Knot Language: Recreating Inca Quipu/Khipu
or... How Would You Communicate with Knots in Rope?

IAP 6.096   January 22–26, 2007   32-G575   3 units

THE MYSTERY:
The Inca Empire (1438–1533) had its own spoken language, Quechua, which is still spoken by about a third of the Peruvian population. It is believed that the only "written" language of the Inca empire is a system of different knots tied in ropes attached to a longer cord. This system is called quipu or khipu. The ropes also have different colors, which may have encoded information. There is evidence from the Spanish crusades that quipus encoded census data as well as stories. However, no one knows how to decode either kind of information. There are several hundred quipus in the world today, waiting to be read.
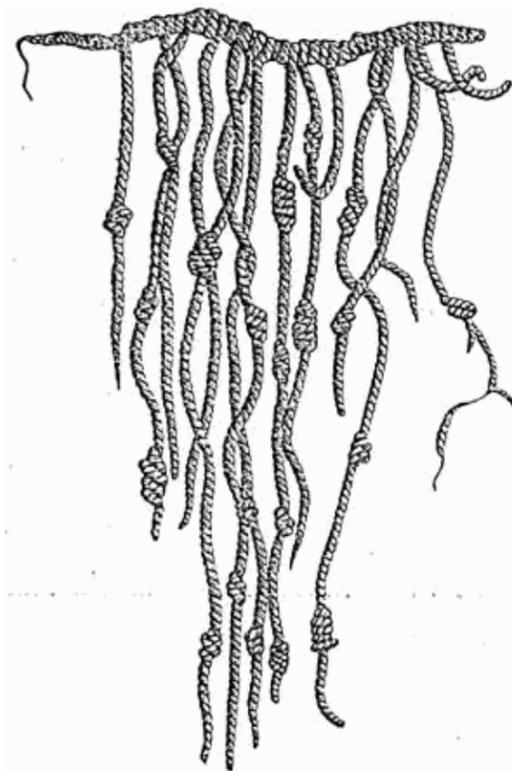
THE CHALLENGE:
Our research group is trying to break the quipu code. But before we can test a hypothesis about how the quipu code might work, we need to come up with some hypotheses. How could the Incas have recorded language with knots on rope? To gain insight into this question, this class will explore how *you* would record language with knots in rope.

THE TASK:
Students will divide into groups. Each group will develop their own way of "writing with rope"—developing a written language like quipu. The method can use all or only some of what we know about actual quipu (e.g., the different types of knots used). These languages will be interesting in their own right, but they may also shed light into plausible approaches taken by the Incas. Each group will also work on breaking the code developed by another group. This will give us experience in recognizing different types of codes, and ultimately in decoding actual quipu. We will also provide real quipu data from the Urton-Brezine database at Harvard for the ambitious code breaker to work on.

THE GOAL:
We are hopeful that exploring different approaches to recording language with knots will lead to insights into solving the mystery of the quipu.

Gary Urton	Carrie Brezine	Jean-Jacques Quisquater	Erik Demaine	Martin Demaine	Heather Lechtman
Archaeology Harvard	Archaeology Harvard *(tentative)*	Electrical Engineering Catholic U. Louvain	Computer Science MIT	Computer Science MIT	Archaeology & Ancient Tech. MIT *(tentative)*

Lectures:
The class will feature lectures by some of the leading researchers in quipu (pictured above), describing current knowledge, conjectures, and approaches.

Schedule:
Each day will have 1–2 hours of lectures, and 1–2 hours of group discussion over a free lunch. The remaining time each day will be for students to work in groups, either designing new encodings or decoding puzzles posed by other groups. The last day will be devoted to student presentations of their techniques and results.

Location:
All lectures and group discussions will be held in or around room 32-G575 in the MIT Stata Center. Students can work in this room anytime they wish during the week, although it is easiest to get in during working hours (9am–5pm).

Organizers:
Erik Demaine, Martin Demaine, and Jean-Jacques Quisquater

Sponsors:
EECS, CSAIL

To sign up or find out more information:
Send email to quipu@theory.csail.mit.edu. Everyone is welcome (including non-MIT students). MIT students should also register on WebSIS.

Webpage:
http://theory.csail.mit.edu/classes/quipu/

10am–noon:	Lecture (1–2 hours)
noon–2pm:	Free lunch and group discussion (1–2 hours)
2pm onward:	Student group work (design and/or decrypting)

Mon., Jan. 22:	Class overview, introduction to quipu *Design groups form and start*
Tues., Jan. 23:	History of quipu and its significance *Design groups continue*
Wed., Jan. 24:	Gary Urton lecture Introduction to cryptanalysis *Design groups present challenges Decoding groups begin Design groups continue*
Thur., Jan. 25:	More on cryptanalysis *Design groups present challenges Decoding groups continue*
Fri., Jan. 26:	Student presentations of decrypting progress Student presentations of encodings Conclusion and follow-on