Peru)

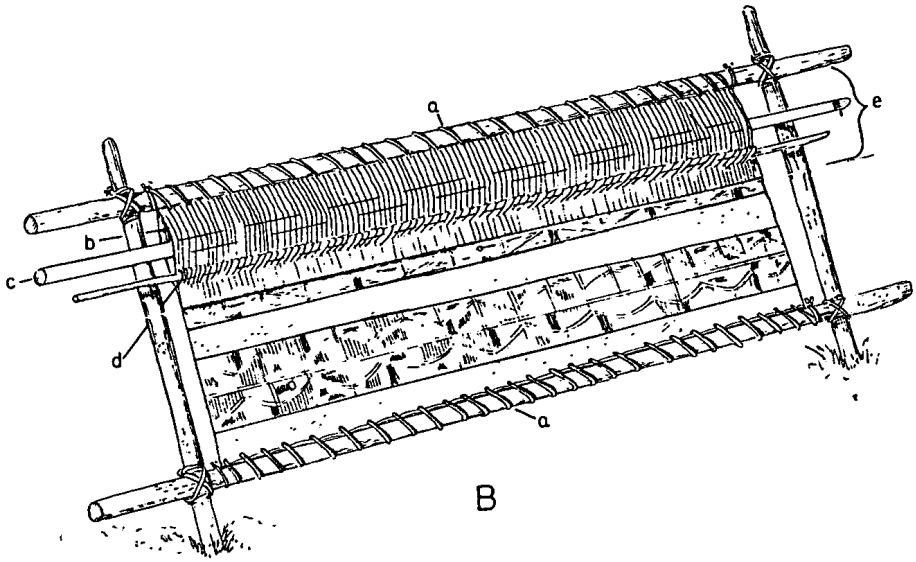

Figure 9. Wari Loom after Conklin (1982).

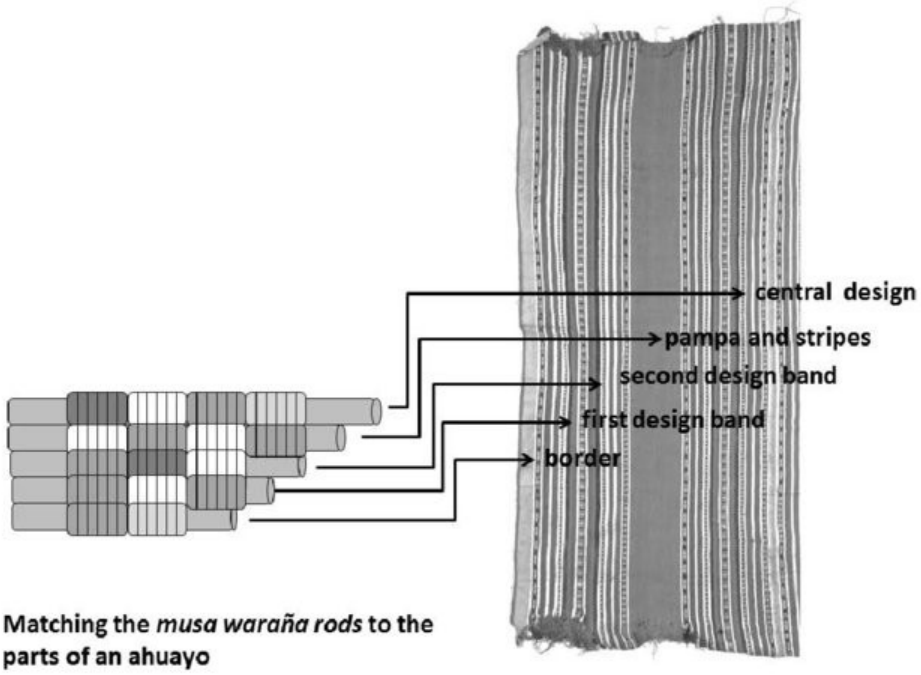

Figure 10. A musa waraña is matched to corresponding parts of an ahuayo. After Arnold and Espejo (2012).

Figure 11. A stone tablet inscribed with proto-cuneiform signs from circa 3,000 BCE. (https://www.thoughtco.com/proto-cuneiform-earliest-form-of-writing-171675)

Figure 12. Sumerian clay tokens.(https://sites.utexas.edu/dsb/tokens/tokens-and-writing-the-cognitive-development/)

Figure 13. A mummy bundle from the necropolis of Ancon excavated in the 19th century equipped with thread wrapped sticks similar to musa waraña. (https://www.researchgate.net/publication/263663281_Andean_weaving_instruments_for_textile_planning_the_warana_coloured_thread-wrapped_rods_and_their_pendant_cords/figures?lo=1)

Figure 14. Late Pre-Hispanic or Early Colonial wrapped sticks from the collection of the Peabody Museum. (https://brewminate.com/the-twisting-paths-of-recall-khipu-andean-cord-notation-as-artifact/)

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