khipus: IAP EECS 6.096 WELCOME

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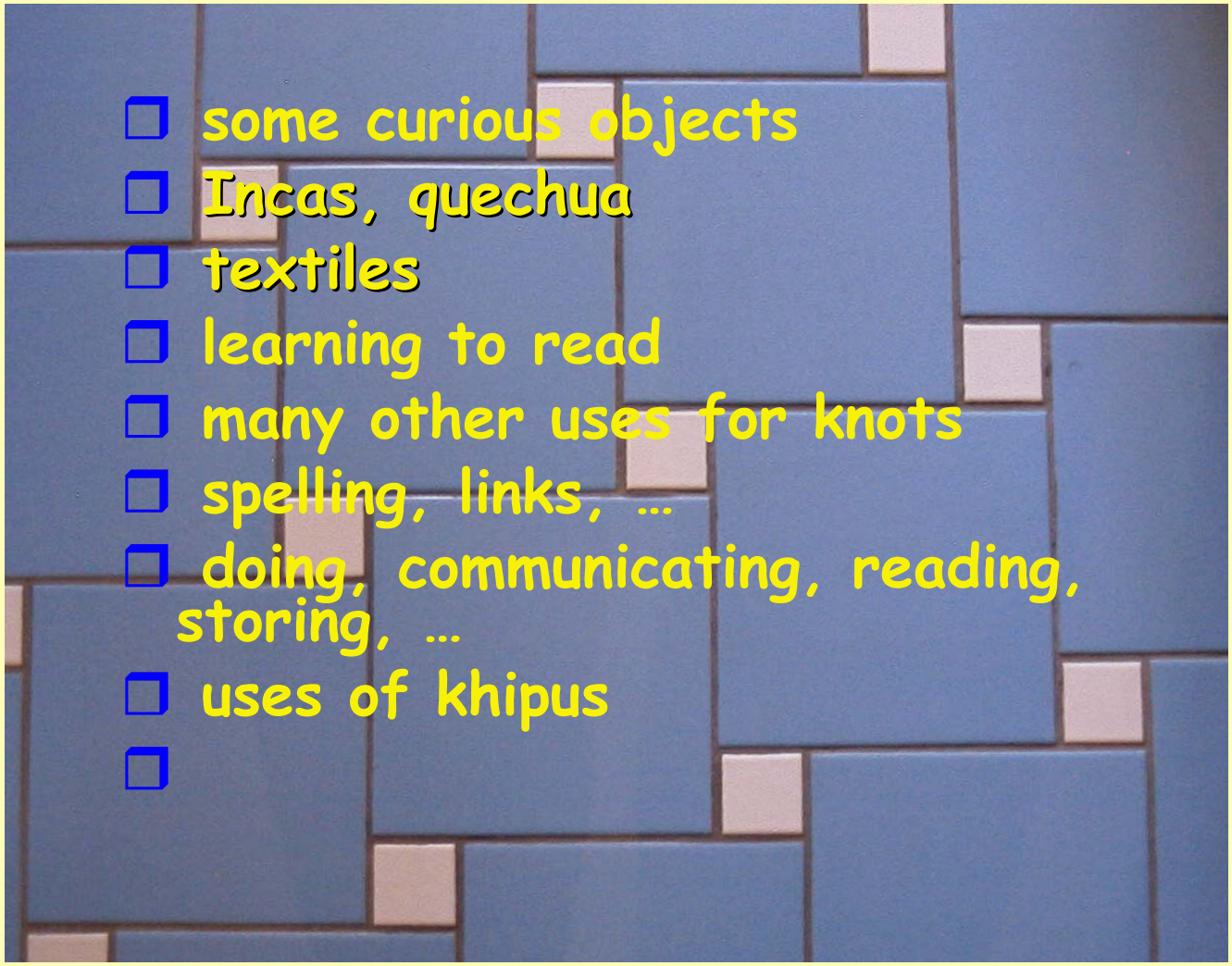
Jean-Jacques Quisquater

- master in engineering of applied mathematics (UCL, Belgium)
- PhD in computer science (Orsay, France)
- research in cryptography (cryptology) from 1980
- teaching about number theory, design of hardware …
- (part of a) sabbatical year at MIT, 2003-2004
- meets familly Demaine (Eric, Martin) in 2004
- meets Gary Urton
- meets Frank Salomon
- common project about decrypting khipus using computer science (see *Wired* January 2007)
- last week: first master's thesis at UCL about khipus

Introduction and basics…

This khipu from the Museum for World Culture in Göteborg, Sweden, has 332 pendant strings and is said to be from Nasca, Peru. (Photo courtesy Gary Urton)

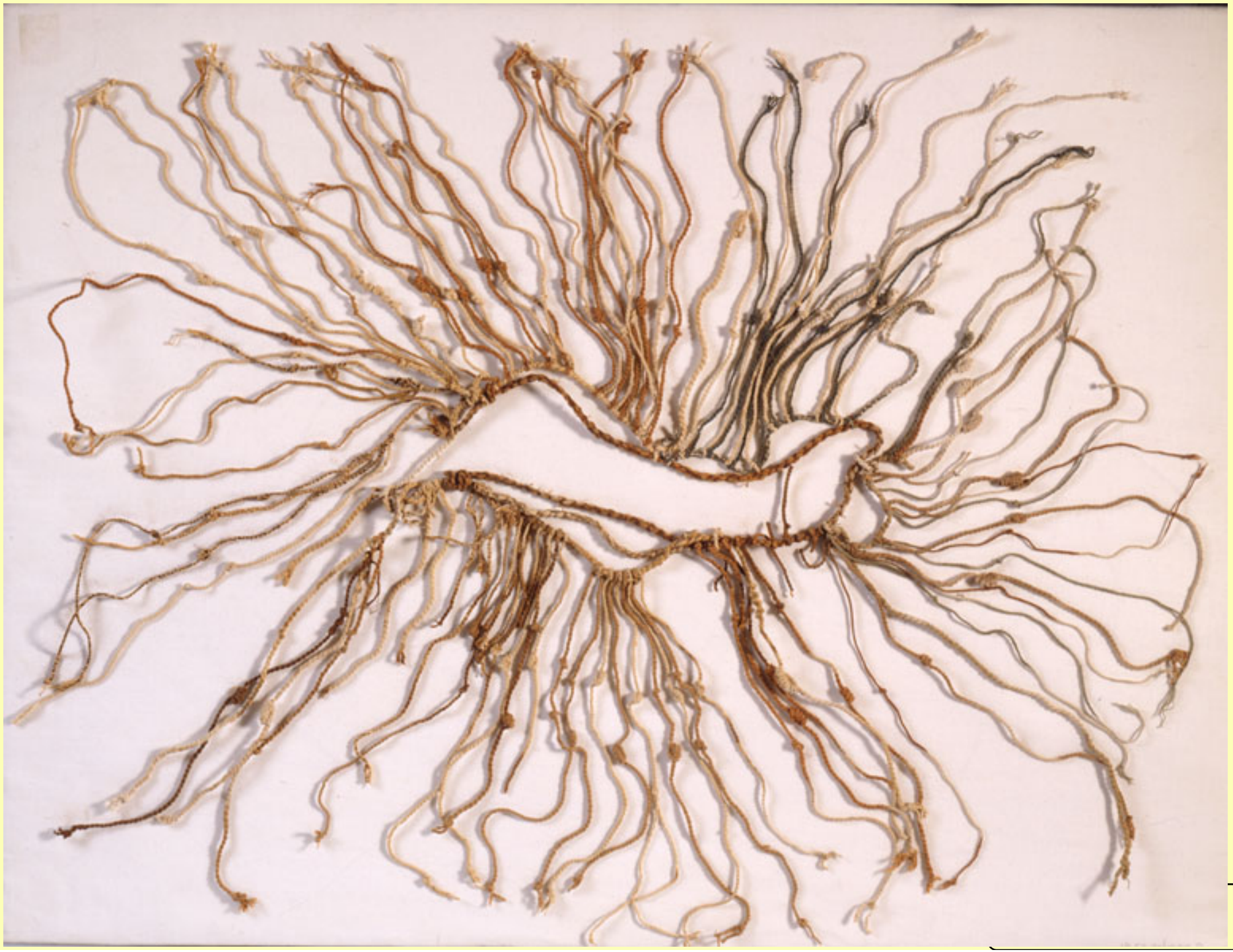
contents



- some curious objects
- Incas, quechua
- textiles
- learning to read
- many other uses for knots
- spelling, links, …
- doing, communicating, reading, storing, …
- uses of khipus
-

Some curious objects …

– January 22-23, 2007
khipus
ean-Jacques Quisquater



MIT – January 22-23, 2007
khipus
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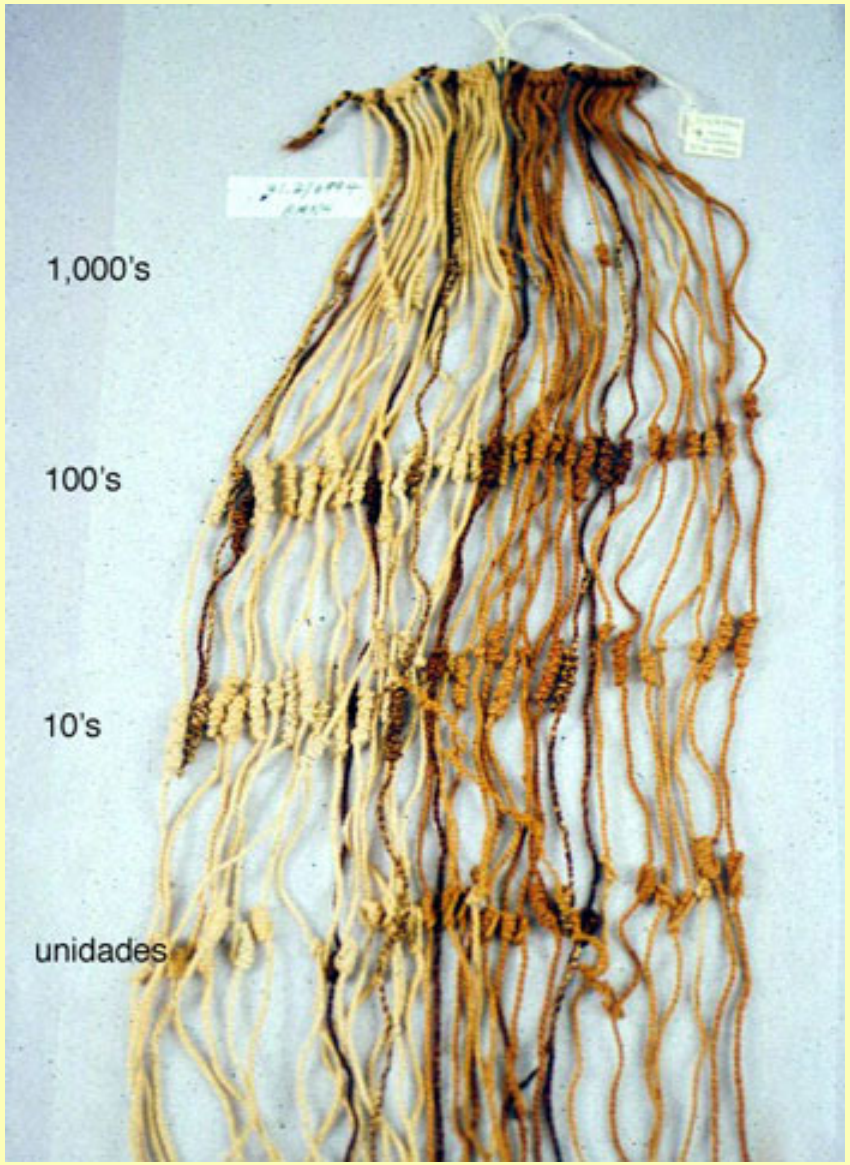
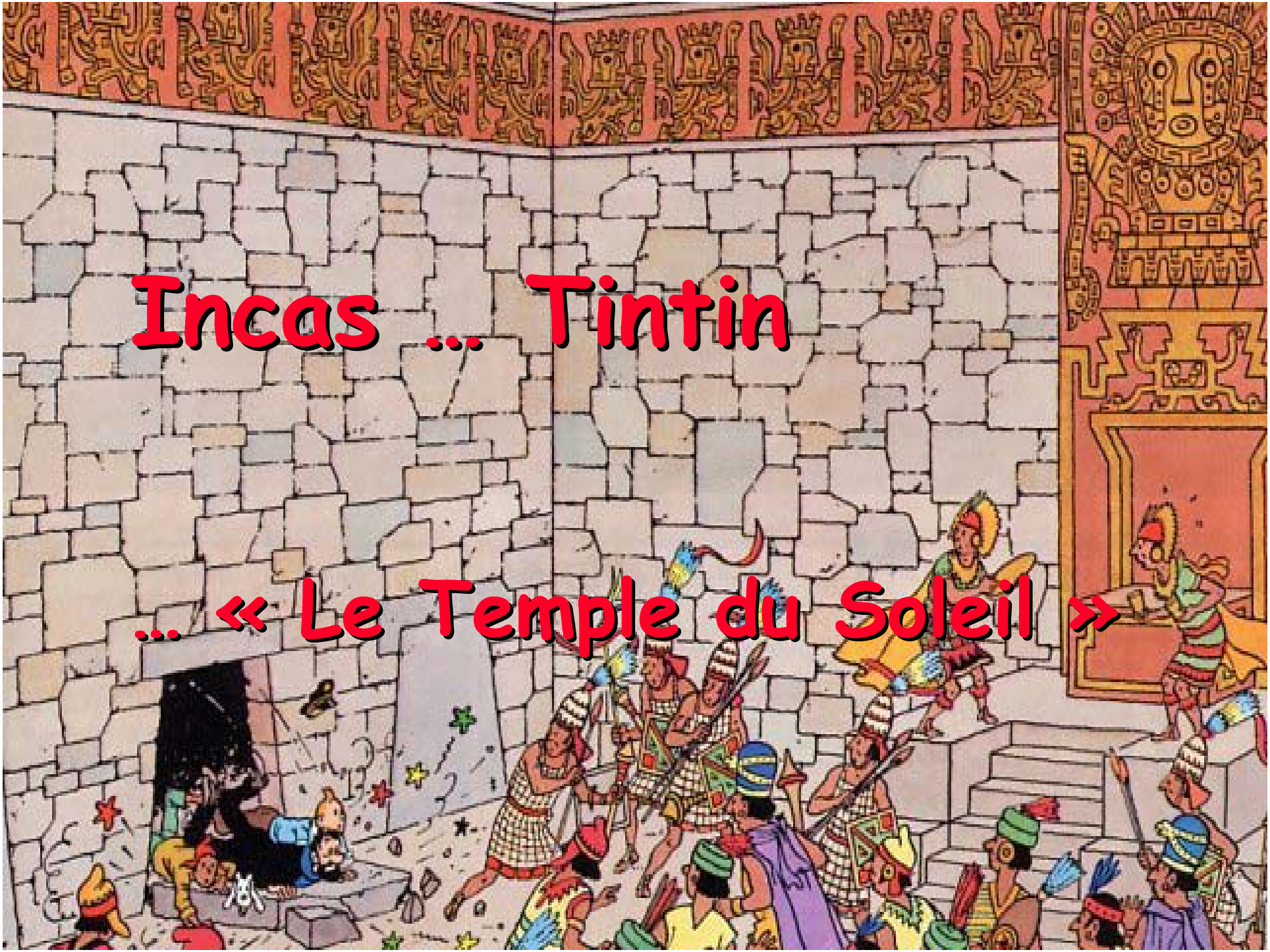
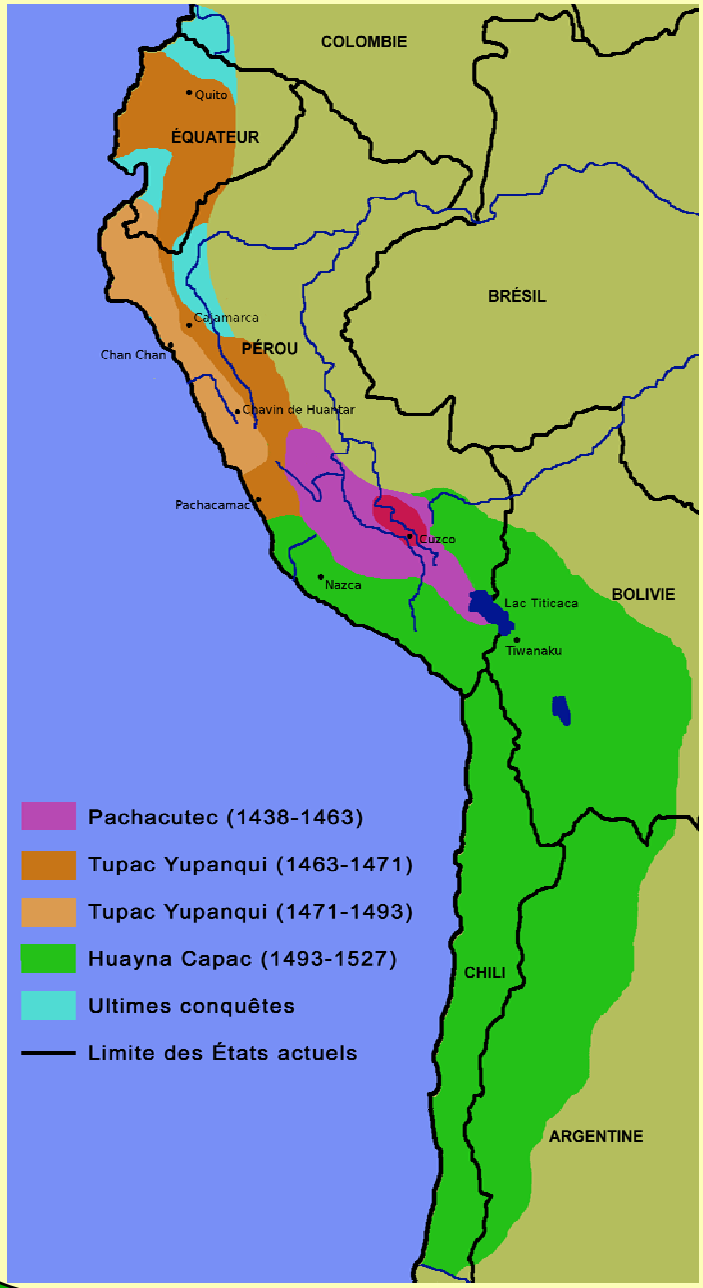

1,000's
100's
10's
unidades


CMA-480
LC1. 109.3
21-04-98


Incas … Tintin
… « Le Temple du Soleil »



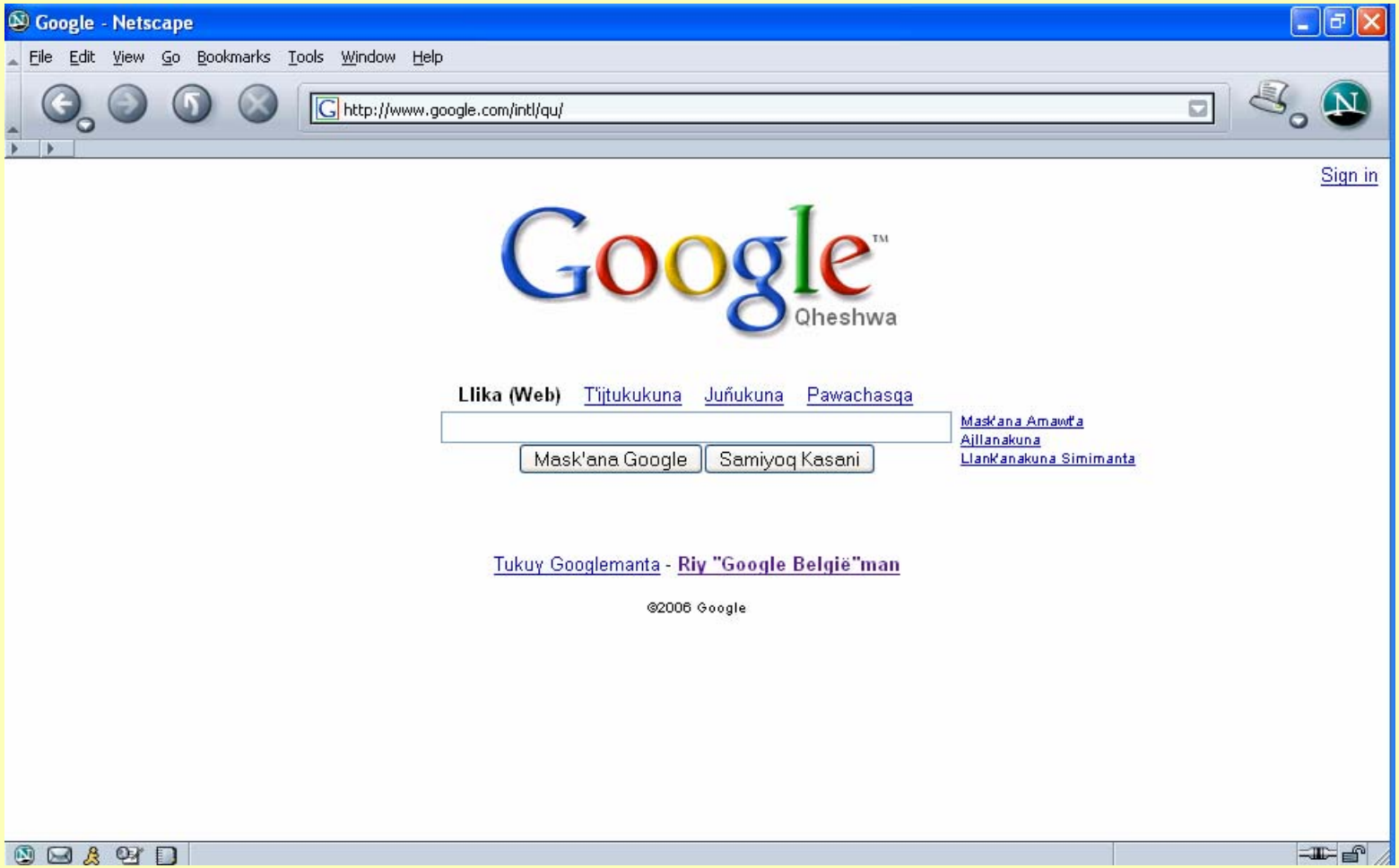
- Inca empire
- Incas created the most vast empire of pre-Columbian America (3: Maya, Aztec)
- during about a century (1438-1533)
- Inca: emperor: 13 from Manco Capac to Atahualpa
- 1532: Francesco Pizarro
- maximum: 4800 km long, 3 millions km2 (Ecuador, Peru, Bolivia, Argentina, Chili)
- main city: Cuzco (*Qusqu*)
- many langages
- no writing, no wheel, …
- strong and centralized administration
- many roads, messagers

Incas roads

- The Inca's conquered South America's western edge. In these lands they terraced and irrigated to farm in what the Spanish later termed uninhabitable land ranging from rainless coastal deserts and high mountain plateaus to steamy tropical jungles. Over this land there existed a network of roads to transport news and food among the Inca's approximately six million subjects. This 10,000 mile network of roads (the black lines below) were sometimes as wide as 24 feet with four main highways entering Cuzco, the "belly button" of the Inca Empire.

quechua

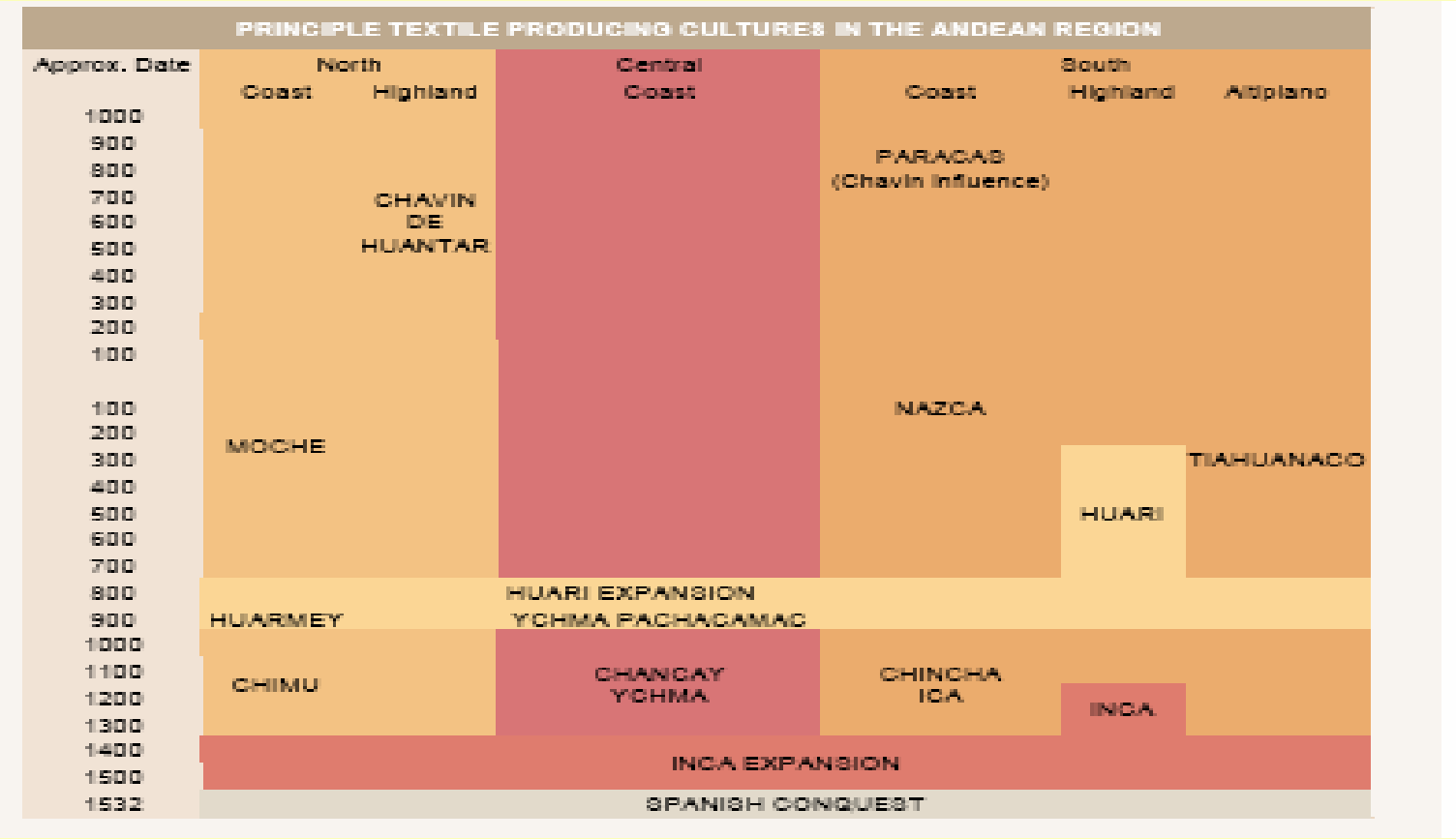
- family of languages
- spoken in Peru (official since 1975)
- from south of Colombia to north of Argentina
- language of the inca civilisation (*runa simi)*
- spoken by around 10 millions people
  - *4.5 millions in Peru*
  - *2 millions in Ecuador*
  - *1.5 millions in Bolivia*
- written tradition from 16th century (Spanish)


Google - Netscape
File Edit View Go Bookmarks Tools Window Help
http://www.google.com/intl/qu/
Sign in
Google
Qheshwa
Llika (Web) T'ijtukukuna Juñukuna Pawachasqa
Mask'ana Amawt'a Ajllanakuna
Llank'anakuna Simimanta
Mask'ana Google
Samiyoq Kasani
Tukuy Googlemanta - Riy "Google België"man
©2006 Google

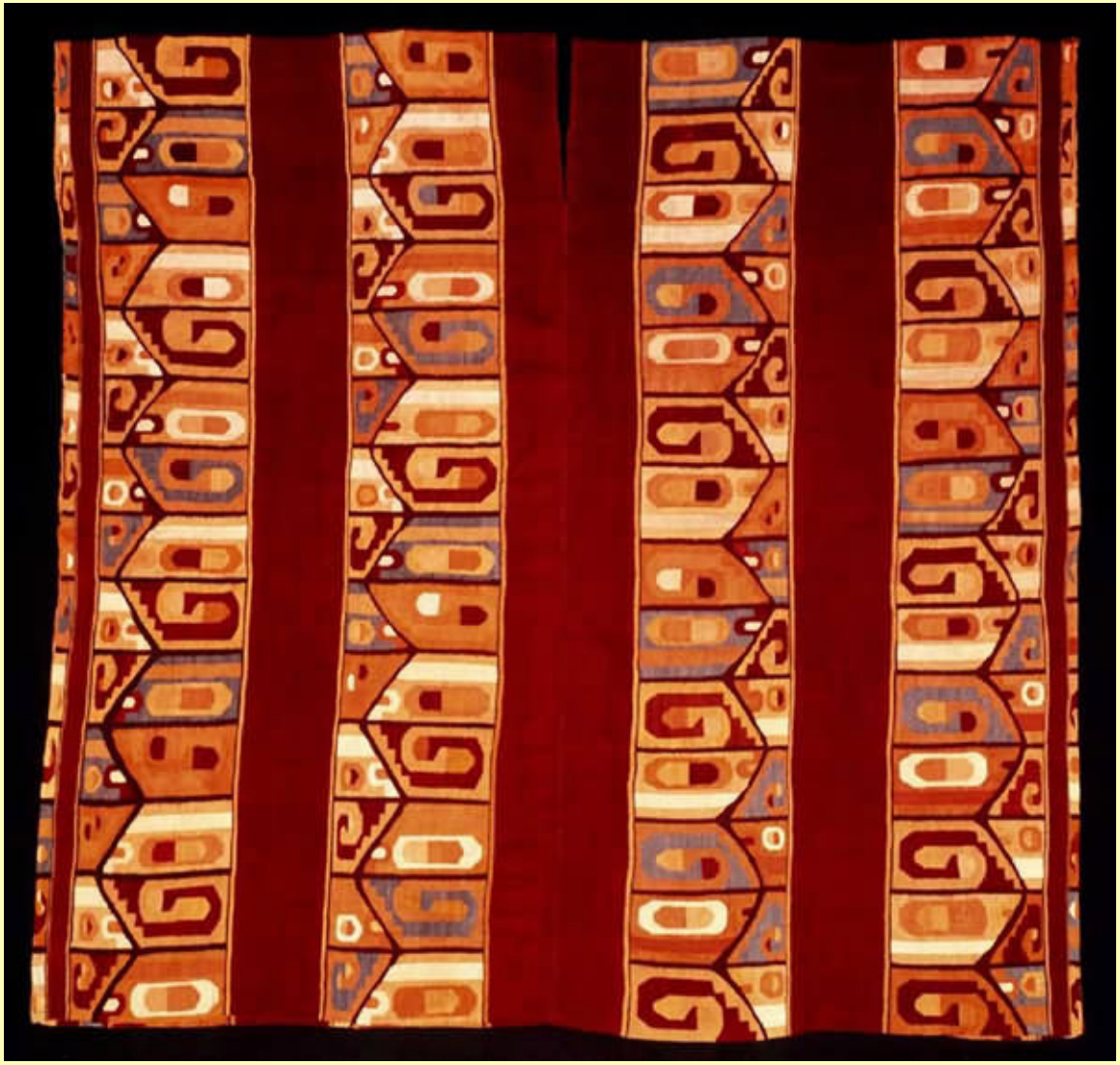
Term paper for free …

Textiles incas

- Tapestries in the ancient Andean world were highly regarded in social, economic and political relationships. Archaeological evidence shows that in the Andes, fibres were worked much earlier than any other materials, such as ceramics (fired clay).
- Textile techniques in Peru have developed in the pre-ceramic period (3,000 - 1800 BC). All forms of textile techniques were known since the earliest Peruvian cultures, such as the Chavin period. Excavations of burial sites in the coastal sand dunes testify of the excellent nature of these textiles, which have been uniquely preserved thanks to soil weather conditions.
- As expert Junius Bird demonstrated, textile art is one of the main aspects of pre-hispanic Peruvian art, not only historically but also culturally and spiritually. It is in the root and heart of Andean social development and undoubtedly constitutes one of the most important and original contributions of this region to the cultural wealth of humanity.


PRINCIPLE TEXTILE PRODUCING CULTURES IN THE ANDEAN REGION
Approx. Date
North
Coast
Highland
Central
Coast
South
Coast
Highland
Altiplano
1000
900
800
700
600
500
400
300
200
100
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1532
CHAVIN DE HUANTAR
PARACAS (Chavin influence)
NAZCA
MOCHE
HUARI
TIAHUANACO
HUARI EXPANSION
HUARMEY
YCHMA PACHACAMAC
CHIMU
CHANCAY YCHMA
CHINCHA ICA
INCA
INCA EXPANSION
SPANISH CONQUEST

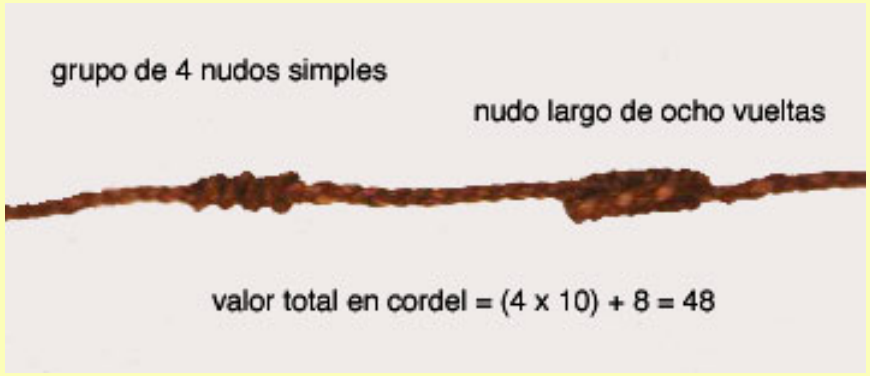
Tiwanaku: Ancestors of the Inca
Tapestry Tunic, Wari style, 500-800, South coast, Peru. Camelid fiber and cotton. The Textile Museum, acquired by George Hewitt Myers.

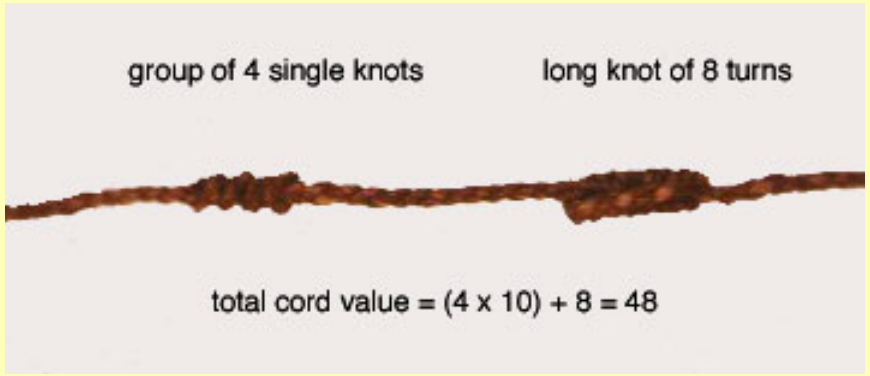


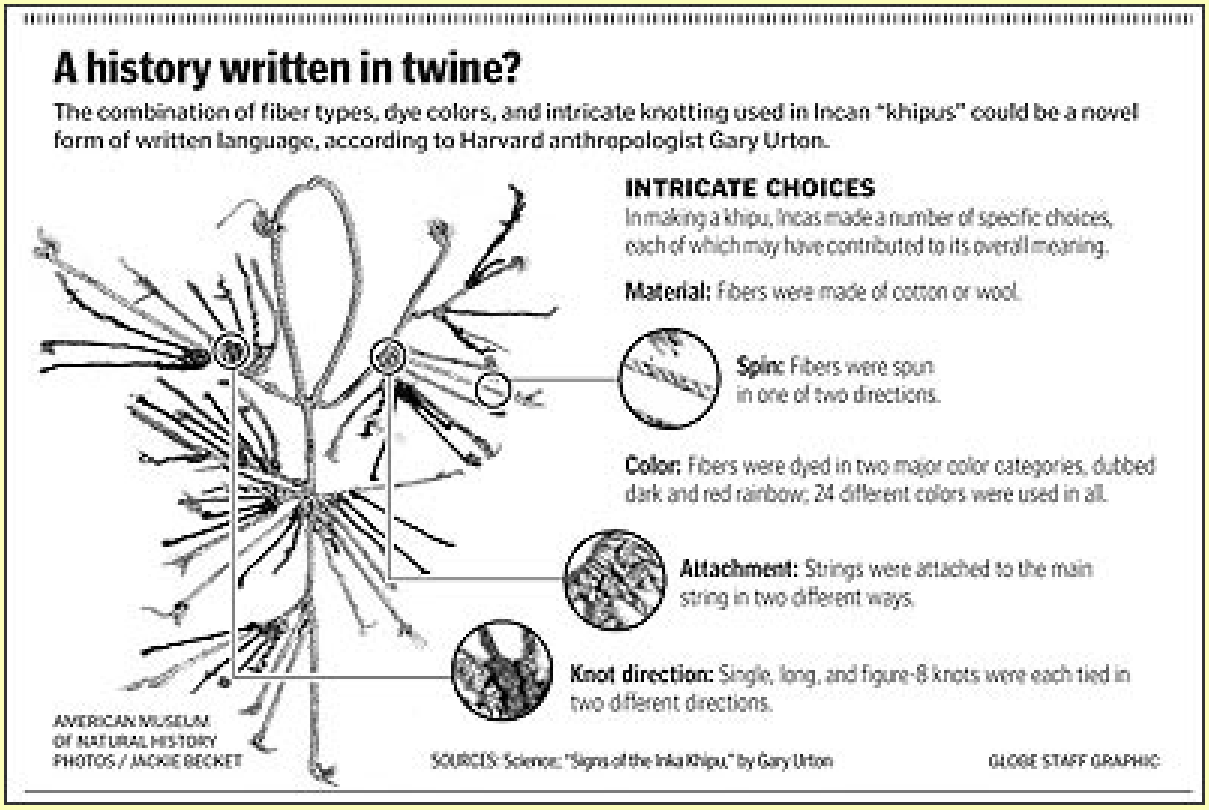
Khipu: code ?

Learning to read

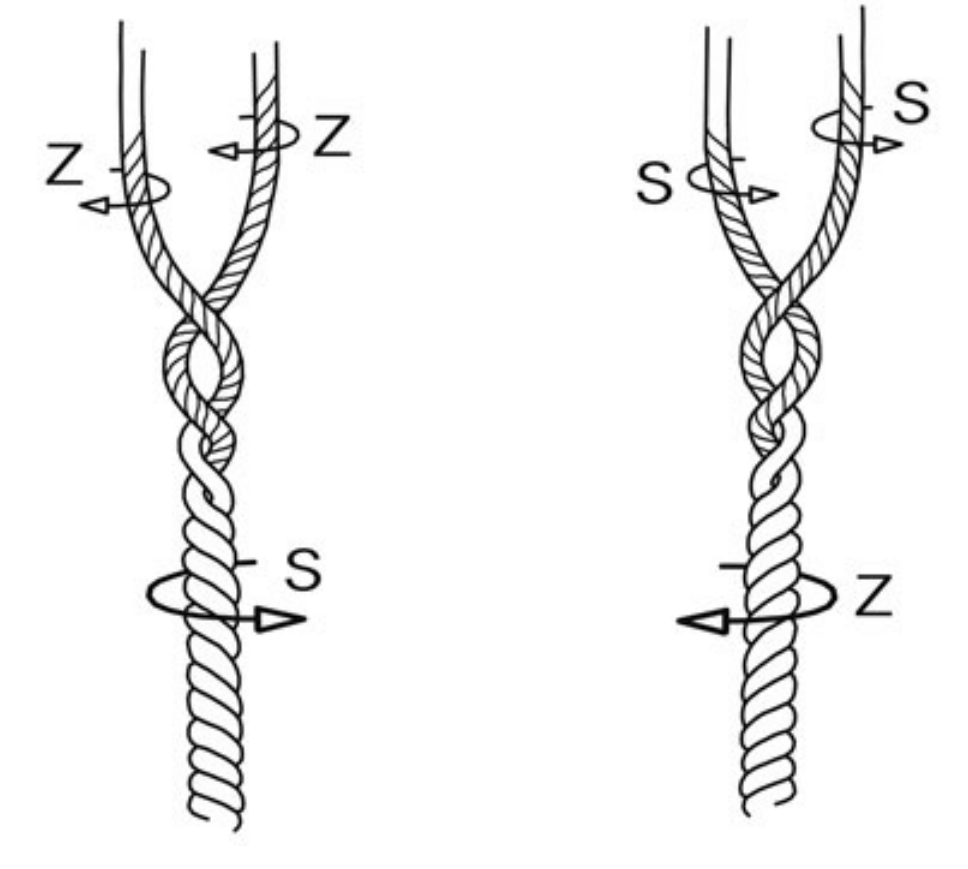
knots


grupo de 4 nudos simples
nudo largo de ocho vueltas
valor total en cordel = (4 x 10) + 8 = 48

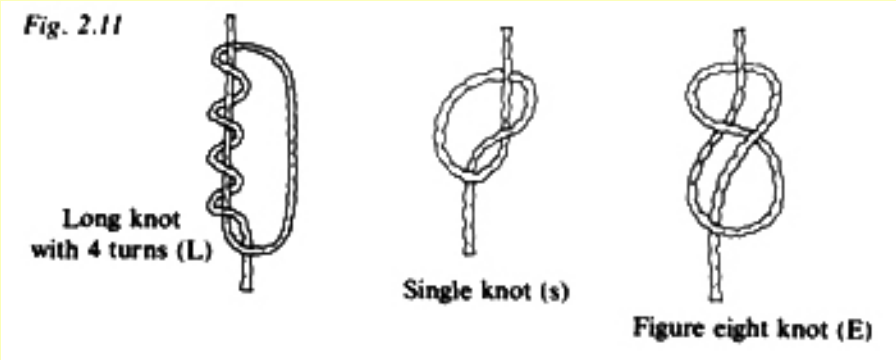

group of 4 single knots
long knot of 8 turns
total cord value = (4 x 10) + 8 = 48

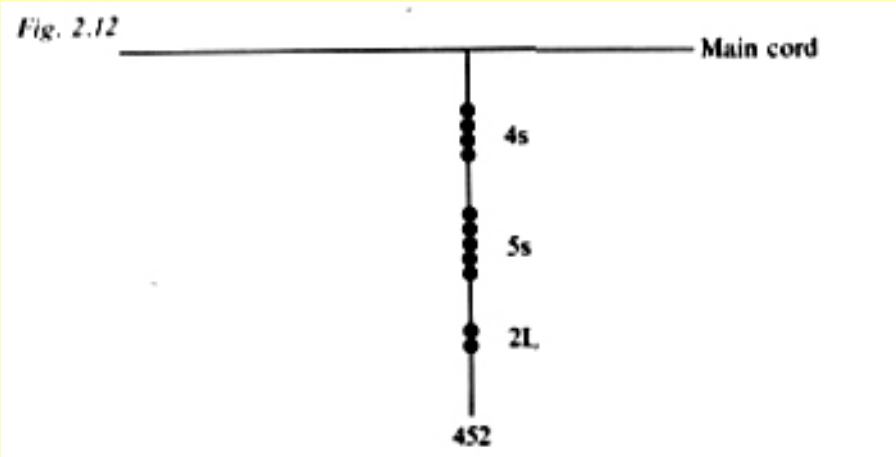

A history written in twine?
The combination of fiber types, dye colors, and intricate knotting used in Incan "khipus" could be a novel form of written language, according to Harvard anthropologist Gary Urton.
INTRICATE CHOICES
In making a khipu, Incas made a number of specific choices, each of which may have contributed to its overall meaning.
Material: Fibers were made of cotton or wool.
Spin: Fibers were spun in one of two directions.
Color: Fibers were dyed in two major color categories, dubbed dark and red rainbow; 24 different colors were used in all.
Attachment: Strings were attached to the main string in two different ways.
Knot direction: Single, long, and figure-8 knots were each tied in two different directions.
AMERICAN MUSEUM OF NATURAL HISTORY PHOTOS / JACKIE BECKET
SOURCES: Science: "Signs of the Inka Khipu," by Gary Urton
GLOBE STAFF GRAPHIC

torsion



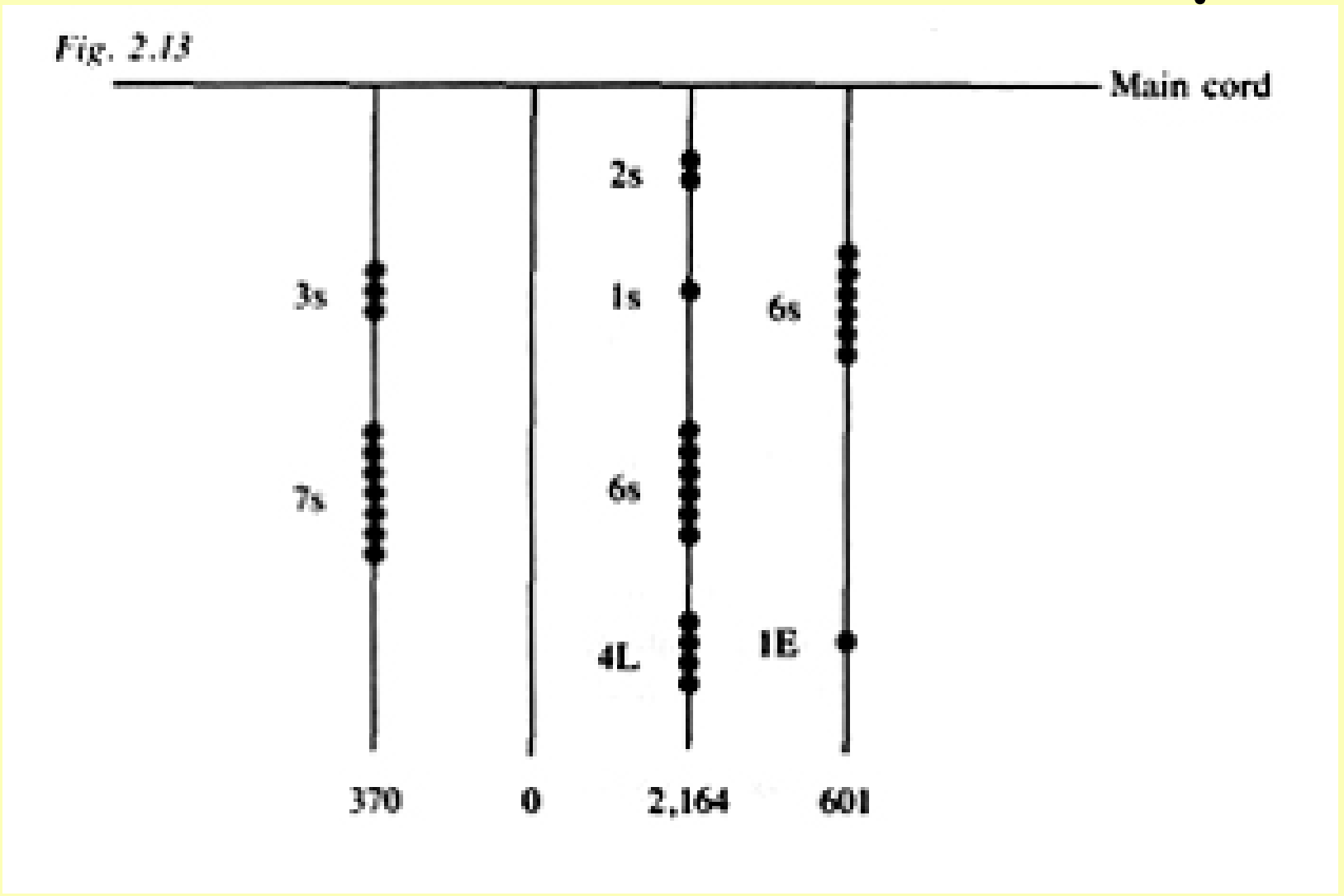
Knot – main cord - pendant



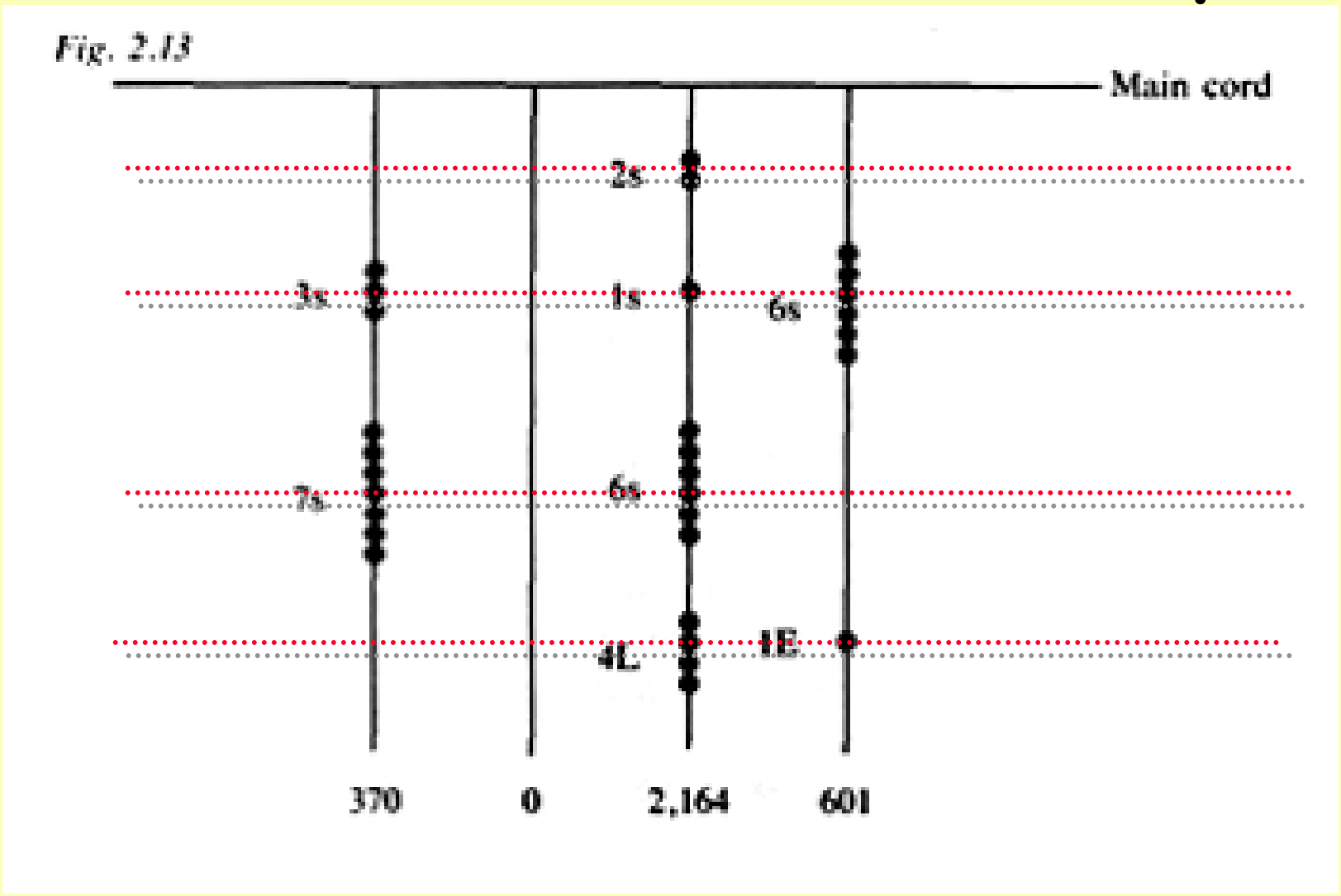


- L: long knot for units (2 to 9)
- s: simple knot in other position
- E: knot like an 8 (Eight) used for units (1)
- zero: no knot
- in general, number of 4 digits, with alignés knots

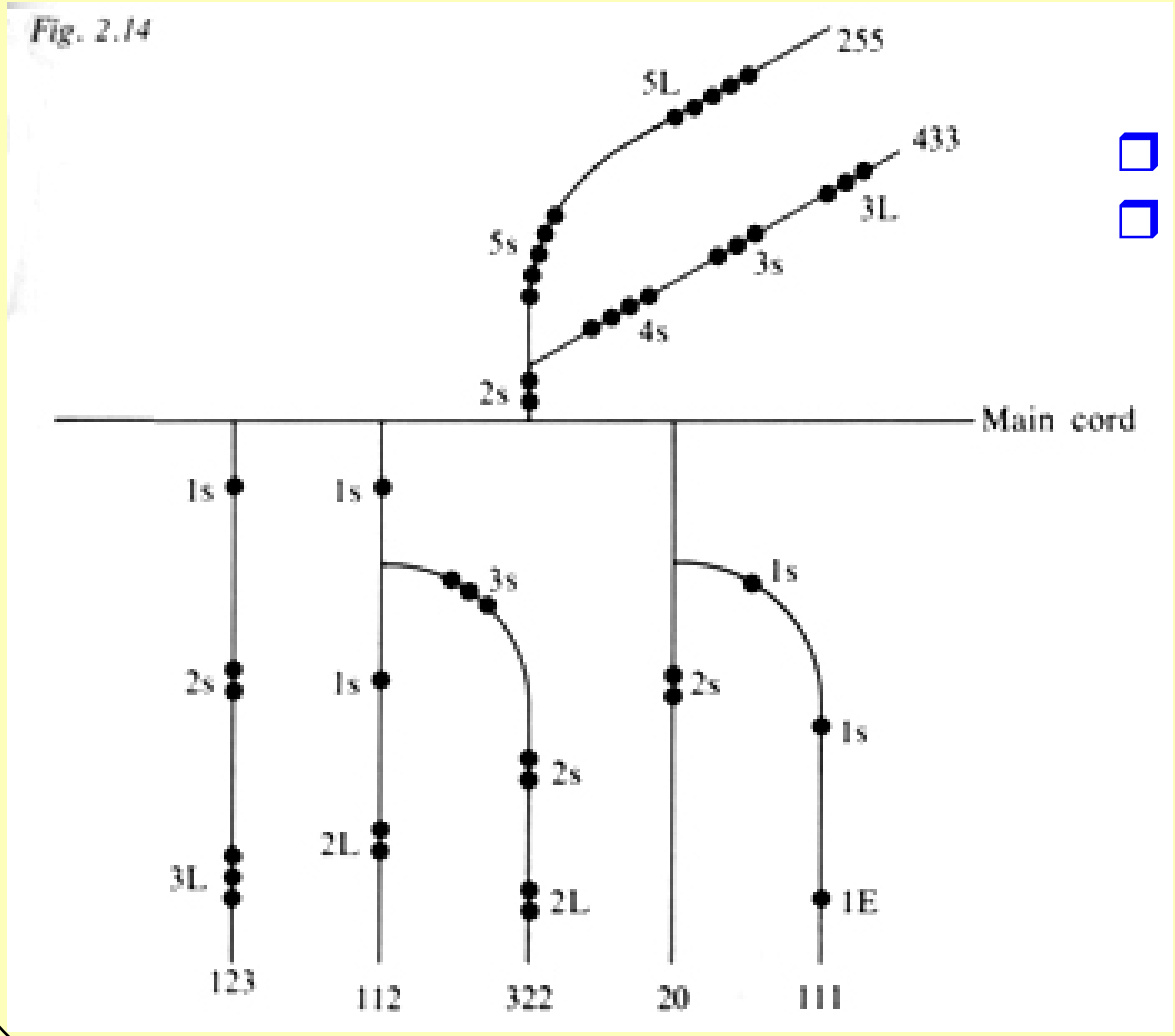
examples



examples



Pendants – subsidiary cords – superior cords



- 123 + 112 + 20
- 322 + 111

Bull. Inst. fr. études andines

1992, 21 (1): 161-175

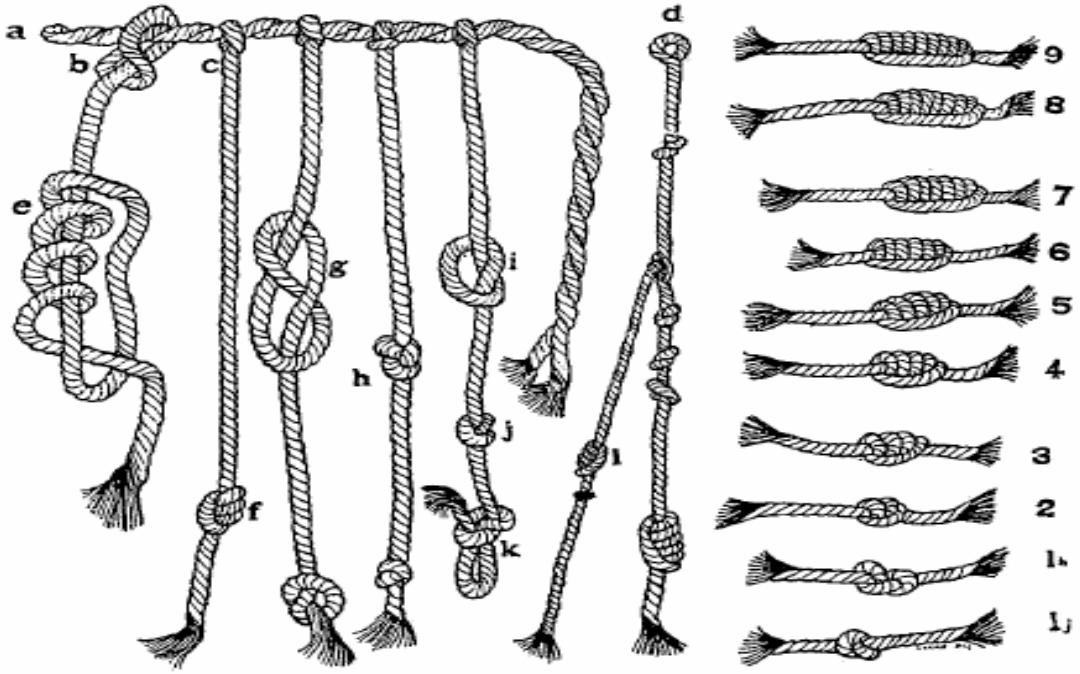
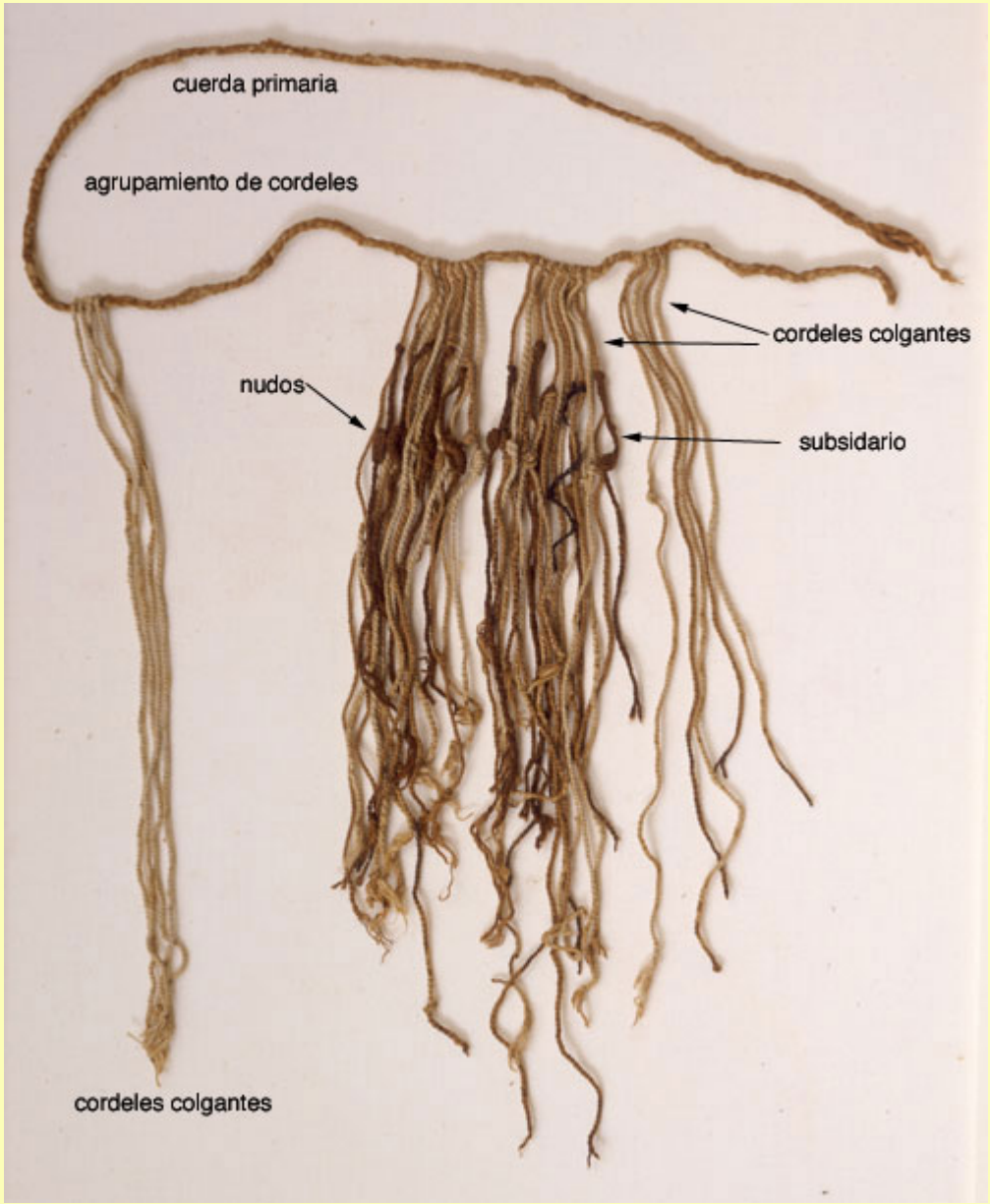


Fig. 3 - Formas de hacer nudos de un quipu, según Locke 1978 [1923]:
a) Cuerda principal; b) Lazo para atar las cuerdas colgantes a la principal; c) Lazo ajustado; d) Cuerda subsidiaria, con resumen de cuentas; e) Nudo largo (no más de 9 lazos), sin ajustar; f) Nudo ajustado; g) Nudo sin ajustar; h) Nudo ajustado; i) Nudo sin ajustar; j) Nudo ajustado; k) Nudo del extremo inferior de la cuerda, sin significado numérico; l) Nudo en cuerda colgante de una cuerda subsidiaria; 1 a 9: numerales representados en los nudos.


cuerda primaria
agrupamiento de cordeles
cordeles colgantes
nudos
subsidario
cordeles colgantes

Stamps (*Peru*, Mexico and Rwanda (!))

- One of the more unusual running-messenger special delivery designs is the 10-centavo brown-red and blue Messenger With Quipu special delivery stamp (Mexico Scott E3)

Uses of knots, notations …

- http://www.earlham.edu/~peters/knotlink.htm
- http://www.earlham.edu/~peters/knotting/notate.htm
- http://www.realknots.com/knots/
- http://www.knotpro.com/knot.htm

- http://www.realknots.com/links/Q.htm

- Tie
- Fishing
- Marine - boating
- Climbing
- Scouting
- Camping
- Speleology
- Decorative arts
- Shoes
- Mathematics (knot theory)
- Cryptography (braid)
- aso

Scientists

- Gary Urton
- Carrie Brezine
- Frank Salomon
- Ascher (Marcia et Robert)
- Peru
- …

Spelling …

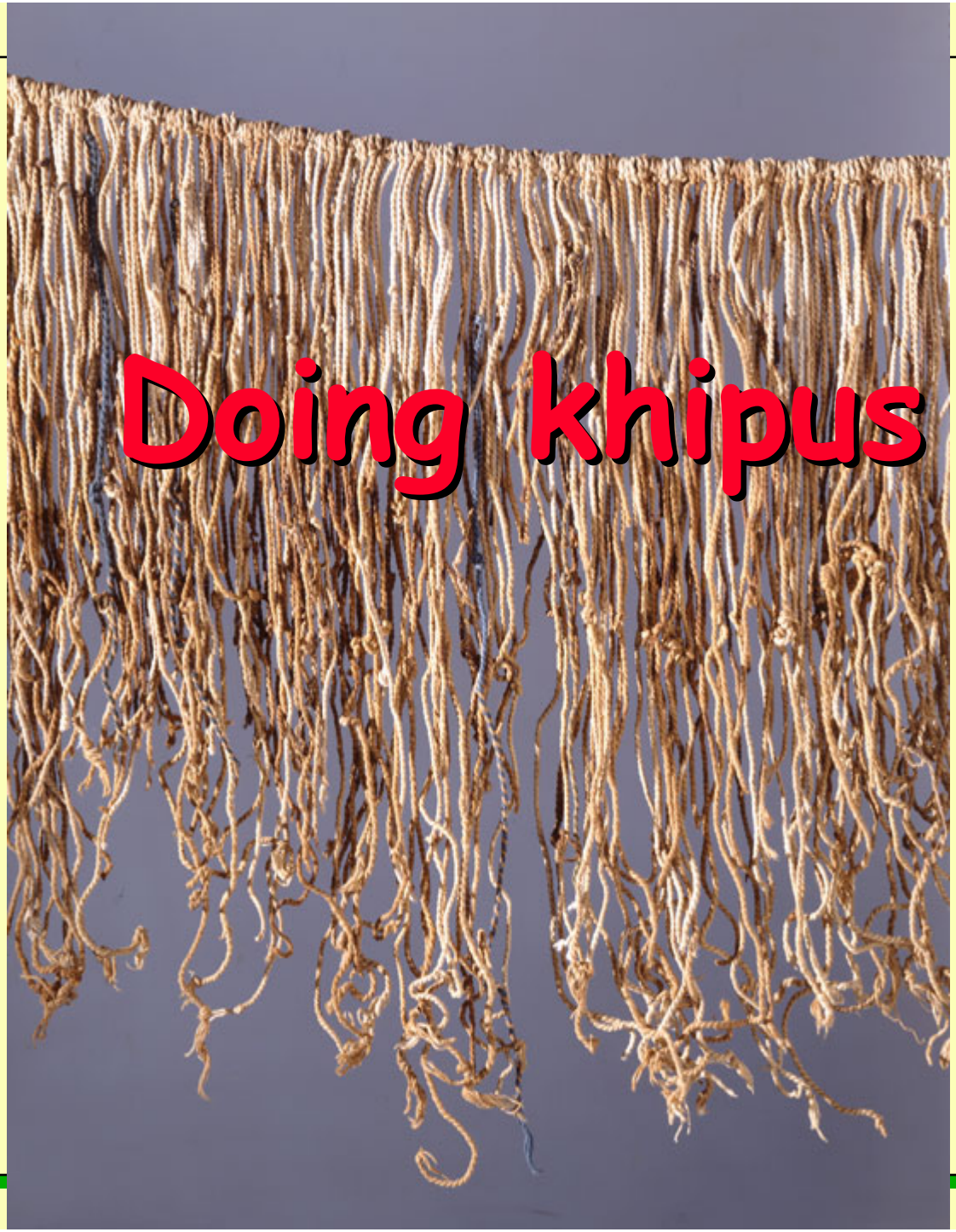
Quipu-khipu … spelling?

- QUIPU (KEE-poo) mnemonic knotted string device: Spanish spelling
- QUIPO
- QUIPOS cuerdas de varios colores con que, haciendo diversos nudos, los indios del Perú consignaban informaciones y hacían sus cálculos
- QIPU
- KHIPU: knot in (Southern) quechua
- KIPU
- Kipuo (esperanto)
- de:Quipu
  en:Quipu
  es:Quipu
  fr:Quipu
  nl:Quipu
  nn:Quipu
  pl:Kipu
  pt:Quipu
  qu:Khipu
  ru:Кипу

links

- Ascher,
http://instruct1.cit.cornell.edu/research/quipu-ascher/
- Gary Urton (Harvard)
http://khipukamayuq.fas.harvard.edu/index.html
- Quipucamayuqui
http://www.spanish.sbc.edu/MMLatAm/Quipus.html

Doing khipus



Doing khipus

- mainly cotton
- alpaga wool (lama)
- later included small objects
- numerous colors
- a quipumaker ?

Doing like this?

khipumaker on the lake Titicaca?

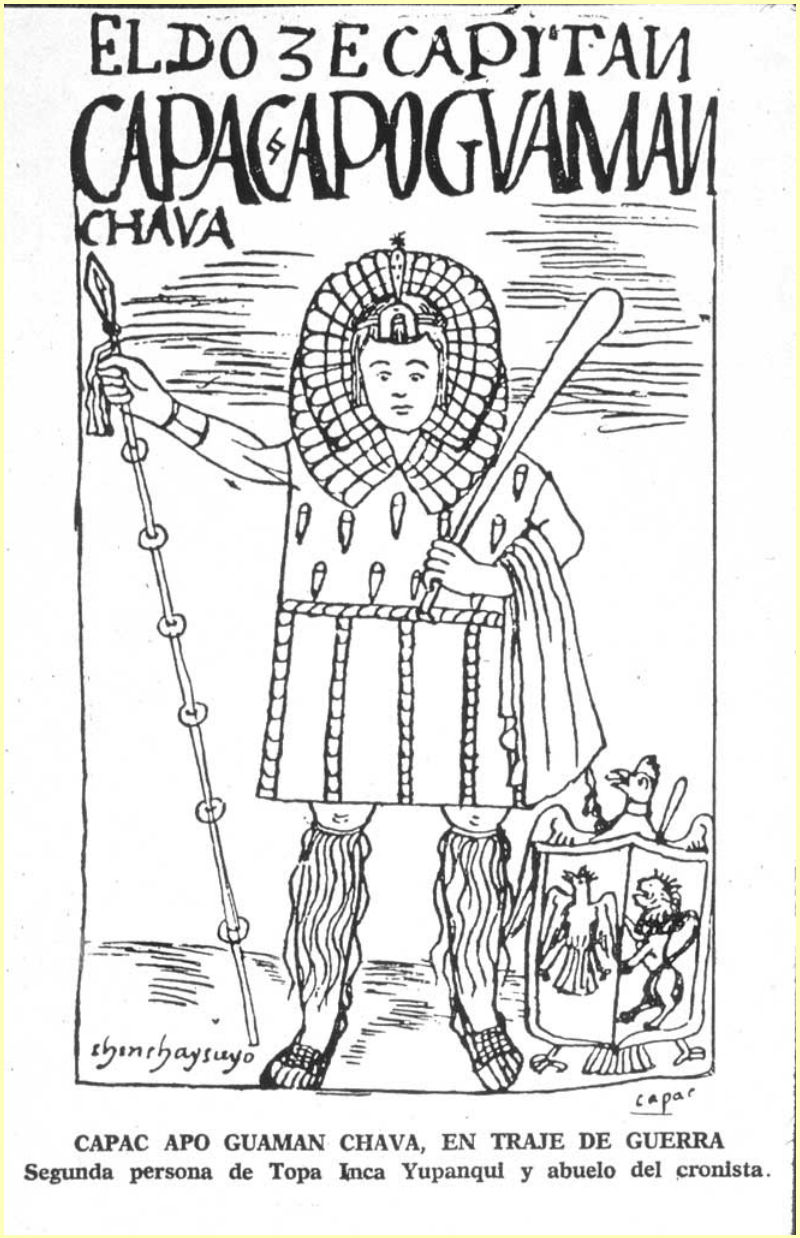
Bull. Inst. fr. études andines
1992, 21 (1): 161-175

Kauffmann Doig, Manual de Arqueologia peruana, Lima.

El resto de los conceptos que acompañaban el trabajo del *contador maior* desaparecieron con esos funcionarios, llegando hasta nosotros sólo fragmentos del uso de tablas y *quipu*, como lo registró Kauffmann (1971), por ejemplo, en las minas de Ondores (Fig. 5):

Fig. 5 - Padrón de madera actual (según Kauffmann Doig, 1971: 61, Fig. 27).

Transmission



CAPAC APO GUAMAN CHAVA, EN TRAJE DE GUERRA
Segunda persona de Topa Inca Yupanqui y abuelo del cronista.

- ?


QVNTO CALLE
SAIA PAIAC


REGIDORES
TEVGA·LIBROQVIPOCV

http://www.anthropology.wisc.edu/chaysimire/titulo2/galeria/foto26.htm

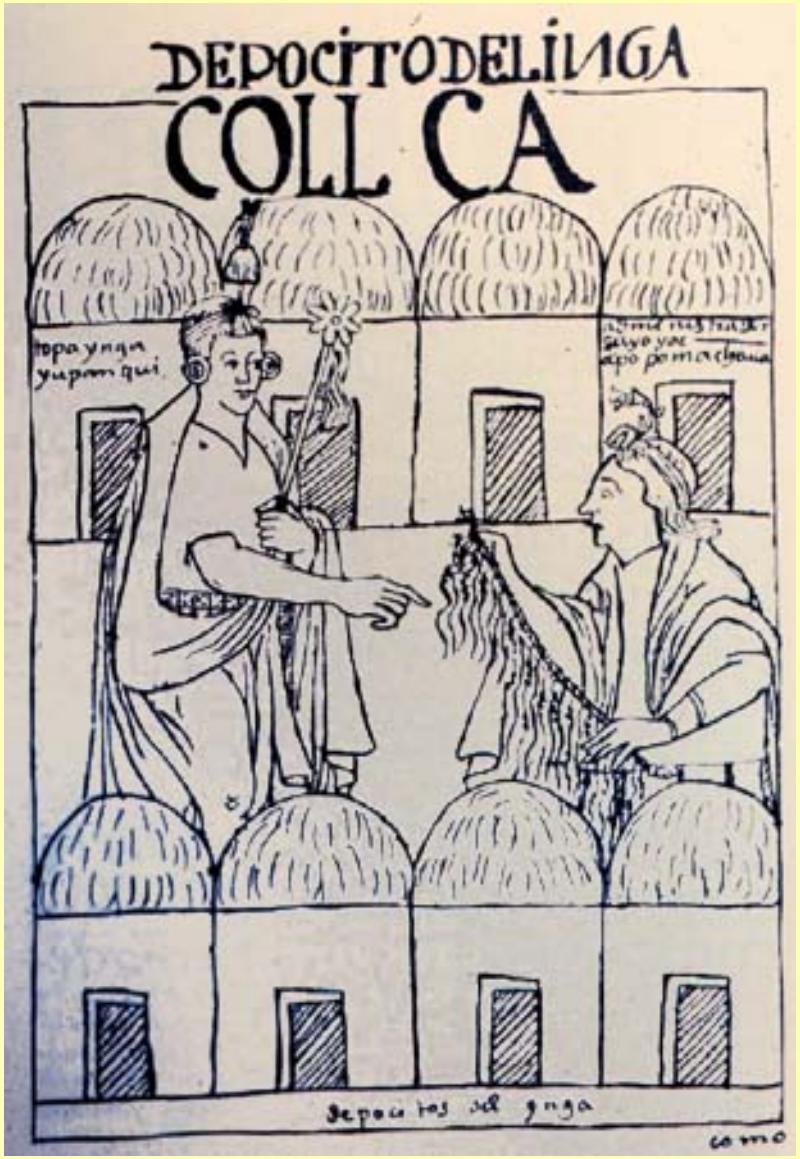
(from Tupicocha: ad hoc invented tradition?)

the house of the khipus, Kaha Wayi ('Treasury House' or 'Counting House')

- Rapaz's unique patrimony consists of a walled precinct containing the structures that once made up a system of control of community resources using traditional Andean technology. This center consisted of a storage building called Pasa Qullqa in Quechua ('Seasonal Storehouse'), and the house of the khipus, Kaha Wayi ('Treasury House' or 'Counting House').

http://www.khipurapaz.org/ingles.htm

Reading khipus


DEPOCITODELINGA
COLL CA


DEPOCITODELINGA
COLL CA

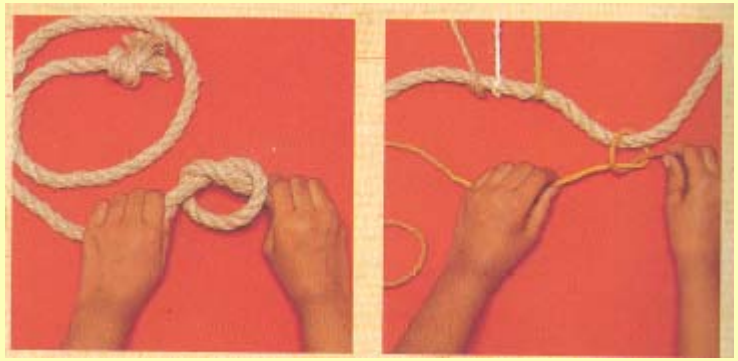
Storing khipus

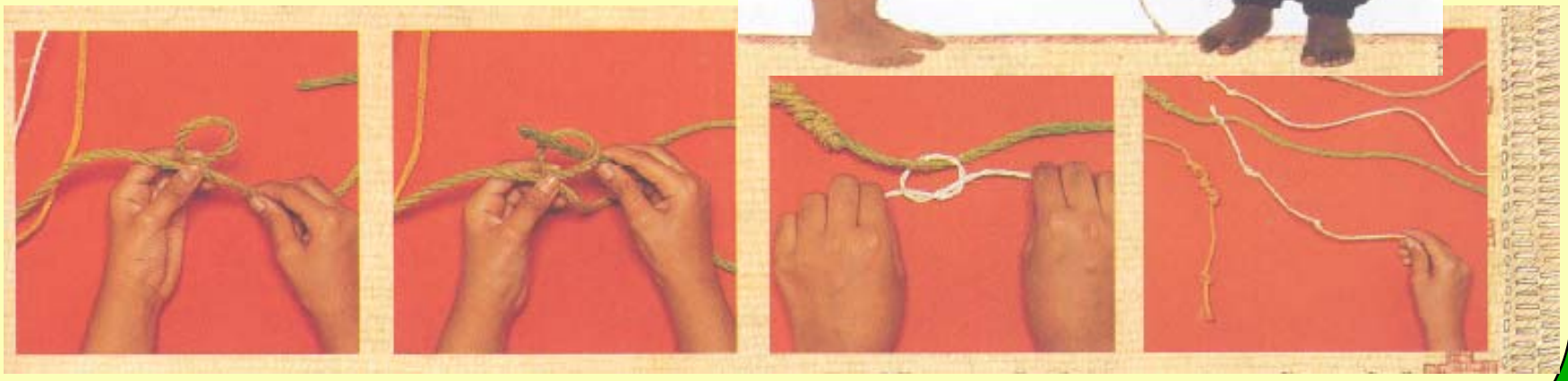
- often together
- in tombs (of the khipumakers?)
- thanks to that it was possible to find relations *between* khipus (Urton et Brezine, 2005).

Uses of khipus

- accounting: empire or local
- calendar
  http://khipukamayuq.fas.harvard.edu/KG_Chacha_Calendar.html
- archives (history, poetry, …) ?
- messages ?
- « identity label » (Urton, 2005) …

- Chachapoyas Khipu: Calendar and related khipu
- The largest khipu found in the Laguna de los Condores has 762 pendant strings. The arrangement of pendants is complex, including many loop pendants, top cords, and top loop pendants. One interpretation of this khipu is as a calendrical device. This is based on an arrangement of 730 of the strings into twenty-four groups made up of approximately 30 pendants each. This leads us to believe that the khipu is divided into two year-long sections, each section containing 12 months (2x365 = 730). With the help of the Khipu Database, it was also found that two other khipu from Chachapoyas match a significant four-month section of the large Calendar khipu. This relation between three khipu is an exciting development in the investigation of these devices.



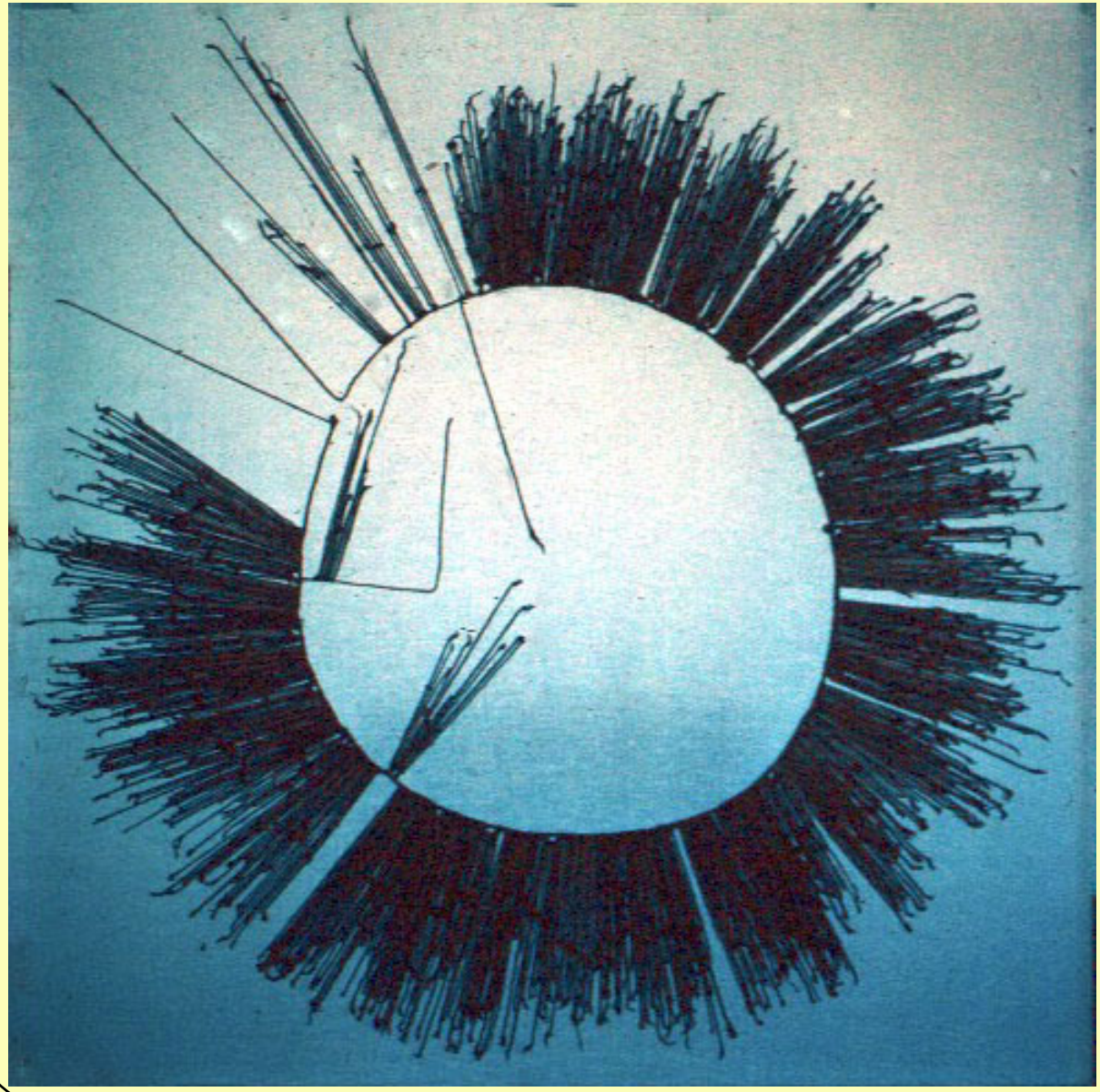


Tuesday January 23

- relations between khipus
- old and recent khipus
- khipus in the world
- databases of khipus
- old sources of informations
- recent progress

UR9

UR06



UR21

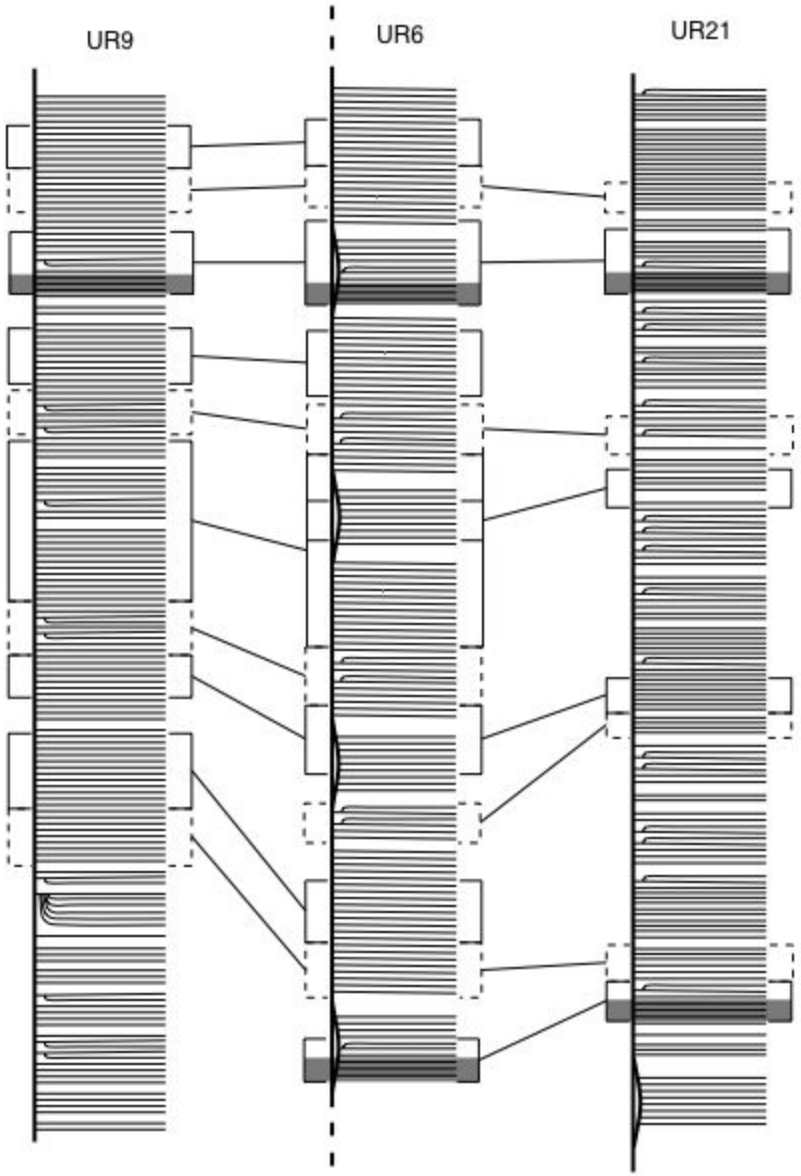


Figure 9. Three matching khipu from Laguna de los Cóndores

Legend: Exact Match Close Match Identity Label

Accounting?

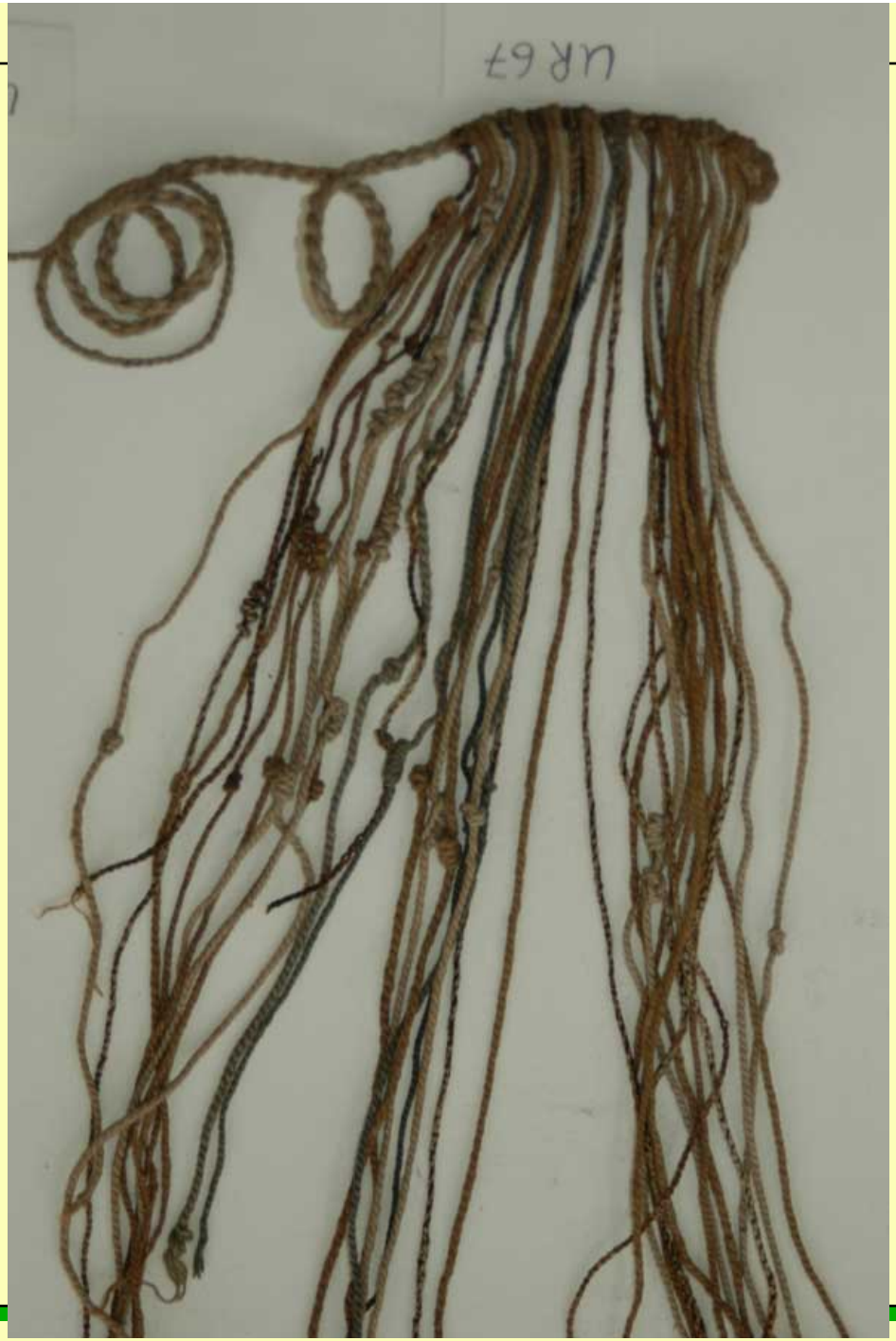
The Puruchuco khipus

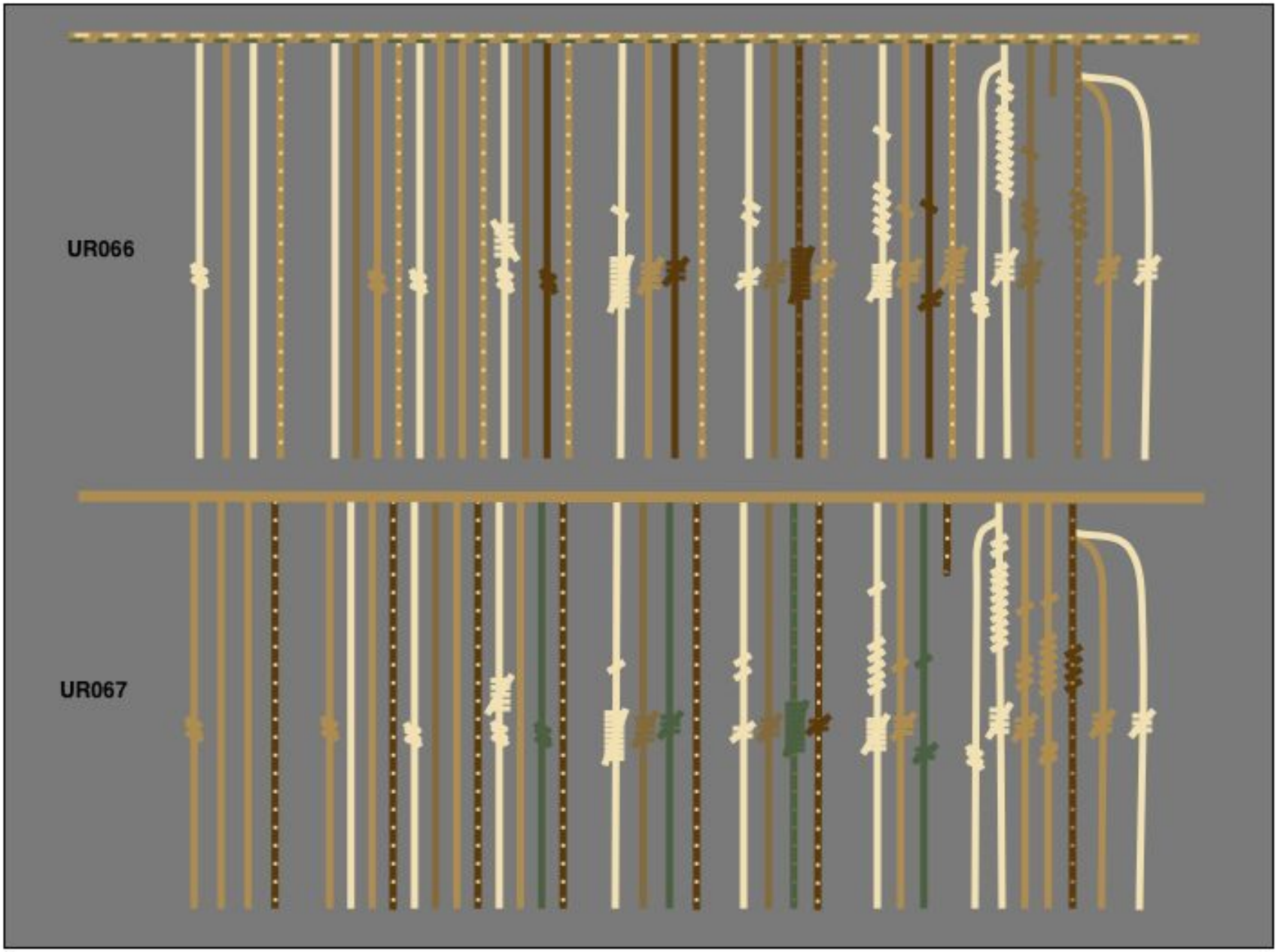
(Gary Urton)

UR66-UR67 together


UR 67
UR 66


UR66





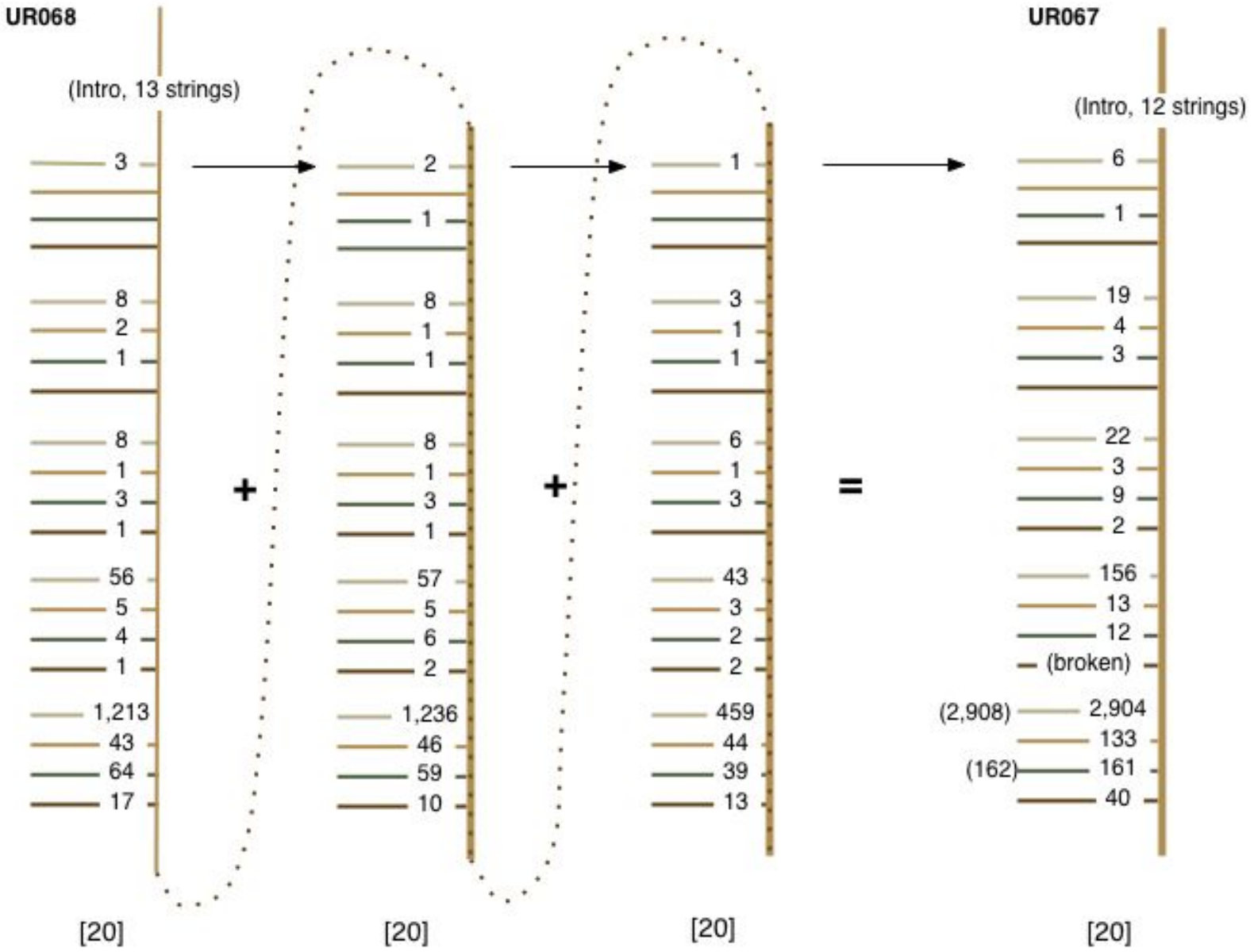
2007

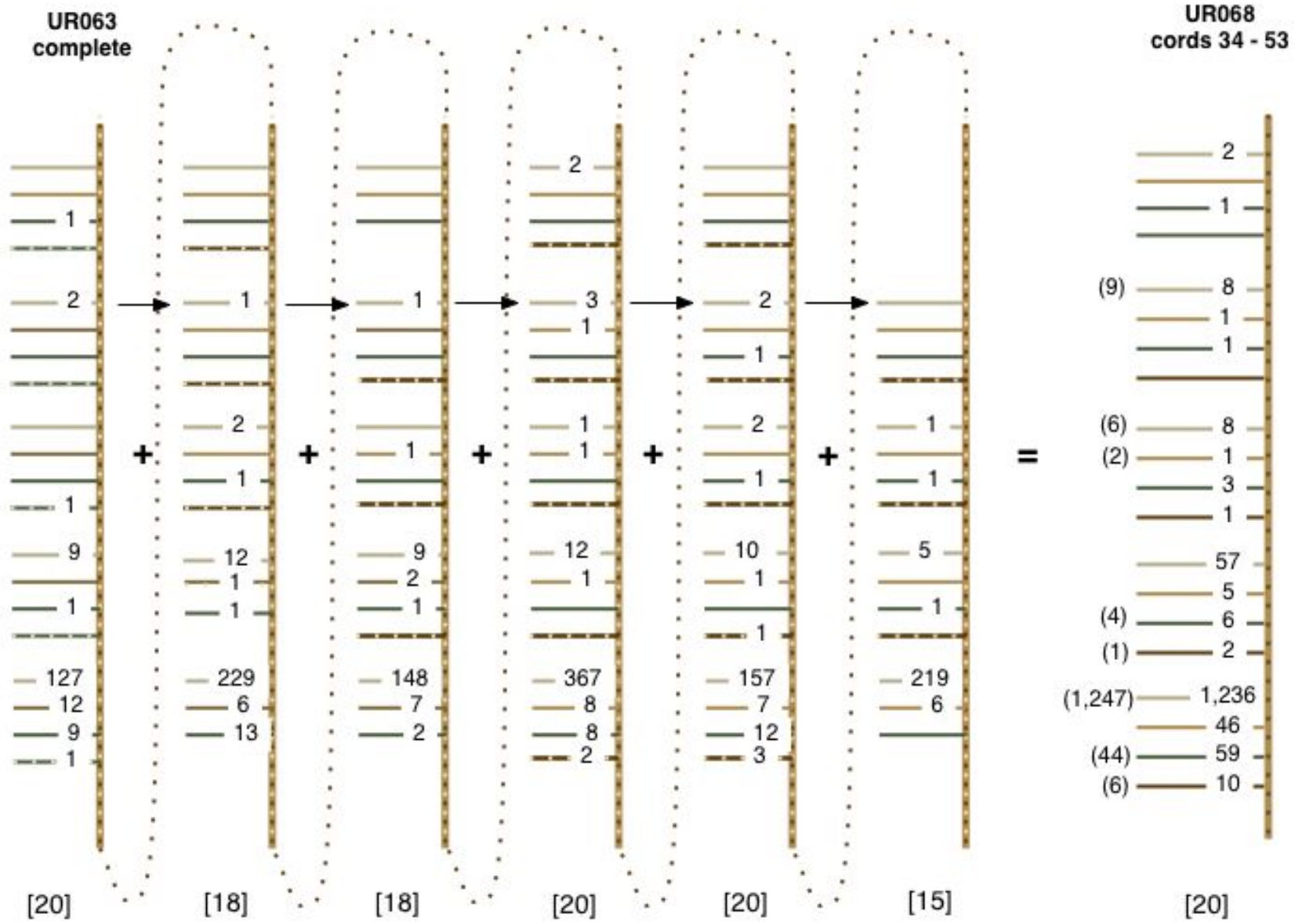
khipus

Jean-Jacques Quisquater

UR68

UR68

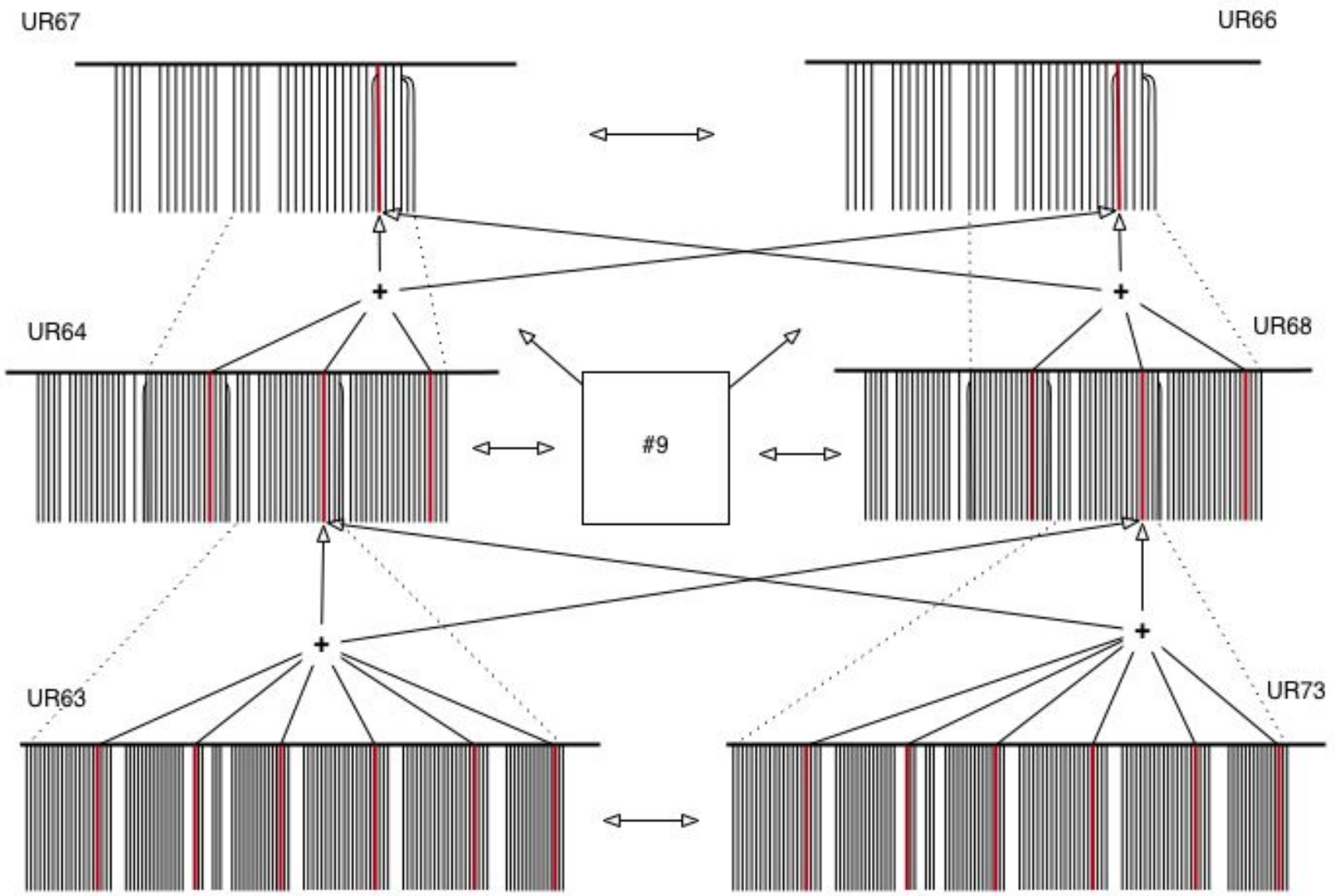

UR068
(Intro, 13 strings)
3
8
2
1
8
1
3
1
56
5
4
1
1,213
43
64
17
[20]
+
2
1
8
1
1
8
1
3
1
57
5
6
2
1,236
46
59
10
[20]
+
1
3
1
1
6
1
3
43
3
2
2
459
44
39
13
[20]
=
UR067
(Intro, 12 strings)
6
1
19
4
3
22
3
9
2
156
13
12
(broken)
(2,908)
2,904
133
(162)
161
40
[20]


UR063
complete
UR068
cords 34 - 53
[20]
[18]
[18]
[20]
[20]
[15]
[20]

UR63

UR73

UR64


UR67
UR66
UR64
UR68
#9
UR63
UR73

Old khipus (650 AC ?)

Quipu de la Huaca San Marcos (Lima)

- http://www.geocities.com/huacasanmarcos/quipu.htm
- Around 650 AC
- Lima
- 2 colors
- Found in 1959 (?)

http://terraeantiqvaefotos.zoomblog.com/cat/1780

- Around 4600 years old
- Found in Caral (Peru, 180 km North of Lima) related to the civilisation of Caral …
- brown cotton strings wound around thin sticks

- http://terraeantiqvaefotos.zoomblog.com/archivo/2005/07/17/caral-Peru-Visita-al-sitio-arqueologic.html

Caral

Amphitheater of Caral

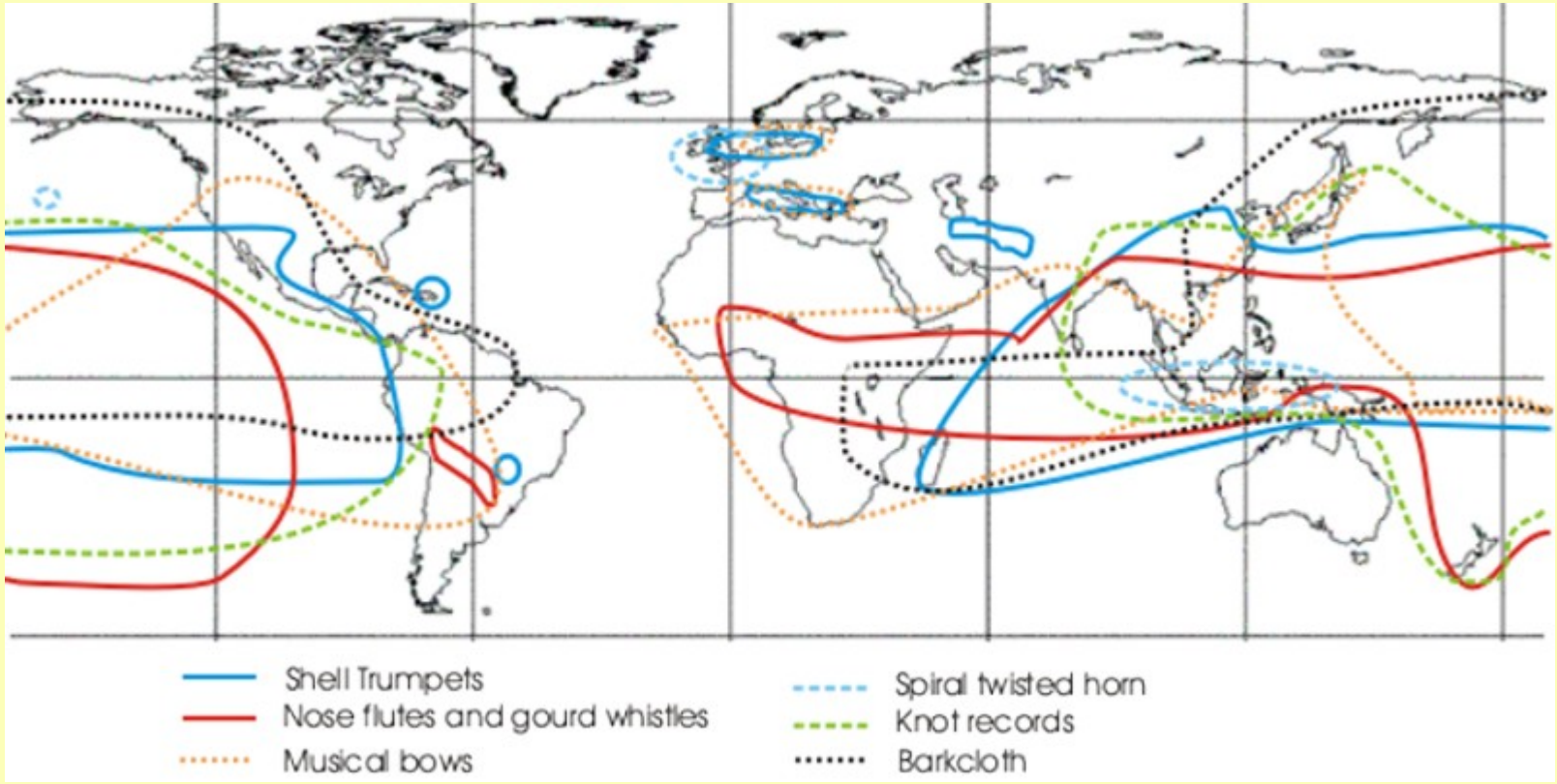
Other civilisations?

- Main reference:

- Quipus and witches' knots: The role of the knot in primitive and ancient cultures
  by Cyrus Day (1967)
- text available on internet

http://www.geocities.com/pinatubo.geo/mapping.jpg

Birket-Smith, Kaj (1966/67) The Circumpacific Distribution of Knot Records. Folk, 8/9: 15 24.



autrepart

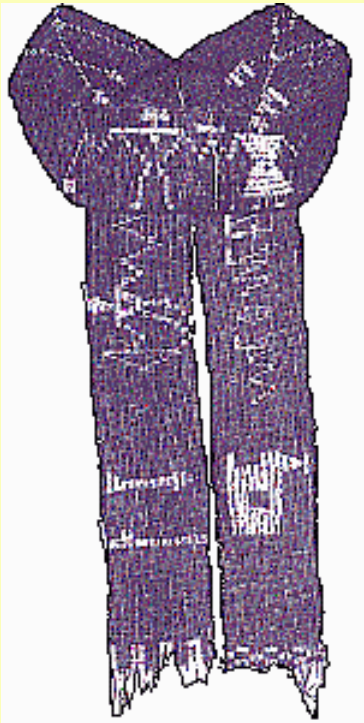
- Chez les Arabes , une cordelette à noeuds a longtemps servi comme procédé de numération concrète pour contrats et les reçus , mais aussi comme système.
- Les Chinois ont sans doute eux aussi utilisé des systèmes analogues de recensement , de comptabilité et d'archives pendant très longtemps ("qi pui", *Histoire de la Chine, par* l'eminent Jesuit Chinese scholar, P. Martin).
- En Extrême Orient, dans l'île de Yalyama, on utilisait, il y a peu de temps, un procédé analogue pour faire le bilan des récoltes. Chaque contribuable recevait de la part de son percepteur une cordelette à noeuds indiquant le montant de l'impôt.
- Au "milieu du siècle dernier" (1850), il semble que les bergers du Pérou , de la Bolivie et de l'Equateur , utilisaient les quipus pour compter le nombre d'animaux. Les Indiens de Bolivie et du Pérou de servent aujourd'hui du *chimpu*, l'équivalent actuel du quipu.
- A "la fin du siècle dernier" (1900), des cordelettes à noeuds étaient encore utilisées par les meuniers afin de comptabilier les différentes transactions avec les boulangers (déjà signalé).
- De nos jours, sur l'île d'Okinawa, les ouvriers utilisent des cordelettes en paille pour comptabiliser leurs journées de travail et les sommes qui leur sont dûes.
- *Iascaltec nepohualtzitzin, the Okinawan warazan, the Bolivian chimpu. Samoan, Egyptian, Hawaiian, Tibetan, Bengali, Formosan knot records*

Sources from 17th century

- Illustrations from 1615 by The "Indian Chronicler" Felipe Guaman Poma de Ayala (1538?-1620?) about the quipu.
  Finding his most persuasive medium to be the visual image, he organizes his 1200-page *Nueva corónica y buen gobierno (New Chronicle and Good Government)* around his 398 pen-and-ink drawings.
- http://www.kb.dk/elib/mss/poma/ (complete facsimile, 2004)
- A New Chronicle
  Several decades after the fall of the Inca empire, a native Andean from the area of Huamanga in the southern Peruvian Andes wrote to king Philip III of Spain. Felipe Guaman Poma de Ayala's aim was to seek the reform of Spanish colonial governance in order to save the Andean peoples from the destructive forces of colonial exploitation, disease, and miscegenation. Finding his most persuasive medium to be the visual image, he composed 398 full-page drawings which are an integral part of his 1200-page *Nueva corónica y buen gobierno*.
- A Digital Research Center
  Less than 50 years after it was completed in Lima, Guaman Poma's autograph manuscript of the *Nueva corónica y buen gobierno* apparently became part of the library of king Fredrick III of Denmark. Long forgotten on the shelves of the Royal Library, it was rediscovered in 1908 and published in a retouched facsimile edition in Paris in 1936. A critical and annotated transcription, based on autoptic study of the manuscript, was published in Mexico City in 1980, edited by John V. Murra, Rolena Adorno, and Jorge L. Urioste (revised edition, 1987). In May 2001, a complete digital facsimile of the original manuscript was launched on the Internet by the Royal Library. In August 2004, this facsimile was embedded in a newly revised, digital, and online searchable version of the 1987 edition of the *Nueva corónica y buen gobierno*, to which the annotation and bibliography have been updated.

- Juan de Betanzos, Pedro Cieza de Leon, and Pedro Sarmiento de Gamboa (transcritions de quipus ?)

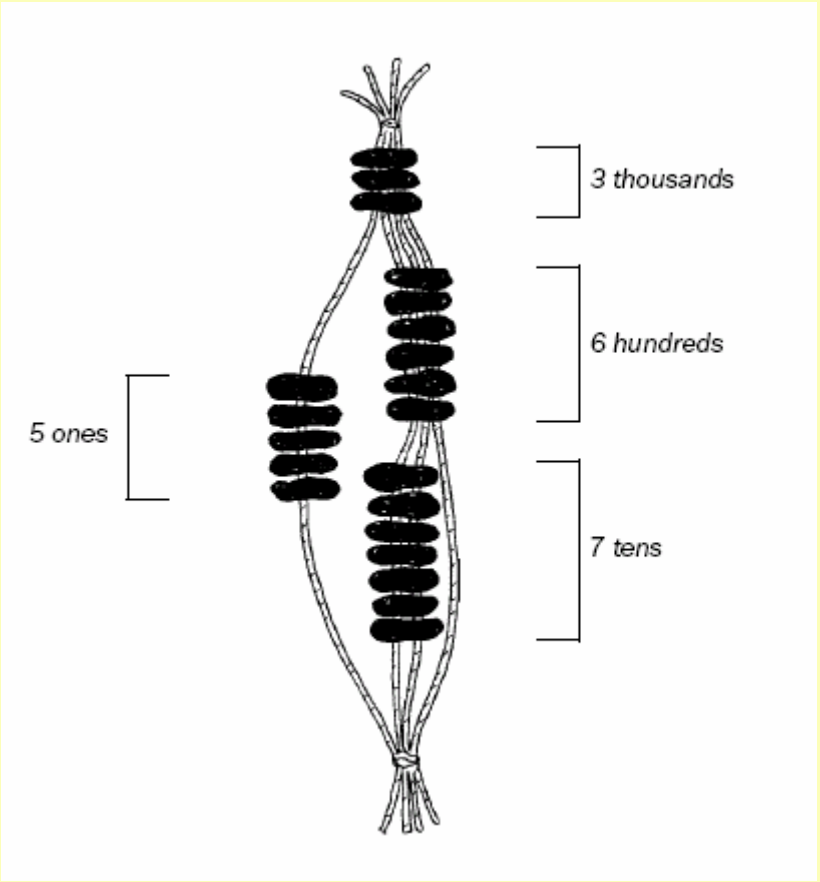
wampum



- *Concordat between the Holy See and the Mik'maq Nation," of Nova Scotia, Canada.*

- *Wampum* was used by many Indian peoples in the northeastern part of North America as a way of recording and sending messages. It consisted of purple and white beads made from the shells of quahog clams. The beads were strung in single strands or woven into "belts", much like those made on bead-looms today. The design on each string or belt indicated the type of message being sent and helped the messenger remember the specific contents.

Chimpu (Bolivia, Peru)



- http://www.origo.com.au/media/pdf/samples_books/sss_sample.pdf
- 3675
- cordón de hilos torcidos que los chinchasuyos y otros indios traen en la cabeza

Warazan (- warasan) - Japon

- http://www.arithmeum.uni-bonn.de/de/events/20
- We are very grateful to Professor Kurayoshi Takara of the Ryûkyû University in Japan for making possible the acquisition by the Arithmeum of extremely rare Japanese calculating aids, the „warazan". In Japanese this means „reckoning with straw". The Okinawa Islands in the Ryûkyû Island Group are one of the very few places in Japan where one used these straw reckoning aids up to the beginning of the nineteenth century.
- Japanese Ketsujo of similar construct from Ryu-Kyu

Barazan and warazan

- http://www.wonder-okinawa.jp/024/english/moji/warazan

quipocamayos" or "equipos" or "caytus

- the quipus of today in Peru in the mountains

Hawai'i

- Journal of voyages and travels by the rev. Daniel Tyerman and George Bennet, esq., deputed from the London Missionary Society, to visit their various stations in the South Sea Islands, China, India, &c. between the years 1821 and 1829
  by Daniel Tyerman (1832)
  [http://www.ethnomath.org/resources/tyerman1832.pdf]
  In Chapter 21 of the second volume, the authors describe their journey into the Hawai'i district of "Waerua". In discussing the power of chiefs, tax collectors are portrayed as being incapable of reading or writing, but keenly adept at keeping precise accounts of all articles gathered from the inhabitants throughout the island. It is noted that the register is a mere line of cordage about four to five hundred fathoms long. Parts of the cordage are assigned to the various districts, made distinctive from another by different knots, loops, tufts, shapes, sizes, and colors. Each taxpayer in the district has a portion in this string, "and the number of dollars, hogs, dogs, pieces of sandal wood, quantity of taro, &c., at which he is rated, is well defined by means of marks, of the above kinds, most ingeniously diversified" (p. 71).

Bible … (Salomon Ganz, 1930)

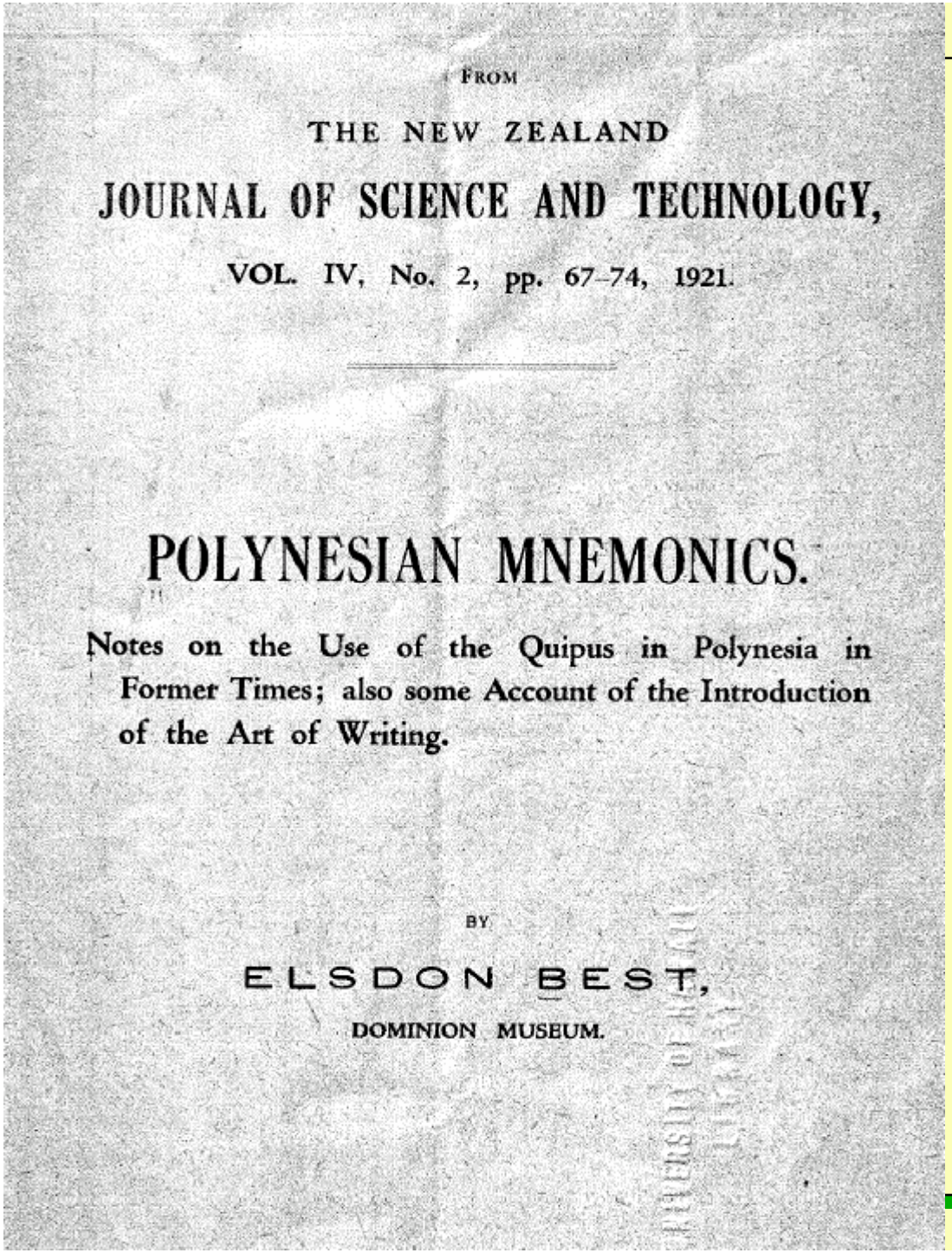
The knot in Hebrew literature, or from the knot to the alphabet

I. Introductory.
1. The Natural and the Mechanical Memory. — 2. Writing, the Memory-Machine. — 3. Knots, the Primitive Memory-Tools.
II. Knots in Magic and Superstition.
4. Magic Knots. — 5. The Magic Knot in Hebrew Literature. — 6. The Cameo. — 7. The vow. Binding and Loosing. — 8. The Magic Knot in the Qurân. — 9. The One who Loosens the Knot.
III. Historical and Mnemonic Knots.
10. The Quipu. — 11. Two aspects of the Quipu. — 12. The Phylacteries (*Tephillin*). — 13. The Fringes (*Ṣiṣith*). — 14. More Evidence for Mnemonic Knots in the Bible. — 15. The Rôle of the Quipu in the Organization of Revolts.
IV. Mathematical Knots.
16. Knots in Counting. — 17. The Knot-Abacus. — 18. Arabic, Roman, and Greek Traces of the Knot-Abacus. Articuli. — 19. Knotted Cords as Registers and Accounts. — 20. The Publican's Knot in Palestine. —
V. Knot-Letters or Knot-Numerals.
21. Knot-Receipts. — 22. The Ghobar-Numerals, or Apices, are called « Roman Knots ». — 23. Knot-Letters in the Phylacteries. — 24. Egyptian and Chinese Knot-Letters. — 25. Conclusion. From the Knot to the Alphabet.

Indians (North America)

[3] J. D. Leechman and M. R. Harrington, *String Records of the Northwest, Indian Notes and Monographs*, 1921.

- We know that the natives of the Caroline, Pelew, and Hawaiian Groups formerly employed the *quipu*, or knotted cords, as mnemonic aids to memory, and that the same aid was in use among Polynesians generally. The Rev. G. Turner remarks in his *Samoa a Hundred Years Ago*, "Tying a number of knots on a pice of cord was a common way of noting and remembering things, in the absence of a written language amongst the South-Sea-Islanders." We also know that the Maori of New Zealand has a traditional knowledge of the *quipu*, known to him as *aho ponapona*.



FROM

THE NEW ZEALAND

JOURNAL OF SCIENCE AND TECHNOLOGY,

VOL. IV, No. 2, pp. 67–74, 1921.

POLYNESIAN MNEMONICS.

Notes on the Use of the Quipus in Polynesia in Former Times; also some Account of the Introduction of the Art of Writing.

BY

ELSDON BEST,

DOMINION MUSEUM.

Polynesian mnemonics: notes on the use of quipus in Polynesia in former times; also some accounts of the introduction of the art of writing
by Elsdon Best (1921)
[http://www.ethnomath.org/resources/best1921.pdf]
This article describes references in early literature to the use of knotted cords, or quipu, in Polynesia. In Hawaii, they seem to have been used for keeping tax records. Although no records of use are extant, the Maori have two expressions, aho ponapona and tau ponapona, that mean "many-knotted cord," and these are used in the tale of Whatonga, a Polynesian voyager of about 700 years ago. Marking notches on gourds may have served a similar purpose.

Maori quipus (kupu) ?

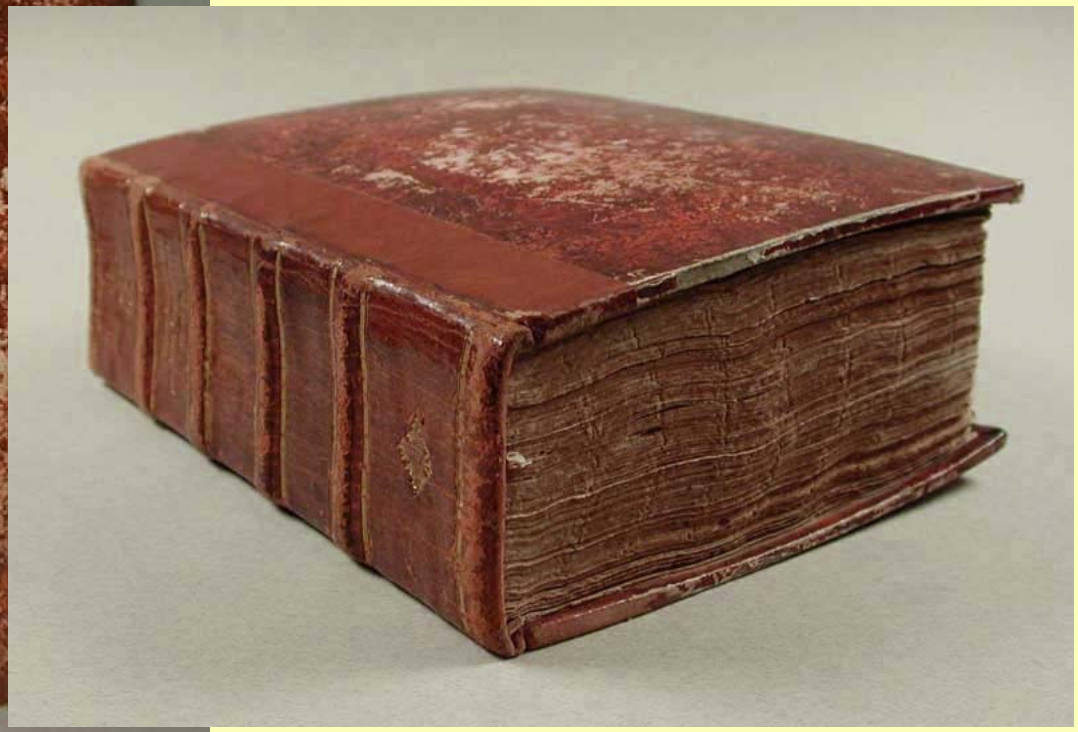
- Quipu knotted string bundles have been found in New Zealand and are preserved in our museums or spoken of within the wharewaananga (Maori schools of learning) as a form of language. It is quite possible that some New Zealand quipu's were used for sine, tangent and cosine logarithmic reference. In New Zealand, 'the string knot language was called "kupu" (like quipu). (ref. Mana Cracknell of the Maori Wharewaananga).

- Maori symbolism: being an account of the origin, migration, and culture of the New Zealand Maori as recorded in certain sacred legends
by Ettie Rout (1926)
[http://www.ethnomath.org/resources/rout1926.pdf]
This report mentions calculations used by the Maoris, described as resembling methods employed in ancient Mexico and Peru. It is noted that the "intellectual life of the Maori was much more rich and full than has been suspected by Europeans . " . reading, writing, and arithmetic were known." A chief kept notations related to community records on his sash (Kupu) worn on ceremonial occasion. "Accounts for high numbers" were kept track on the Kupu. A detailed description is provided of the elaborate and colorfully woven sash consisting of knotted strings. The king's Kupu kept track of all the community records. Various "signs "used for ranges of numbers are also covered (e.g., "from 11 to 19 the same signs are used [as for 'numbers 1 to 10], but with the hands resting flat on top of head"). Beyond 10,999, "multiplication signs were employed" and indicated by different colors.

Old sources of informations

www.kb.dk/elib/mss/poma/index-en.htm

12 pages speak about khipus



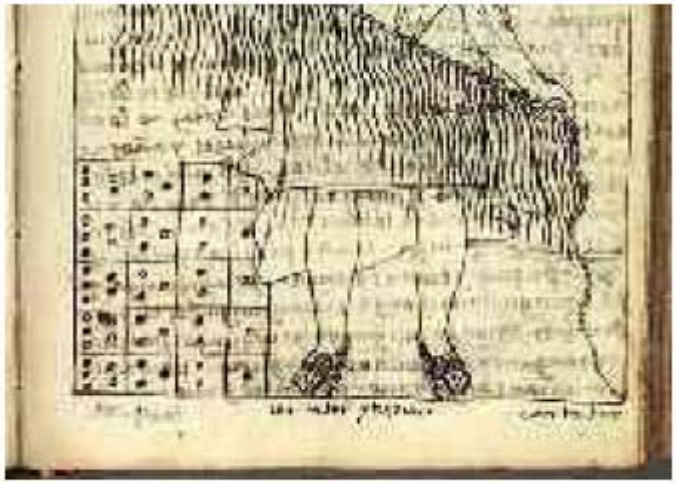
Huaman Poma de Ayala, folio 362 - Biblioteca Real de Copenaghe

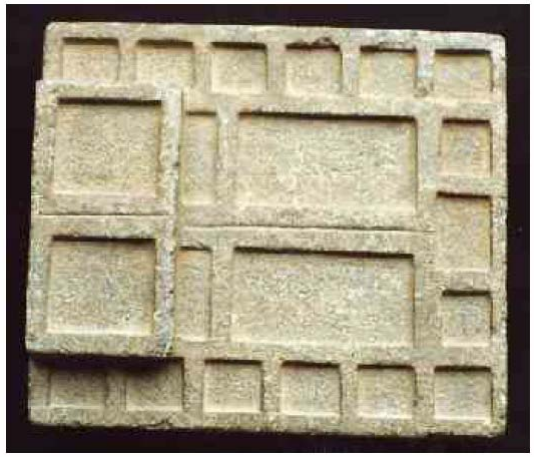

CVRACA·CON DOR·CHAVA


362
36
CVRACA·CON DOR·CHAVA
con tador y tegorero
contador

Nicolino De Pasquale

http://www.quipu.it





Nicolino De Pasquale (Pisa)

- reçoit un livre avec des énigmes pour sa Noël 2000
- résoud l'énigme des quipus en 40 minutes (tiens, tiens),
- utilise les nombres de Fibonacci (1, 2, 3, 5),
- Leonardo Pisano (surnom Fibonacci, et encore bigollo, bon à rien, né et mort à Pise), éduqué en Algérie où son père travaille,
- système en base 40, car

  1x1 + 2x2 + 3x3 + 5x5 = 39
- opérations compliquées mais mathématiquement correctes
- devient un héros italien et a des explications pour tout …

Other source

- Garcilaso de la Vega, (né à Cuzco le 12 avril 1539, mort le 23 avril 1616).Ne pas confondre avec le poète.
- C'est un métis fils d'un capitaine espagnol, Sebastián Garcilaso de la Vega y Vargas, et de la princesse Inca Isabel Chimpu Ocllo, descendante de l'Inca Huayna Capac.
- Il réside à Cuzco jusqu'en 1560, date de la mort de son père, année où il part définitivement du Pérou pour s'installer en Espagne.
- C'est le premier grand écrivain péruvien. Ce fut aussi le premier latino-américain à écrire sur l'Amérique depuis l'Europe. Ce sont les *Commentaires Royaux* (Comentarios Reales), qu'il conçoit en deux parties : la première sera celle de l'histoire de ses ancêtres maternels, la seconde celle de la conquête du Pérou et qu'il publie au crépuscule de sa vie en 1609.
- Ce livre est un témoignage unique sur l'histoire des Incas avec une vision moins européenne que les ouvrages publiés à cette époque

Khipus census (Urton)

estimations

- around 730 khipus known in museums
- Gary Urton: around 2000 khipus in the world (private collections)
- Gary Urton: census in September 2005

Europe

Amerika Museum, Cuijk, Netherlands	1			
British Museum, London, England	1		1	AS14
Deutsche Museum, Munich, Germany			1	
Ethnografiska Museum, Göteborg, Sweden	17		17	UR113-129
Ethnografiska Museum, Stockholm, Sweden	1			
Ethnographic Museum, Antwerp, Belgium	1			
Linden Museum, Stuttgart, Germany	1			
Musée d'L'Homme, Paris, France	15		11	AS74-84
Musée d'Ethnographie, Geneva, Switze	1		1	AS85
Museum Voor Landen Volk., Rotterdam, Netherlands	1		1	AS29
Museum für Völkerkunde, Basel, Switzerland	4		1	AS86
Museum für Völkerkunde, Berlin, Germany	298	(402?)	93	AS97-189
Museum für Völkerkunde, Freiburg-Im-Breisgau, Ger.	1			
Museum für Völkerkunde, Hamburg, Germany	2			
Museum für Völkerkunde, Leipzig, Germany	10			
Museum für Völkerkunde, Munich, Germany	21		18	AS87/N3-96; UR23-29; 57
Museum für Völkerkunde, Vienna, Austria	1		1	AS208
Náprstkova Muzeum, Prague, Czechoslovakia	1		1	AS211
National Museum, Copenhagen, Denmark	1			
Niedersächsisches Landesmuseum, Hannover, Germany	4		4	AS10-13
Rijksmuseum voor Volkenkunde, Leiden, Netherlands	1		1	UR56
Tropen Museum, Amsterdam, Netherlands	1			

Amérique du nord

Amer. Museum of Nat. History, New York, N.Y.	48	8	AS190-200
Beloit College	1	-	
Brooklyn Museum, New York, N.Y.	3	1	AS35
Carlos Museum, Emory Univ., Atlanta, GA	2	2	UR30-31a-c
Dallas Museum of Art	ca. 20		
Field Museum of Nat. History, Chicago, Ill.	1	1	AS210
Furman University, Greenville, S.C.	1		
Haffenreffer Museum, Brown Univ., Bristol, RI	1		
Harris, Leo J., St. Paul, Minn.	1	1	AS213
Hood Museum of Art, Dartmouth Coll., Hanover, N.H.	2	2	AS214-215
Joslyn Art Museum, Omaha, Neb.	1	1	AS212
Llewellyn, C., Durham, N.C.	1		
Lowie Museum, Univ. of Cal., Berkeley, Cal.	5	5	AS201-205; UR32-33
Milwaukee Public Museum, Milwaukee, WI	3		
Museum of Cult. History, UCLA, Los Angeles, CA	1	1	AS206
Museum of Science, Buffalo, N.Y.	1	1	AS207
National Museum, Smithsonian, Washington, D.C.	1	1	AS34
Newark Museum, Newark, N.J.	1		
Peabody Museum, Harvard Univ., Cambridge, M	5	5	AS30-33;UR40-44
Peabody Museum, Yale Univ., New Haven, CT	1	1	(?)
Royal Ontario Museum, Toronto, Ontario	2	1	AS209
Textile Museum, Washington, D.C.	2		
University Museum, Univ. of Penn., Philadelphia, PA.	14	14	AS15-28

Amérique du sud

Armatambo, Peru	ca. 10	-	-
Banco Cen. Res.Peru, Lima, Peru	5	3	UR51-53a-e
Bruning Museum, Lambayeque, Peru	1	-	-
Centro Mallqui, Leymebamba, Peru	32	22	UR1-22
Dauelsberg, P., Arica, Chile	3	3	AS69-71
Museo Amano, Lima, Peru	4	4	AS48-49; UR37-38
Museo de Arqueo., Azapa, Arica, Chile	1	1	UR58A-B
Museo Chileno (MCAP), Santiago, Chile	7	6	UR35,36, 130-133
Museo de Ica, Ica, Peru	22	8	AS51-58
Museo "Jijon y Caamaño," Quito, Ec.	2	2	AS36-37
Museo Larco, Lima, Peru	5	5	UR45-49
Museo Nac. De Ant./Arq., Lima, Peru	35	10	AS38-47
Museo Oro, Lima, Peru	1	1	UR55
Museo de Pachacamac, Peru	35	-	-
Museo Puruchuco, Ate, Peru	23	23	UR60-82
Museo Temple Radicati, Lima, Peru	27	27	UR85-112
Nuñez del Prado, O., Cusco, Peru	9	9	AS59-67
Rancho de S. Juan, Ica Valley, Peru	2	2	AS72-73
Soldi, A., Lima, Peru	3	3	AS50; UR50, 54
Univ. Nac. La Plata, La Plata, Argentina	2	-	-
Univ. San Martín de Porras, Lima	1	1	UR39

- **Carmen Beatriz LOZA EHESS (1996-1998)•**
- **"'Tyrannie' des Incas et 'naturalisation' des Indiens. La politique de Francisco de Toledo, vice-roi du Pérou (1571-1628)", *Annales*, avril-mai 2002.**
- **• "El modelo de Max Uhle para el estudio de los 'quipus', a la luz de sus notas inéditas de trabajo de campo (1894-1897)", *Indiana* (Berlin), 16 (2000), p. 123-158.**
- **• "Quipus y quipolas at the Museum für Völkerkunde, Berlin: genesis of a reference collection (1872-1999)", *Baessler-Archiv. Beiträge zur Völkerkunde* (Berlin), 47 (72) (1999) 1, p. 39-75.**
- Max Uhle (1856-1944)
- **• "Juger les chiffres : statut des nombres et pratiques de comptage dans les dénombrements andins, 1542-1560" *Histoire et mesure*, 13 (1/2 1998), p.13-37.**
- **• "Du bon usage des quipus face à l'administration coloniale espagnole", *Population* 53 (1-2 1998), p. 139-160.**

Matériel étudié

- 734 quipus connus dans des musées (dont près de la moitié dans un musée à Berlin)
- 2/3 sont en système décimal (accounting)
- environ 200 dans des musées au Pérou
- seulement 325 décrits scientifiquement (Urton, Ascher)
- très peu ont une origine connue
- Ascher : environ 200 quipus
- Urton : environ 200 quipus (recoupement avec l'autre)
- deux tiers des quipus sont dans des collections privées (et bien plus, sans doute, chez des habitants du Pérou)

http://instruct1.cit.cornell.edu/research/quipu-ascher/

CONTENTS OF INTRODUCTION

Pages 1-10

- Tag system to uniquely identify each published quipu description
- Locations of quipus we examined and detail in these books
- Locations of quipus we are aware of but have not yet examined
- References to other published quipu descriptions

Pages 11-30

- General description of quipus and quipu parts
- Format and symbols used in our descriptions to represent cord types, cord placement, cord attachments, cord length, cord colors, knot types, knot positions on cords, numerical interpretations
- Types of information in observation sections of descriptions: provenance; associated artifacts; special construction features; observed regularities or interrelationships based on cord positions, color, knots, and numerical values INDIVIDUAL QUIPUS

Book I: Pages 31-1155

- Individual descriptions of the 191 quipus identified by tags AS10 through AS200

Book II: Pages 31-132

- Individual descriptions of the 15 quipus identified by tags AS201 through AS215

31

QUIPU AS10

Museum identification: No. 6271 (Niedersächsische Landesmuseum, Hanover, West Germany)

Main Cord: color W

$ 3.0 cm: top cord (T1), then space of 1.5 cm
4.5 cm: group of 6 pendant cords (1-6), then space of 0.5 cm
6.5 cm: group of 3 pendant cords (7-9), then space of 0.5 cm
7.5 cm: group of 3 pendant cords (10-12), then space of 0.5 cm
8.5 cm: pendant cord (13), then mend in main cord
9.5 cm: group of 2 pendant cords (14-15)
10.0 cm: top cord (T2)
10.5 cm: group of 3 pendant cords (16-18), then space of 0.5 cm
11.5 cm: group of 3 pendant cords (19-21), then space of 1.0 cm
13.0 cm: pendant cord (22), then single knot in main cord
13.5 cm: pendant cord (23), then space of 59 cm
73.0 cm: end ¢

Cord	Knots (no.,type,position)	Length	Color	Value	Subsidiaries (no.,position)
T1	3s(3.5);3L(14.5)	24.5¢	LB:W	33	1:0.5
T1s1	1s(3.0);8L(14.0)	19.0¢	W	18	
1	2L(14.5)	39.5¢	RG:W	2	

Observations

1. All cords have end knots making this a well-preserved specimen.
2. Association by color gives one possible grouping while spacing gives another: by color groups of 4,3,7,3,1,2; by spacing groups of 6,3,3,6,3,2.
3. Top cord 2 has value of 21 equaling the number of cords (excluding last two set off by main cord knot).
4. The value of top cord 1 plus the value of its subsidiary equals 51. The total value of the first 7 pendants is 51 and the total value of the next 7 pendants is 51.

Database by Gary Urton
http://khipukamayuq.fas.harvard.edu/DataTables.html

KDB data as of 08/16/2004 03:09 PM

KHIPU UR9 / 1000019

Museum Name: Centro Mallqui, Leymebamba, Amazonas

Museum Number: CMA 850/LC1-479

Nickname: none

Provenance: Leymebamba

Region: Chachapoyas

Archive: 100 - Leymebamba

Museum Description: none

Primary Cord

Total Length: 90 cm Beginning: no information Termination: K - knotted

Color: MB

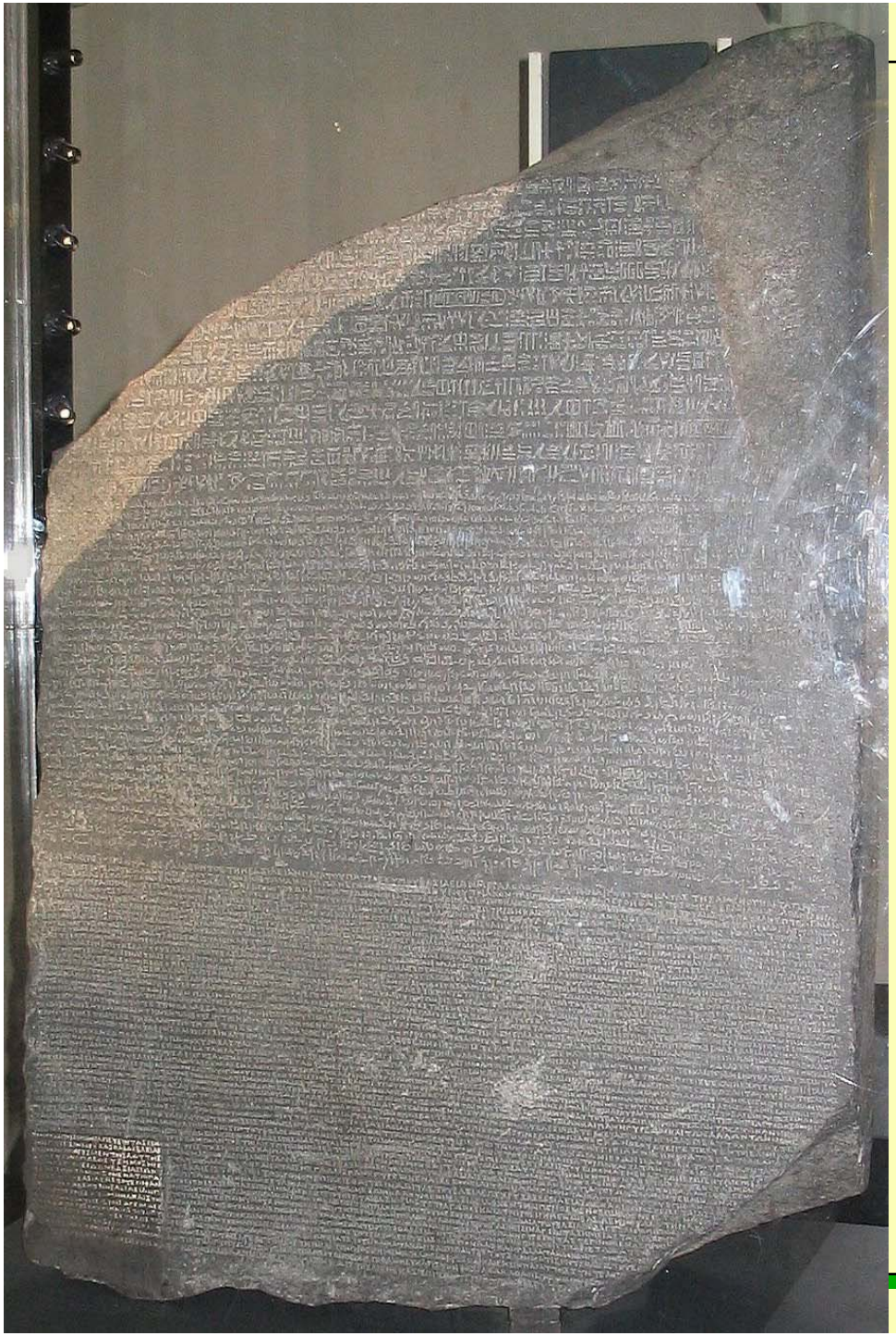
Final Twist: S Thickness: no information Fiber: CN - cotton

Notes:

- 3.0 cm group of 1 knot (K1 - K1) space of 3.0 cm
- 6.5 cm group of 2 pendant(s) (1 - 2) space of 13.0 cm
- 20.5 cm group of 4 pendant(s) (3 - 6) space of 3.0 cm
- 25.0 cm group of 7 pendant(s) (7 - 13) space of 4.5 cm
- 31.5 cm group of 5 pendant(s) (14 - 18) space of 6.5 cm
- 39.5 cm group of 3 pendant(s) (19 - 21) space of 4.5 cm
- 44.5 cm group of 3 pendant(s) (22 - 24) space of 10.0 cm
- 56.0 cm group of 1 pendant(s) (25 - 25) space of 2.0 cm
- 58.5 cm group of 1 pendant(s) (26 - 26) space of 2.0 cm
- 60.5 cm group of 2 pendant(s) (27 - 28) space of 1.5 cm
- 61.5 cm group of 1 marker (M1 - M1) space of 0.0 cm
- 62.0 cm group of 1 marker (M2 - M2) space of 1.0 cm
- 64.5 cm group of 22 pendant(s) (29 - 50) space of 0.0 cm
- 68.5 cm group of 1 marker (M3 - M3) space of 1.5 cm
- 70.0 cm group of 30 pendant(s) (51 - 80) space of 0.0 cm
- 76.5 cm group of 8 pendant(s) (81 - 88) space of 0.0 cm
- 76.5 cm group of 1 marker (M4 - M4) space of 0.0 cm
- 78.5 cm group of 21 pendant(s) (89 - 109) space of 0.0 cm
- 78.5 cm group of 1 marker (M5 - M5) space of 0.0 cm
- 82.0 cm group of 2 pendant(s) (110 - 111) space of 0.0 cm
- 82.5 cm group of 32 pendant(s) (112 - 143) space of 1.0 cm

Decrypting

- decimal (1923 : L. Leland Locke)
- Locke, L. Leland. 1923. *The ancient quipu.* The American Museum of Natural History.
- binary (1997 : William J. Conklin of the Textile Museum in Washington, DC, proposes the Inca quipu (a.k.a. khipu) records information in a binary code that includes the material (wool or cotton), the slant of the string, the direction of a knot, and so forth, giving as many as 26 × 24, or 1536 et Gary Urton en 2003)
- phonetic
- mathematics: Ruth Rodriguez Sotomayor
- Rosetta stone …



Possible?

- we have 15 to 20 transcriptions but the khipus are lost …
- ANTHROPOLOGY: Cracking the Khipu Code
  Science Magazine | 2003-06-13 | Charles C. Mann

Khipus ?

http://www.iberosaatio.fi/textosandinos.htm

Projects and recent progress

projects

- 1. *improve access to database* (queries)
- 2. *statistics: number of occurrences of digits, numbers, …*
- 3. *classification of khipus* (similarity)
- 4. *substrings*
- 5. improve data entry (scanning)
- 6. *drawing of khipus*
- 7. correlation between Inca data and database
- 8. input missing khipus and correct other ones
- 9. what about colors?

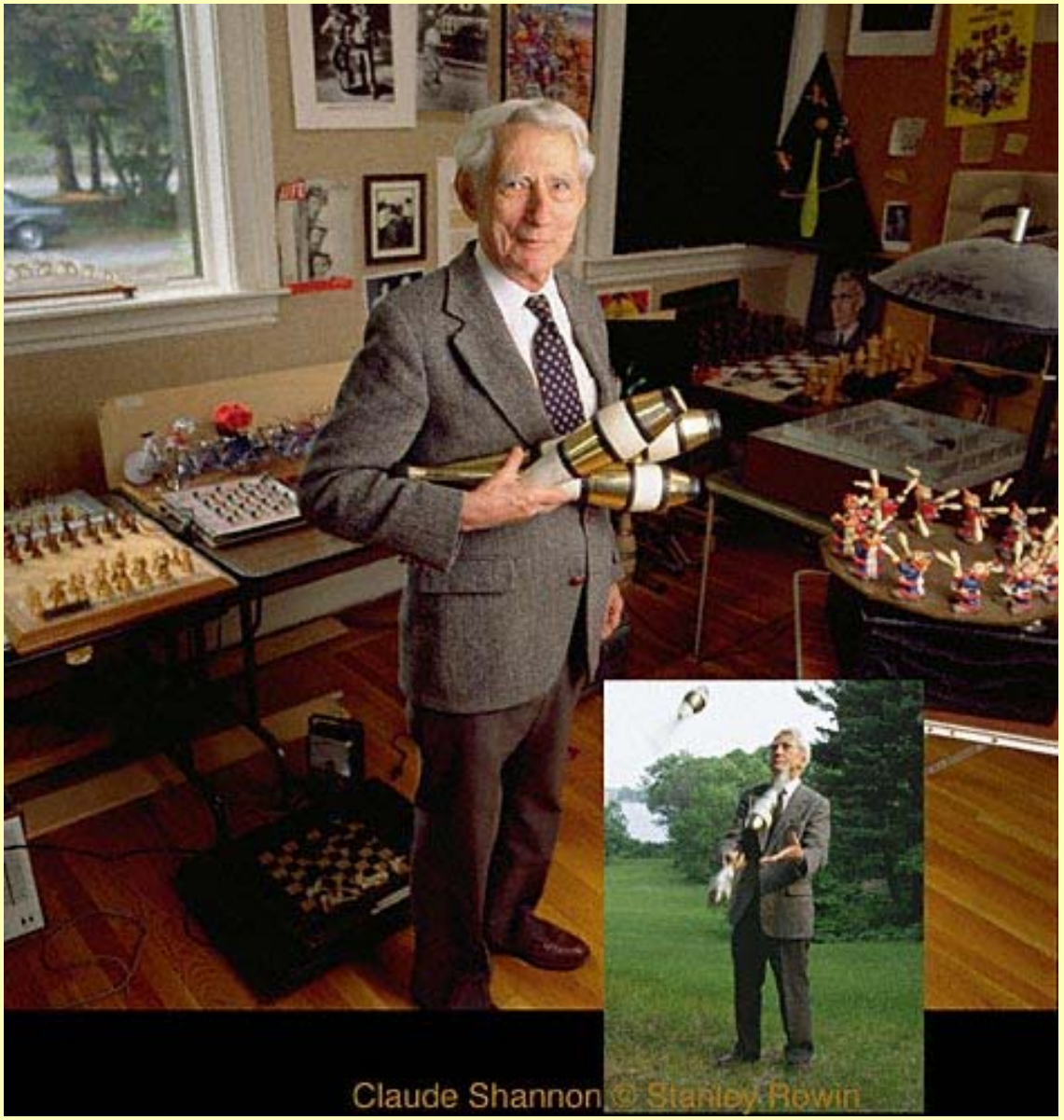
General sources

- http://dduguay.club.fr/index.html (Incas dictionary)
- http://www.sciencemag.org/cgi/content/full/310/5756/1903d (discussions about the problem of errors in associated khipus found by Gary Urton …)
- http://en.wikipedia.org/wiki/Inca
- http://www.ethnomath.org/

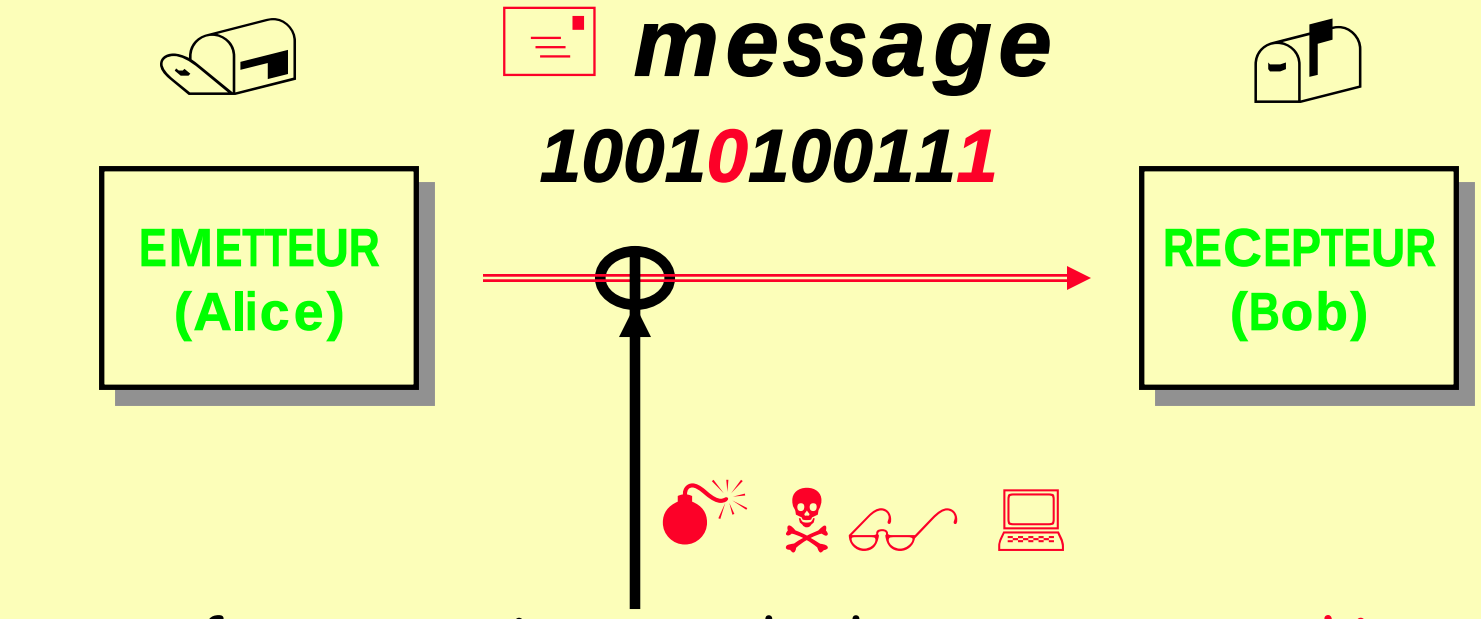
Thanks to

Gary Urton
Carrie Brezine
Frank Salomon
Erik et Marty Demaine
Vincent Castus


il n'y a rien de plus beau qu'une clef
(MAURICE MAETERLINCK)
tant qu'on ne sait pas ce qu'elle ouvre
© www.Citations du Monde .com


Claude Shannon © Stanley Rowin

Modèle avec malveillance (copie conforme, confidentialité)



transformer ou ajouter redondance : cryptographie

Poésie

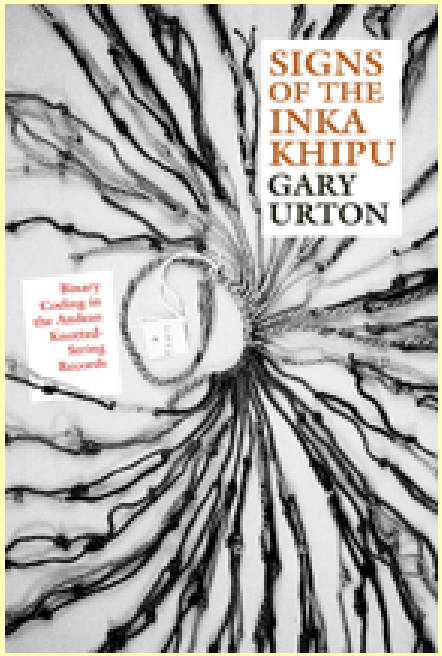
Je voudrais avoir un lama
Dont le poil serait d'or
Brillant comme le soleil
Et fort comme l'amour,
Doux comme la nuée
Qui dissipe l'aurore.
Pour faire un quipu
Où je marquerais
Les lunes qui passent
Et les fleurs qui meurent.

(région de Cuzco, recueilli par Alomias Robles, « literatura Inca », biblioth. De Cultura Peruana, 1938, p. 104)
(Traduction de P.G et A.P.)

Noeuds

- dans la ville de Shuri, les usuriers consignaient le montant de leurs prets.
- Le classique noeud au mouchoir, qui rafraîchit notre mémoire, n'est au fond que la survivance d'une methode d'enregistrement des données qui connut dans les siècles passés une diffusion quasi universelle.
- On la retrouve dans les grains des rosaires, tant chrétiens que musulmans, ou est noté le nombre d'invocations ou de prieres à reciter.
- Ceux des moines tibétains, avec 108 grains de couleurs diverses, quoique beaucoup plus complexes, remplissent le meme rôle. Chacune des couleurs se rapporte à la divinité à laquelle s'adresse la priere: jaune pour le Bouddha, blanc pour la Bodhisatva, rouge pour le maître qui convertit le Tibet au bouddhisme...
- Dans quelques régions africaines, les femmes enregistrent encore aujourd'hui la durée de leur grossesse sur une cordelette, avec une série de noeuds, de telle maniere que, en dénouant un noeud à chaque pleine lune, elles peuvent predire avec exactitude le moment de leur accouchement.
- Toujours en Afrique, l'homme qui part en voyage laisse à son épouse une cordelette avec autant de noeuds que de jours d'absence. De la sorte, la femme, en défaisant un noeud chaque jour, connaît la date à laquelle son mari sera de retour.
- Le même système, comme le rapporte Hérodote, fut employé par le roi de Perse Darius Ier lorsque, au cours d'une operation militaire, il laissa une corde de 60 noeuds aux soldats de garde à un pont de grande importance stratégique. Ces soldats reçurent l'ordre de défaire un noeud chaque jour et d'abandonner la position lorsque tous les noeuds auraient été défaits, que le roi soit ou non revenu.
- En Europe le plus curieux système de numération à noeuds fut celui employé, jusqu au début du 20eme siècle, par des meuniers allemands. Ceux-ci, pour indiquer la quantité et le type de farine contenue dans un sac, réalisaient une serie de noeuds à la ficelle qui fermait le sac.

Books about khipus



- Signs of the Inka Khipu
  Binary Coding in the Andean Knotted-String Records, par Gary Urton, 2003.
- 003 6 x 9 in., 216 pp., 21 b&w illus., 24 figures, 5 tables
- ISBN 0-292-78539-9

- Table of Contents
- Preface and Acknowledgments
- Chapter 1. Memory, Writing, and Record Keeping in the Inka Empire
- Chapter 2. Theory and Methods in the Study of Khipu Binary Coding
- Chapter 3. The Physical Components of Khipu Bindry Coding
- Chapter 4. The Linguistic Components of Khipu Bindry Coding
- Chapter 5. Khipu Sign Capacity and Code Conversion
- Chapter 6. Sign Theory, Markedness, and Parallelism in the Khipu Information System
- Chapter 7. Conclusions
- Appendix. Tabular Description of Khipu UR19 from Chachapoyas
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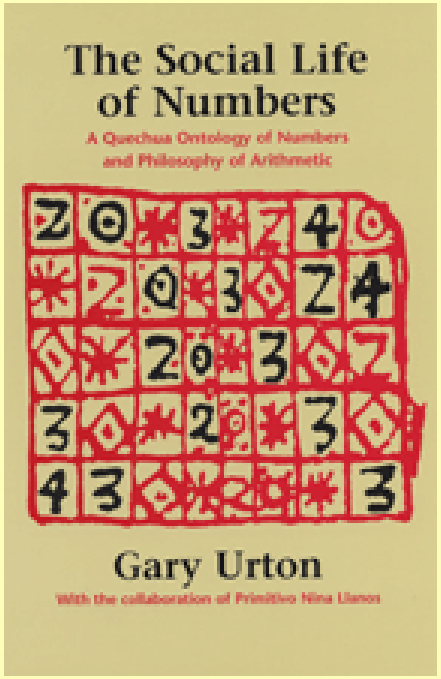

- 1997, ISBN 0-292-78534-8
- http://www.utexas.edu/utpress/excerpts/exurtsoc.html

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- 1. Anthropology and the Philosophy of Arithmetic
- 2. The Cardinal Numbers and Their Social Relations
- 3. Ordinal Numerals: The Reproduction and Succession of Numbers
- 4. Yupay: Counting, Recounting, and the Fabric of Numbers
- 5. Quechua Arithmetic as an Art of Rectification
- 6. Numbers and Arithmetic in Pre-Hispanic and Colonial Andean Societies
- 7. Conclusions
- Appendix: Quechua Number Symbols and Metaphors Notes
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Narrative Threads Accounting and Recounting in Andean Khipu, 2002, ISBN 0-292-76903-2

Edited by Jeffrey Quilter and Gary Urton

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- Acknowledgments
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  - *1. An Overview of Spanish Colonial Commentary on Andean Knotted-String Records (Gary Urton)*
  - *2. Spinning a Yarn: Landscape, Memory, and Discourse Structure in Quechua Narratives (Rosaleen Howard)*
- Part Two. Structure and Information in the Khipu
  - *3. A Khipu Information String Theory (William J Conklin)*
  - *4. Reading Khipu: Labels, Structure, and Format (Marcia Ascher)*
  - *5. Inka Writing (Robert Ascher)*
- Part Three. Interpreting Chroniclers' Accounts of Khipu
  - *6. String Registries: Native Accounting and Memory According to the Colonial Sources (Carlos Sempat Assadourian)*
  - *7. Woven Words: The Royal Khipu of Blas Valera (Sabine P. Hyland)*
  - *8. Recording Signs in Narrative-Accounting Khipu (Gary Urton)*
  - *9. Yncap Cimin Quipococ's Knots (Jeffrey Quilter)*
- Part Four. Colonial Uses and Transformations of the Khipu
  - *10. "Without Deceit or Lies": Variable* Chinu *Readings during a Sixteenth-Century Tribute-Restitution Trial (Tristan Platt)*
  - *11. Pérez Bocanegra's* Ritual formulario: *Khipu Knots and Confession (Regina Harrison)*
- Part Five. Contemporary Khipu Traditions
  - *12. Patrimonial Khipu in a Modern Peruvian Village: An Introduction to the "Quipocamayos" of Tupicocha, Huarochiri (Frank Salomon)*
  - *13. The Continuing Khipu Traditions: Principles and Practices (Carol Mackey)*
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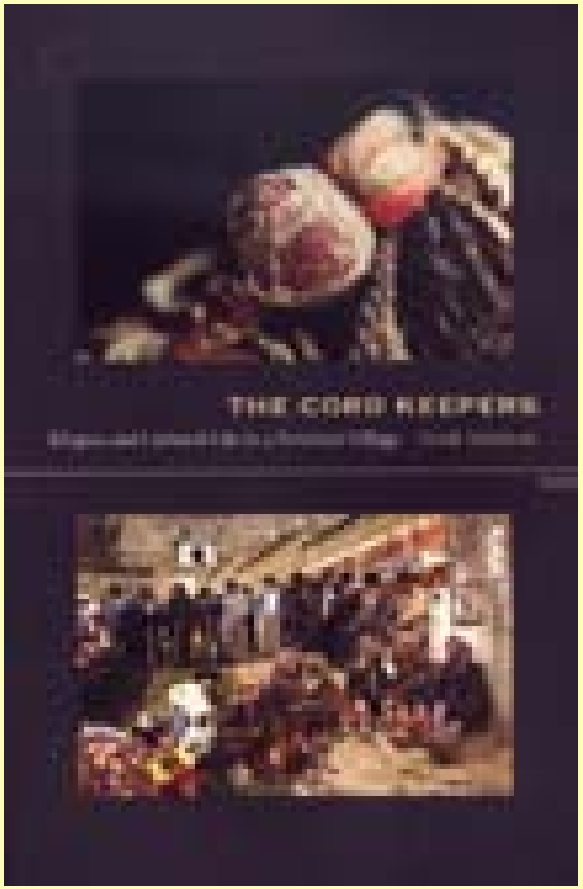
The Cord Keepers: Khipus and Cultural Life in a Peruvian Village

Frank Salomon, Octobre 2004, ISBN 0-8223-3390-2 Paperback



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The Unread Legacy: An Introduction to Tupicocha's Khipu Problem, and Anthropology's 3

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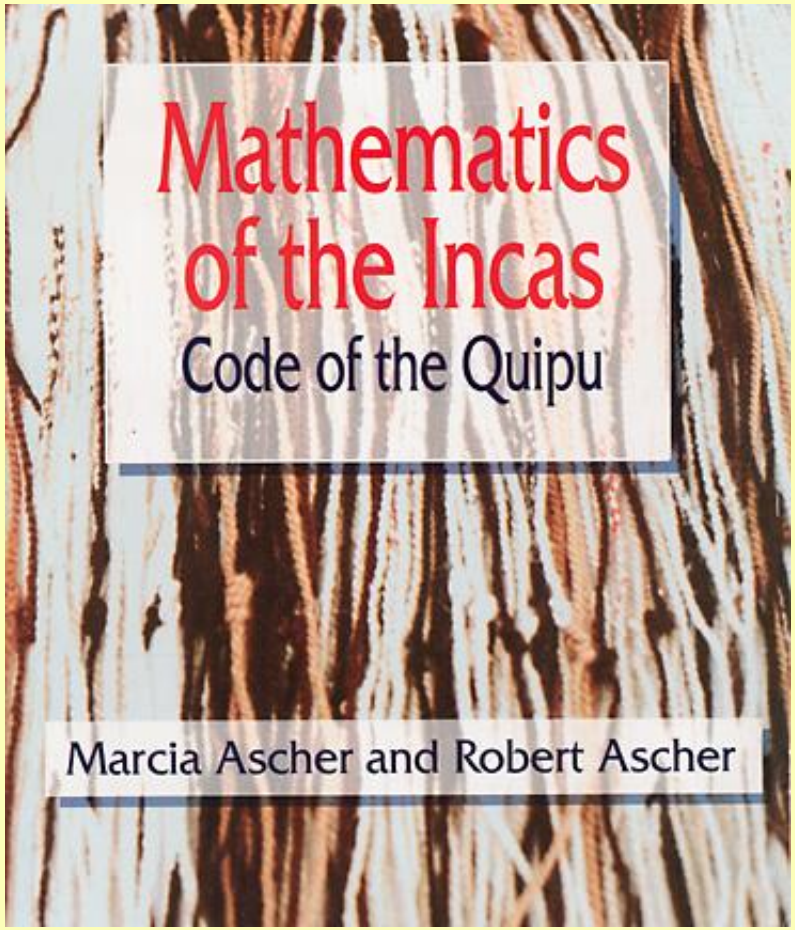
Mathematics of the Incas: Code of the Quipu

by Marcia Ascher, Robert Ascher

ISBN: 0486295540, 1981-1997, Dover Publications



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- 1 Odyssey
- 2 How to Make a Quipu
- 3 Inca Insistence
- 4 The Quipumaker
- 5 Format, Category, and Summation
- 6 Hierarchy and Pattern
- 7 Arithmetical Ideas and Recurrent Numbers
- 8 A Piece of String

More infos

- TI: How can spin, ply, and knot direction contribute to understanding the quipu code?
- AU: Ascher-M
- SO: LATIN-AMERICAN-ANTIQUITY. MAR 2005; 16 (1) : 99-111
- DT: Article PY: 2005 IS: 1045-6635
- AB: Essential to quipu analysis is identification of the logical structure of the quipu and the internal relationships of the data within that structure. The identification process relies on examining, in detail, the colors, placement, and spacing of the quipu cords, and the knot types and positions on the cords. Spin, ply, and knot directionality have recently become available for 59 otherwise well-described quipus. Here, I examine this additional information in the context of the logic of the quipus. Analysis shows that for these quipus, except for three in which the main cord differs from the other cords, spin and ply are uniform for all the cords on a quipu. For the large majority of the quipus (about 81 percent), knot directionality is also uniform throughout. The 19 percent for which knot directionality is mixed are presented and discussed individually. On them, knot directionality conforms to, and plays a role in, the overall logic of the quipu. It is clear that spin, ply, and knot directionality are not chosen by the quipu-maker on a cord-by-cord basis and they do not serve to distinguish between quantitative and non-quantitative data.

- ACCESSION NUMBER: 101YE-0008 See Contents-Page
  RECORD TYPE: Bibliographic-Record
  PUBLICATION TYPE: Journal
  ARTICLE TITLE: Use of the quipu and the Spanish colonial administration
  ARTICLE AUTHOR: Loza-CB
  REPRINT AUTHOR: Loza, CB; MAX PLANCK INST WISSENSCH GESCHICHTE; WILHELMSTR 44; BERLIN; GERMANY
  SOURCE: POPULATION-. JAN-APR 1998; 53 (1-2) : 139-159
  DOCUMENT TYPE: Article
  PUBLICATION YEAR: 1998
  ISSN: 0032-4663
  LANGUAGE: French
  ABSTRACT: This article examines the problem of the legal recognition of the quipu in the law of the Indies. It explores the reasons why the crown and officials came to accept the information (about population and taxation) provided by this native instrument, which took the form of a series of knotted threads, of various colours, by means of which large quantities of information could be recorded. The quipu was based on a system of decimal numbering system, and it could be used to perform calculations without systematic use of abacuses. The process whereby the quipu came tn be recognized is studied by establishing a chronology of the process of transaction between the Indians and the officials based on the quipu. We have tracked from 1550 their first official decoding and their admission in juridical matters, up to the attribution of a statute to the quipu by the colonial administration from 1570. An analysis of trial records and the body of laws, establishes the authority of the qui pu in the sixteenth century, and illustrates the acceptance of an arithmetical knowledge and a technology that was specific to the Indians.
  ABSTRACT INDICATOR: Yes
  JOURNAL SUBJECT CATEGORIES: SOCIOLOGY-AND-ANTHROPOLOGY
  CC EDITION: Social-and-Behavioral-Sciences
  NUMBER OF REFERENCES: 33
  GENUINE ARTICLE NUMBER: 101YE
  UPDATE CODE: 199834

- TI: From stewards to bureaucrats: Architecture and information flow at Chan Chan, Peru
  AU: Topic-JR
  SO: LATIN-AMERICAN-ANTIQUITY. SEP 2003; 14 (3) : 243-274
  DT: Article
  PY: 2003
  IS: 1045-6635
  AB: Archaeologists working with complex societies are concerned with the administration of political economies. Beginning with the premise that there are differing forms of administration and that bureaucracy, in the classic formulation of Max Weber, is one of these, I develop a heuristic dichotomy between two types of administrators: stewards (who closely supervise goods and people) and bureaucrats (who process and control information). Bureaucracy is often linked to written records, but in the Central Andes alternative methods of record keeping were developed, such as the quipu or knotted string record. I argue that one alternative record-keeping device was an architectural form, the U-shaped structure. U-shaped structures are closely identified with the administrative architecture of the Chimu kingdom (ca. AD 850-1470) on the north coast of Peru. Four independent lines of argument demonstrate the development of bureaucracy from stewardship at Chan Chan, the capital of the Chimu kingdom. Brief comparisons are made between the Chimu administrative patterns and commodity and information flow in the earlier Huari and Tiwanku civilisations, and with the later Inka pattern. These comparisons show how record-keeping technology affects political economy and the strategy of expansion.

- AN: 0001789333-0011 See Contents-Page
  TI: The Incan quipus
  AU: Christensen-A
  SO: SYNTHESE-. OCT-NOV 2002; 133 (1-2) : 159-172
  DT: Article
  PY: 2002
  IS: 0039-7857
  AB: Quipus, knotted structures of woollen or cotton cords, were used as a bureaucratic tool in the Inca state. In the absense of a writing system, numerals and possibly other pieces of information were encoded on the quipus by tying knots into elaborately structured coloured cords. Though interpretation of the quipu contents is far from complete, some information on Inca mathematics can be deducted from the analysis of ancient specimen, especially when combined with the results of anthropological and linguistic research in contemporary Andean societies. In this paper, the quipus are introduced, their structure is explained, and some results on mathematical concepts of the Incas are presented based on a comparison of mathematical and anthropological literature on the subject.

- CONKLIN WJ
  THE INFORMATION-SYSTEM OF MIDDLE HORIZON QUIPUS
  ANNALS OF THE NEW YORK ACADEMY OF SCIENCES 385 : 261 1982

- 98.46.16 - français - Carmen Beatriz LOZA, Max-Planck Institut für Wissenschaftsgeschichte, Wilhelmstrasse 44, Berlin (Allemagne) E-mail : loza@mailmac.mpiwg-berlin.mpg.de
- Du bon usage des quipus face à l'administration coloniale espagnole (p. 139-159)
- Cet article aborde le problème de la constitution de la preuve par quipu dans le " droit des Indes ". Autrement dit, il s'agit de comprendre les raisons pour lesquelles la Couronne et ses fonctionnaires acceptent d'utiliser les données (de population et fiscales) qui proviennent de cet instrument indigène construit à partir de cordelettes-registres mnémotechniques, capables d'enregistrer un grand nombre d'informations. Le quipu est fondé sur un système de numération décimale. A partir de cet instrument, il était possible de réaliser des opérations de calcul sans avoir systématiquement recours aux abaques. Pour restituer la dynamique de reconnaissance du quipu, nous avons établi une chronologie du processus de transaction entre les Indiens et les fonctionnaires à partir des quipus. Ainsi, nous avons suivi à partir de 1550 leurs premiers décodages officiels et leur introduction dans les dossiers juridiques, ceci jusqu'à l'octroi d'un statut aux quipus dans l'administration coloniale à partir de 1570. L'analyse des dossiers de procès et celle du corpus des lois, garantissent la force probatoire des quipus au XVIe siècle, et montrent l'admission d'un savoir arithmétique et d'une technologie propre aux Indiens. (PEROU, HISTOIRE, RASSEMBLEMENT DES DONNEES, COLONIE, TECHNOLOGIE)
- 98.46.17 - français - Cem BEHAR, Department of Economics, Bogaziçi University, 80815 Bobek, Istanbul (Turquie

- Calculations with years and months in the Peruvian quipus (His Comparative ethnographical studies. 6)
- 36 pages
- Publisher: Erlanders boktryckeri aktiebolag (January 1, 1925)
- Language: English
- ASIN: B00086QI8E

- Decodificacion De Quipus
- *by William Burns Glynn*
- ISBN:9972-9378-6-0 / 9972937860
- Title: Decodificacion De Quipus
- Author: William Burns Glynn
- Publisher:Banco Central de Reserva del PeruCountry: PeruEdition: Softcover