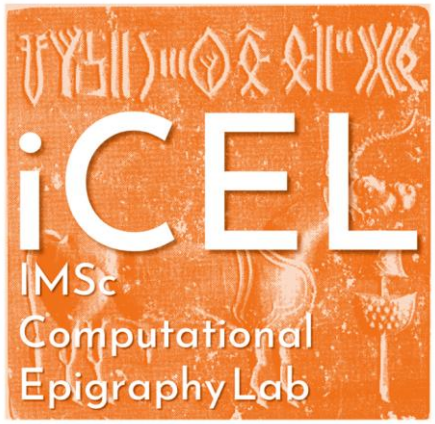
Bits & Scripts



The Story of Writing

Sitabhra Sinha

Classifying writing systems based on number of characters

Alphabetic (~25 signs)

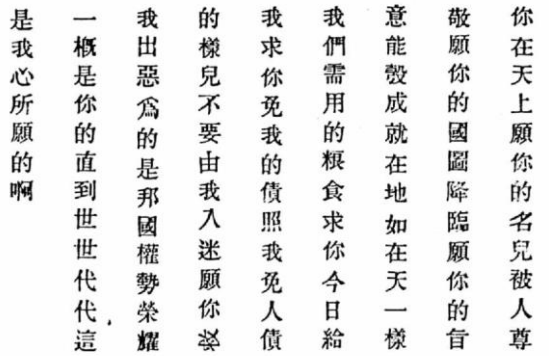
E.g., Latin

Syllabic (~100 signs)

あ a	い i	う u	え e	お o
か ka	き ki	く ku	け ke	こ ko
さ sa	し shi	す su	せ se	そ so
た ta	ち chi	つ tsu	て te	と to
な na	に ni	ぬ nu	ね ne	の no
は ha	ひ hi	ふ fu	へ he	ほ ho
ま ma	み mi	む mu	め me	も mo
や ya		ゆ yu		よ yo
ら ra	り ri	る ru	れ re	ろ ro
わ wa				を (w)o
ん n				

E.g., Japanese Kana

Ideographic (>50000 signs)



E.g., Chinese

Logo-syllabic (~900 signs)

E.g., Sumerian cuneiform

Alphabets themselves further distinguished into

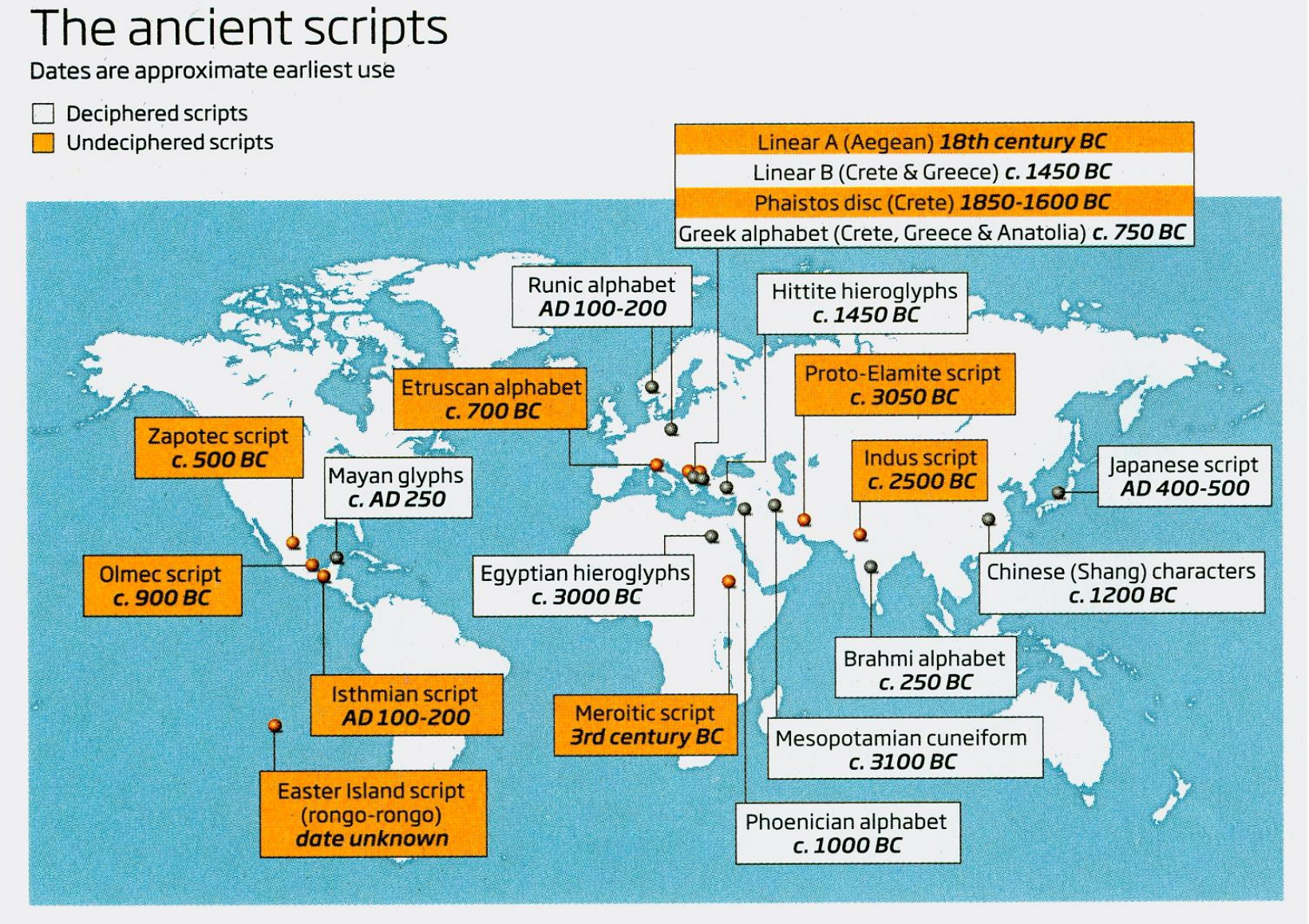
Pure Alphabets: distinct letters for consonants & vowels

Abugida: vowels modify characters for consonants

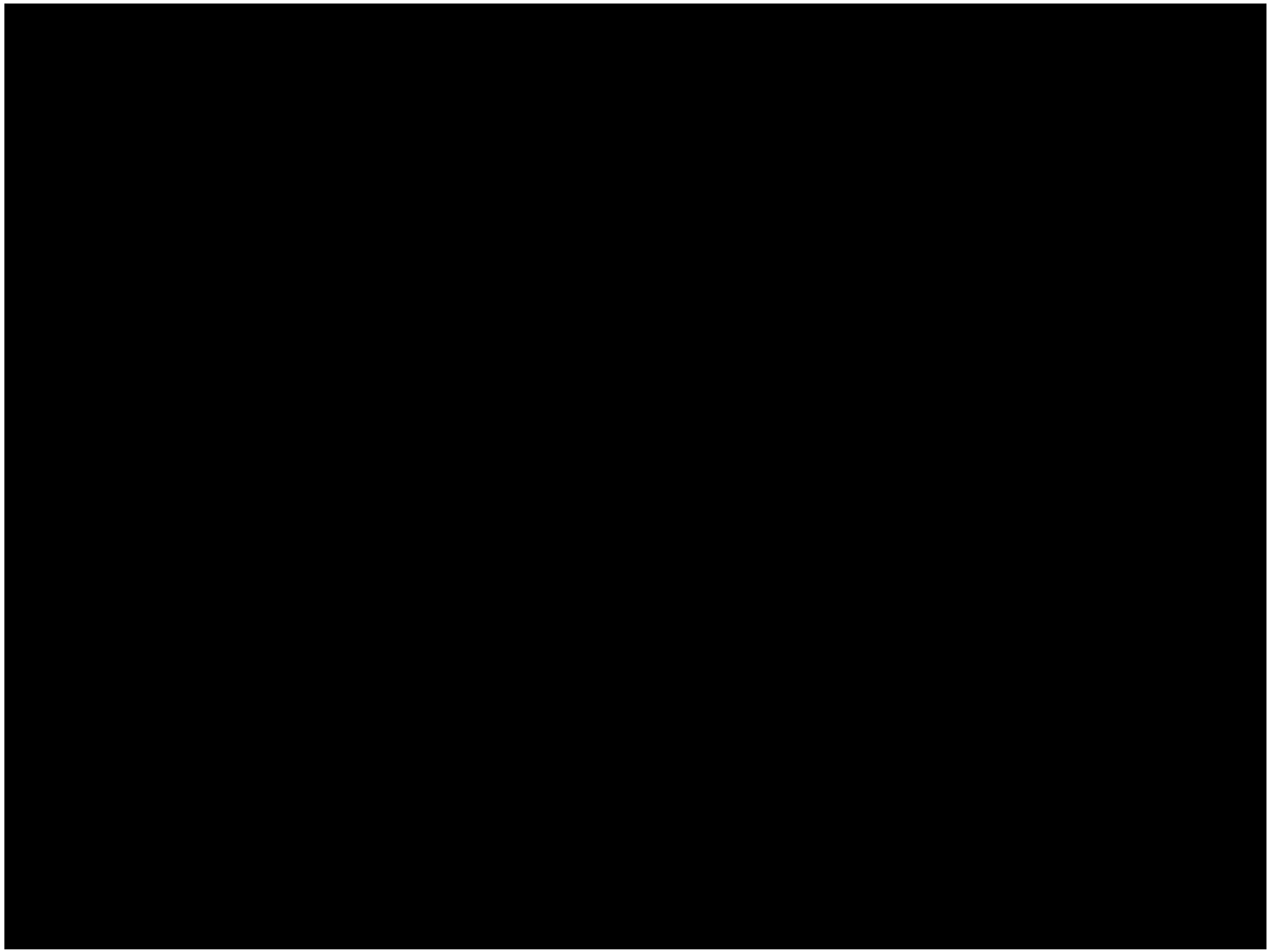
Abjad: vowels are omitted as they are implied rather than being explicit

The Origins of Writing

Writing may have originated independently multiple (likely, four) times in history



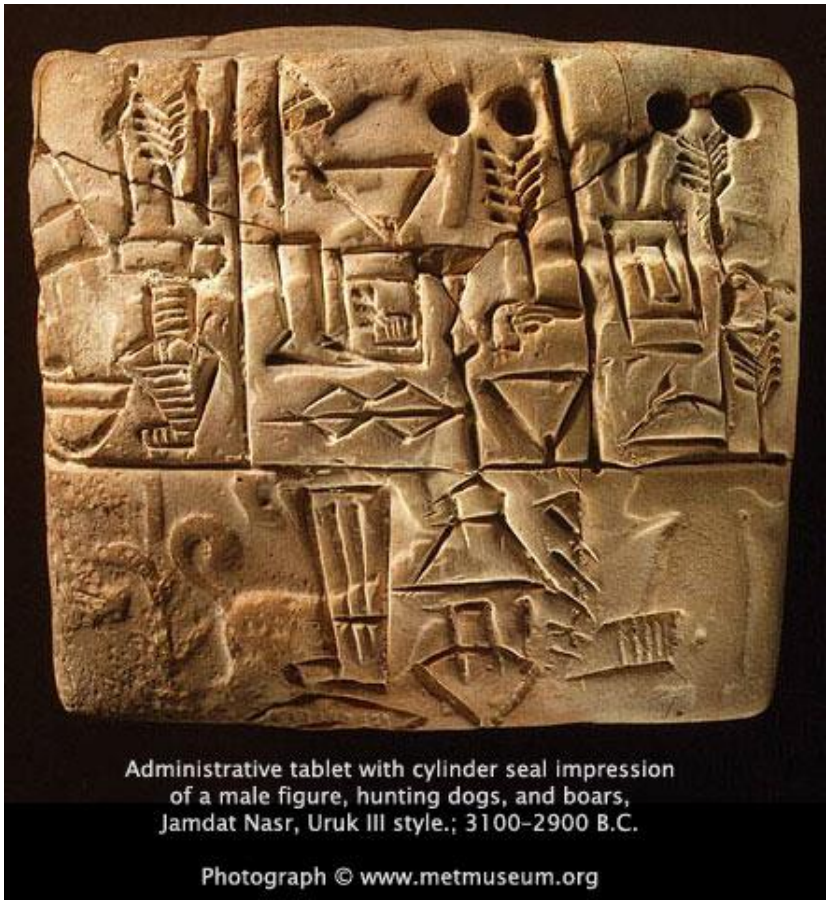
The Spread of Writing : Animated Video



https://www.youtube.com/watch?v=eUpJ4yVCNrI

Ollie Bye

Does early writing systems resemble what we mean by "language" ?



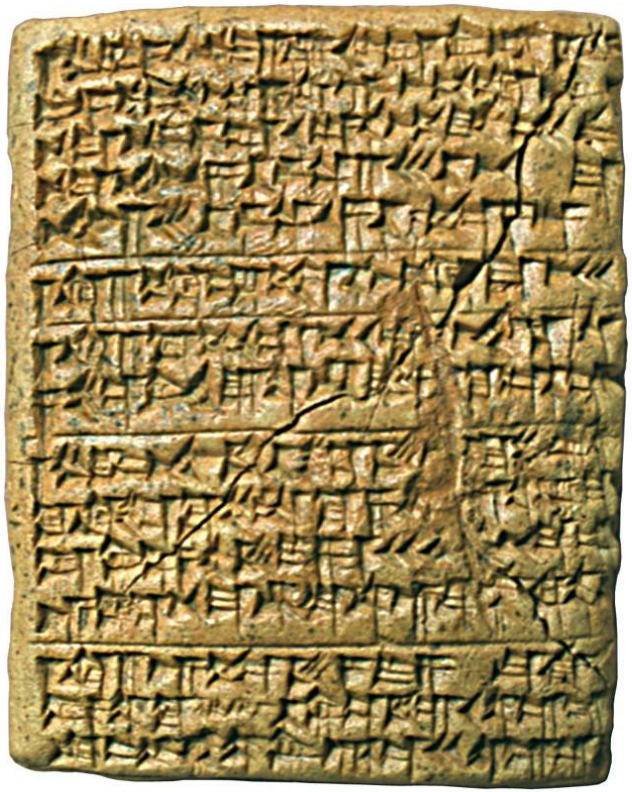
Trigger (2004): Early writing systems were not the full systems that they later became, with the gradual addition of grammar and syntactic capability over centuries as languages like Sumerian cuneiform and Egyptian developed.

Cooper (2004): Early Sumerian and Egyptian were probably no more versatile than Inka khipu, perhaps even less so ….The early systems express language [only] in highly restricted applications

All early writing depend to some extent on non-linguistic features:

- ❑ Tablet format (Uruk III tablets)
- ❑ String placement
- ❑ Figural representation
- ❑ Institutional context

Proto-writing is more useful for things other than encoding "language"



MS 4575
Medical text; the scribe's exemplar is broken.
Uruk, ca. 300 BC

Trigger (2004): Early writing systems were only able to fully express spoken language after centuries of development.

Cooper (2004): No writing system was invented (or used early on) to mimic spoken language or to perform spoken language's function.

The following have no oral counterparts:

- ❑ Livestock or ration accounts
- ❑ Land management records
- ❑ Lexical texts (word lists, thematically arranged)
- ❑ Labels identifying funerary offerings
- ❑ Divination records
- ❑ Commemorative stelae

Proto-writing systems represent the extension of language into areas where spoken language does not work.

Some possible non-syntactic interpretation for the "inscriptions" (such as those of the Indus Civilization)

I. Accounting tokens

II. Heraldic devices

IIa. Tagmas

III. "Dabbawala" symbols

IV. Ritual/Religious symbols

V. Mnemonic devices

Science

Hypothesis 1: Accounting tokens

Schmandt-Besserat's scheme of how tokens and their impressed signs gave rise to Sumerian pictograph writing (*Science*, 1981)

Tokens						
Impressed signs						
Proposed translation	10 animals	Unit of grain measure	Unit of grain measure	Unit of land measure	Unit of land measure	100 animals
Pictograph IIIrd mill.						
ATU	753	892	899	905		918
Translation after Falkenstein	Slab, total circle	1	60	600		Fraction

Hypothesis 1: Accounting tokens

based on Schmandt-Besserat's idea for the origin of Mesopotamian writing

Administrative clay tablet of c. 3000 BCE (Uruk)
Simple enumeration scheme of accounting:
Deep circles & crescents: numbers.
Other symbols: pictographs representing jars etc.
[Not until 2600 BCE do we see tablets that are truly written forms of language having grammar.]

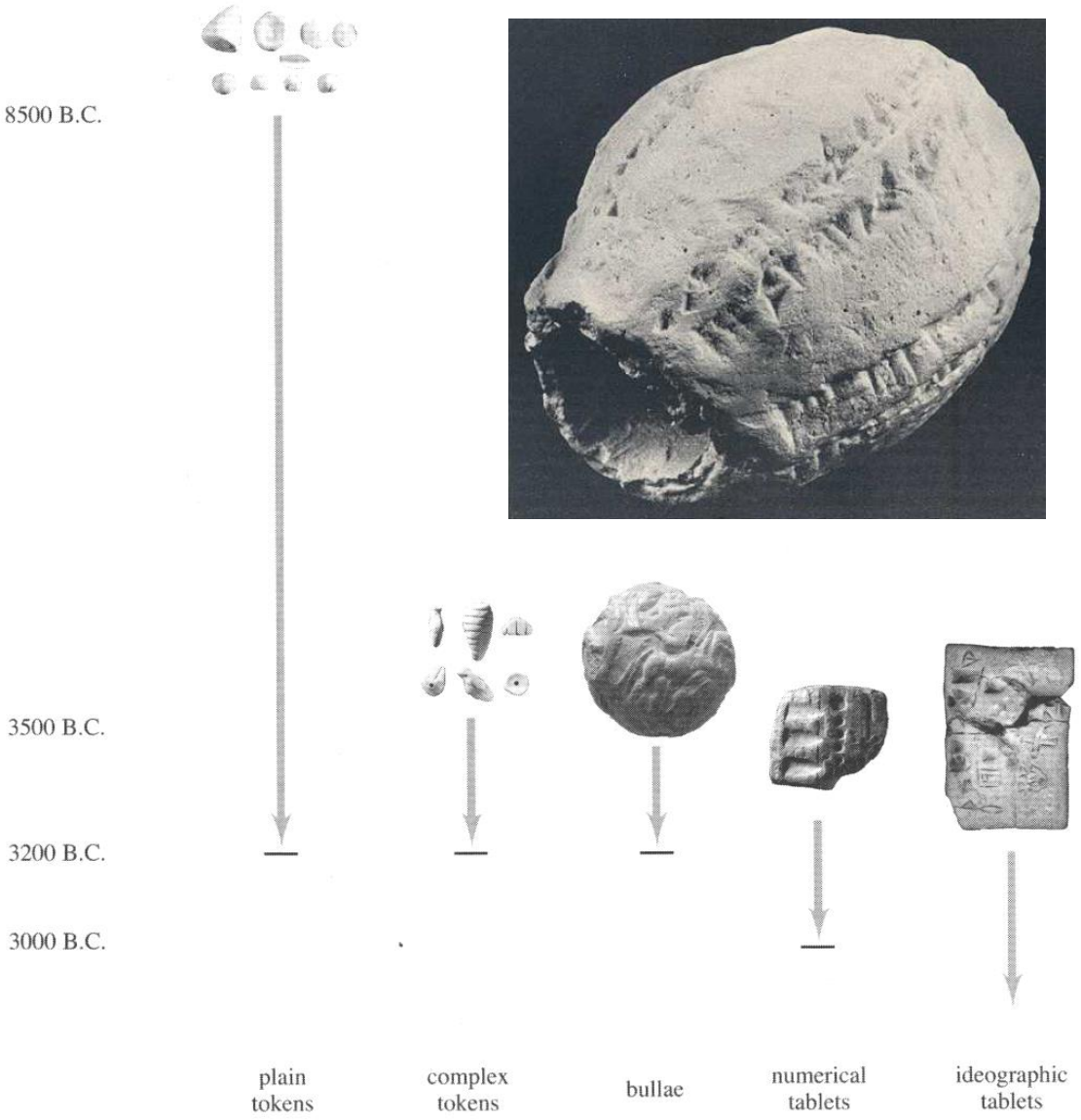
Schmandt-Besserat (1978):
Long before Sumerians invented writing, accounts were kept with clay tokens of various shapes.
Such accounting tokens evolved into writing

Cooper (2004): Syntax was scarce or non-existent in early Sumerian
No evidence of grammar until 4 centuries after invention of proto-cuneiform … but this does not impair their utility

"Even today, grammar has little or no role to play in ledgers"

The Economic Nature of Indus Inscriptions ?

Do the Indus inscriptions represent inventories or invoices ?



Brevity is a common feature of most early writing – were used mainly to record economic transactions and maintain accounts

E.g.,Only 15% of early Sumerian inscriptions have non-economic subjects

Note that Susa had close contacts with Indus Valley

Very short sequences may suggest the application of a writing system in a specialized or restricted context, most possibly economic

Independently suggested by evidence that many of the seals were used to impress inscriptions upon clay-tag sealings that were affixed to packages

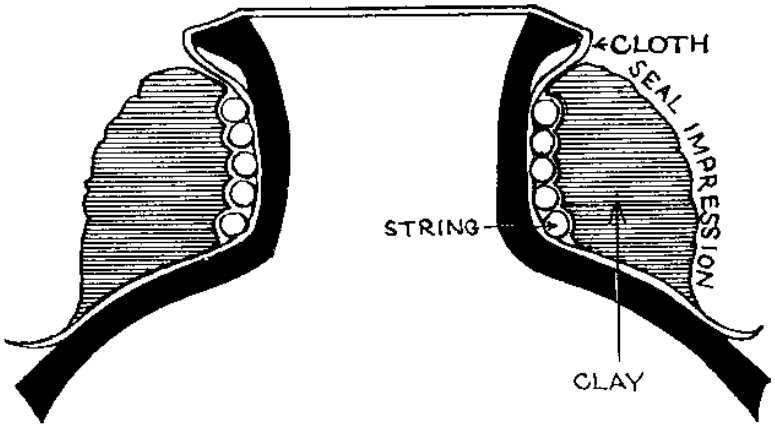
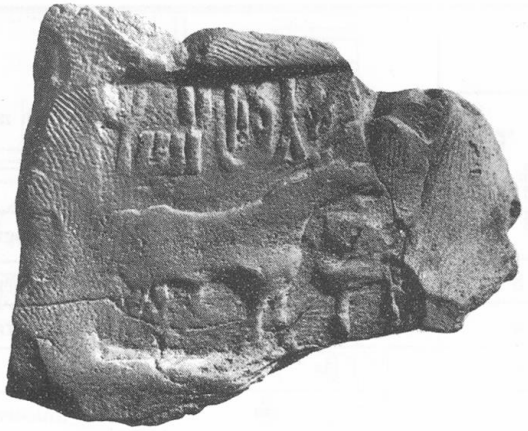
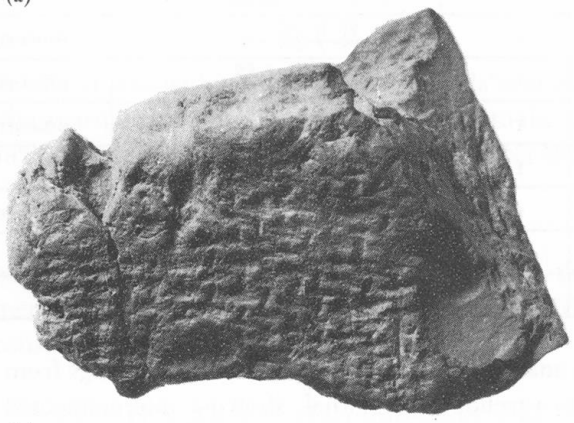


Fig. 7.18. The method of securing the integrity of a commodity container in third millennium Mesopotamia. After Frankfort 1939: 2, text-fig. 1.



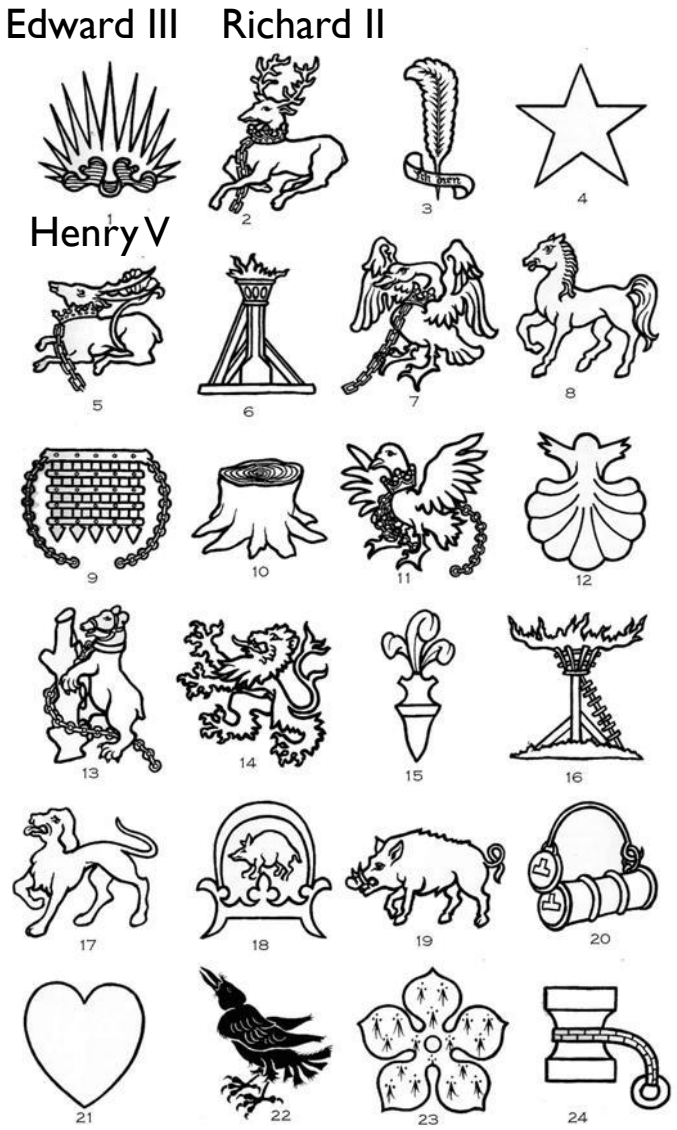
(a)



(b)

Fig. 7.16. A clay tag from Umma, Iraq. (a) Obverse bearing an impression of a typically Harappan square stamp seal with Indus script and the 'unicorn' bull. (b) Reverse with an impression of cloth. Department of the Ancient Near East (accession no. 1931.120), Ashmolean Museum, Oxford.

Hypothesis 11: Heraldic devices



Use as a heraldic badge

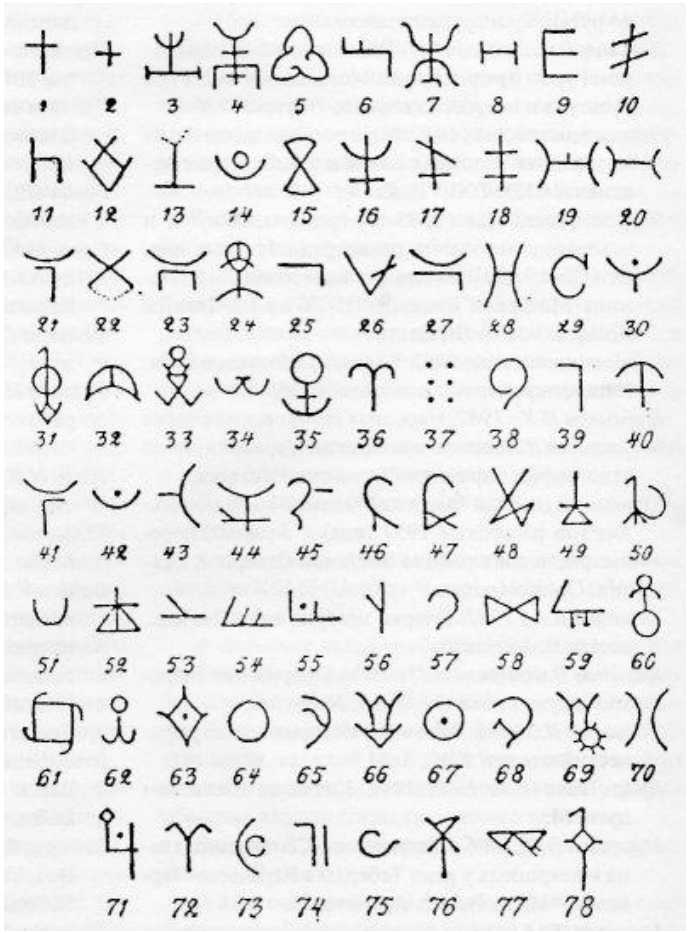
"…a distinctive device or emblem assumed as a mark of recognition by an individual or family and often worn as a symbol of loyalty and allegiance."
http://www.sca.org.au/st_florians/university/library/articles-howtos/heraldry/HeraldicBadges.htm

Fairservis (1971): "seal writing is not necessary writing derived from the oral language. It has its own meanings and in effect need not have verb, adjective or adverb. Rather it may be simply a kind of label specifying the individual or his god, house, or belongings, much as a heraldic device"
[Echoed by Farmer (2003)]

Possible support from the use of seals in Mesopotamia during the Uruk period

"To some extent the [seal motifs] were like heraldic devices, with the semiotics of the design being secondary to the purpose of identifying the bearer and destination." (Leick, 2001)

Hypothesis 11a: Tagmas



Old Turkic Tagmas

Clan symbol

Abstract seal or device used by Eurasian nomadic people …normally the emblem of a particular clan, tribe or family ….

Used to allow identification of property … usually as a cattle brand or stamp"

http://en.wikipedia.org/wiki/Tamga

Witzel (2007): "Even if Indus signs do not encode … a spoken language, [they] may (like heraldic signs, Mongolian tamghas and similar nonlinguistic symbol systems) contain occasional puns even without systematically encoding language"

How to test this ?

Simple tagma/heraldic elements will have little correlation in occurrence of various sign combinations – more complex sign combination less likely to appear

If heraldic devices have a recursive structure, then the symbol system is syntactic even though not "language"

Hypothesis III: "Dabbawala" symbols

- Initial Coding system used colored threads to mark 7 islands.
- Then utilized thrown away cotton waste from tailors.
- Now using colour markers.

E :: Code for Dabbawala/Street at residential station.

VLP :: Residential station Vile Parle.

3:: Code for destination Station
eg. Churchgate Station.

9:: Code for Dabbawalas at Destination

EX:: Express Towers (building name)

12:: Floor no in the building.

Kurush Dalal (2008): What if the Indus seals serve the same purpose as markings used by Mumbai "dabbawalas" to enable efficient point-to-point delivery of packages

Possible Support

Some sealings appear to have been attached to fabric – indication of use as origin-destination markers ?

Mesopotamian seals were used to mark sender identification & receiver acknowledgment (Leick)

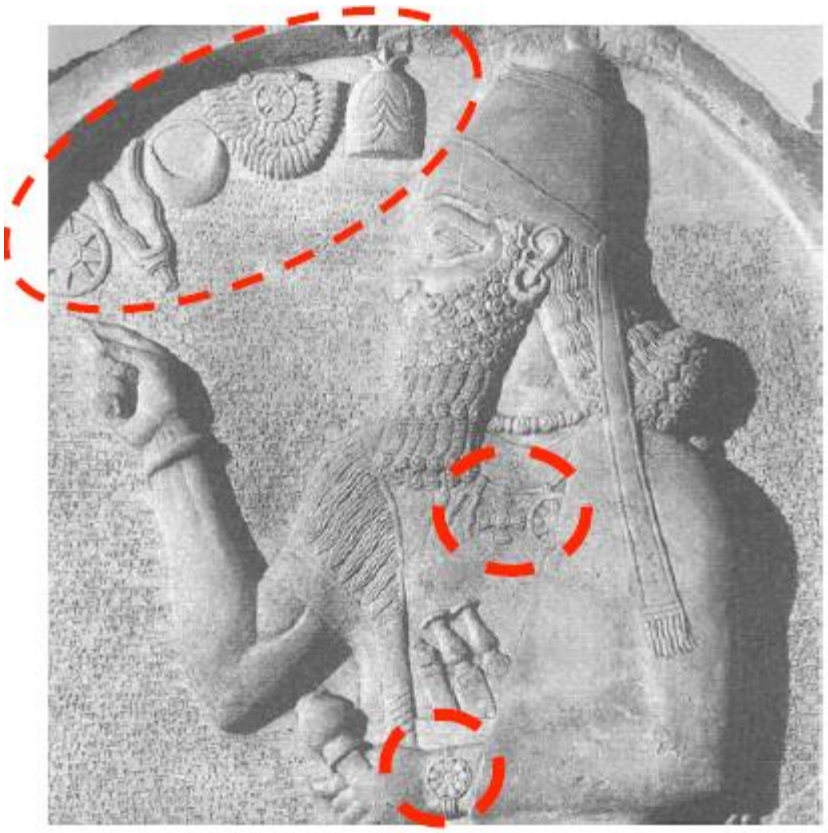
How to test this ?

- ❑ **Positional sign frequency variation**

Signs/sign groups occurring at certain positions will occur very commonly, more variation at other positions

- ❑ **Correlation of sign occurrence with physical locations**

Hypothesis IV: Ritual/Religious symbols



Stela found at entrance to temple of Ninurta, Nippur showing Assurnasirpal II (884-859 BCE)
Note the 5-sign emblem representing major gods (Istar, Adad, Sin, Samas, Assur)

Farmer (2004): "Indus symbols were … nonlinguistic symbol systems… that served key religious, political and social functions without encoding speech or serving as formal memory aids"

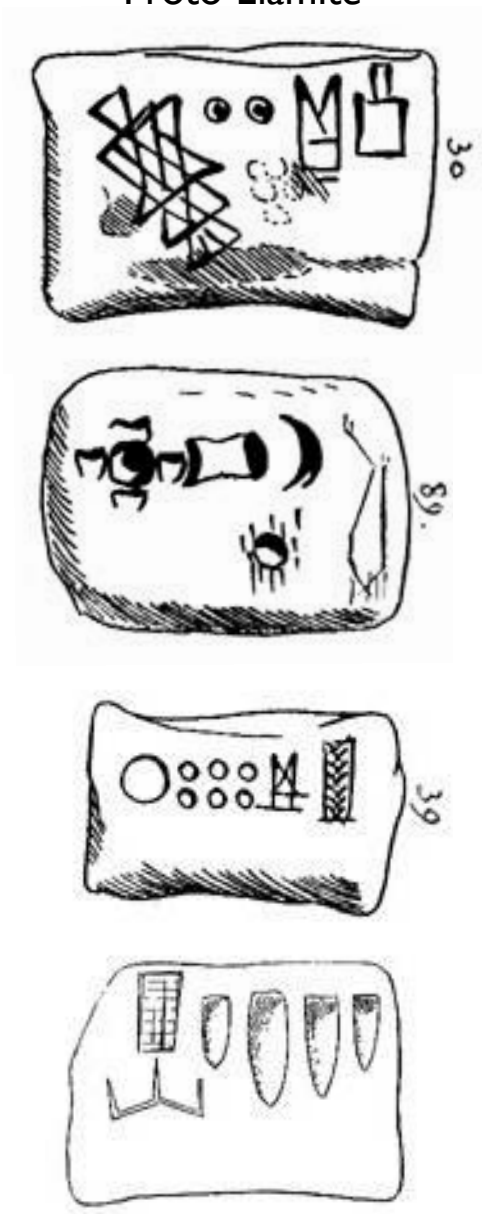
Parallels with Indus sign system:

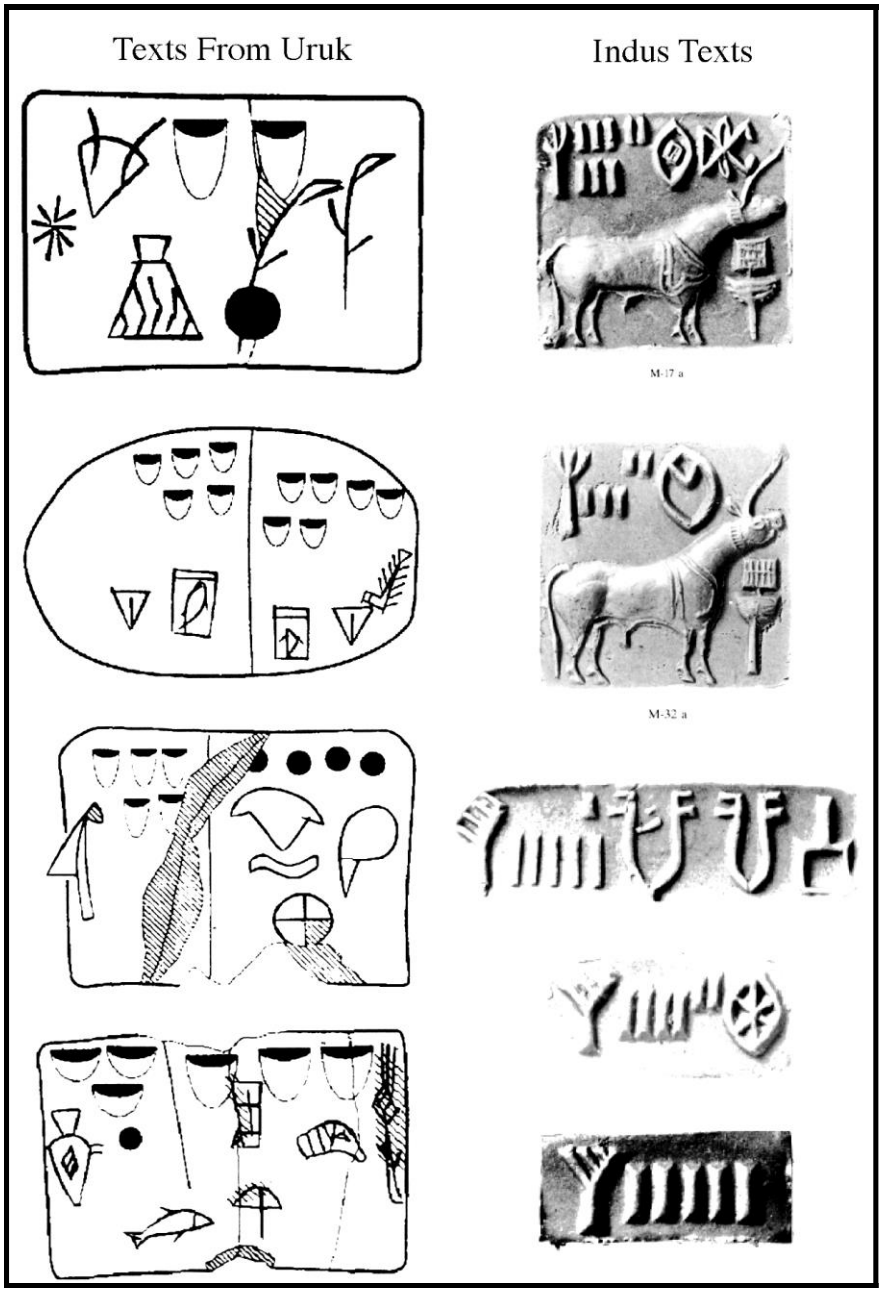
- ❑ A small number of high-frequency signs dominate the inscriptions, supplemented by hundreds of rare signs
- ❑ Length of inscriptions are relatively short
- ❑ Some evidence of sign clustering and positional regularities

Could there be plasticity of meaning associated with the signs?

But most early seals have short inscriptions

Proto-Elamite





Figures: Bryan Wells

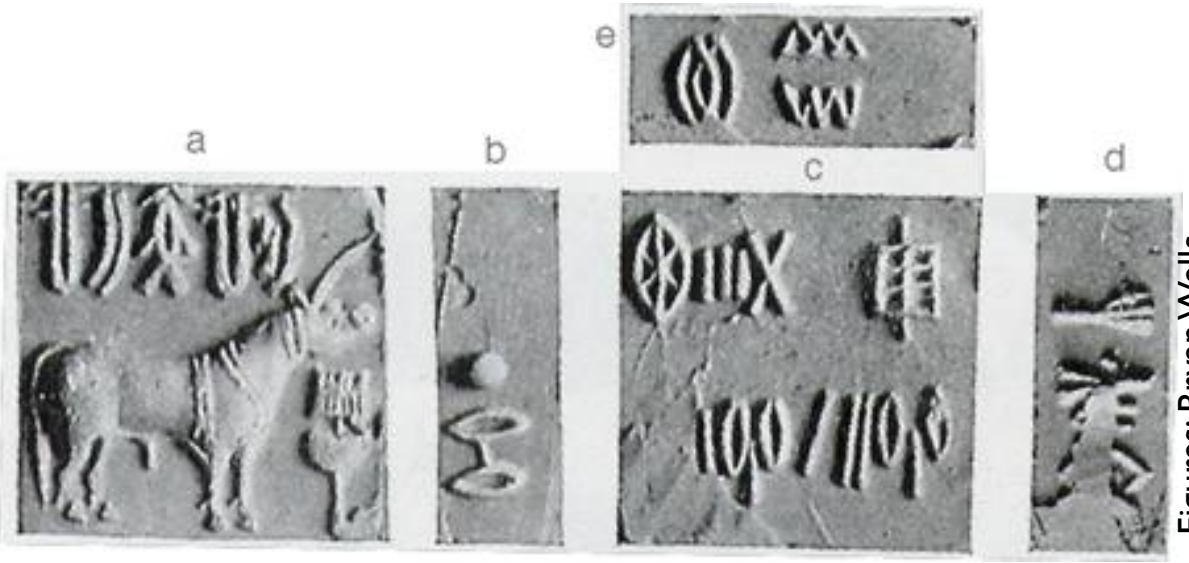
Short Seal Texts from various civilizations

Egyptian Seals

Chinese Seal

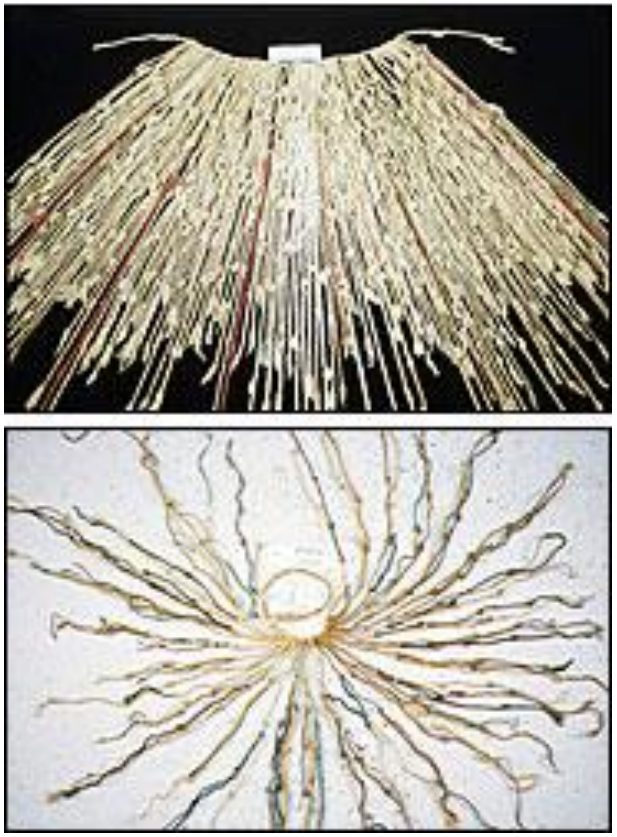
Anau Seal

J'lem Seal



Figures: Bryan Wells

Hypothesis V: Mnemonic devices



An Inca quipu/khipu and a khipu at the American Museum of Natural History. Arranged as knotted strings hanging from horizontal cords … to represent numbers for bookkeeping & census purposes. …Presumably textile abacuses

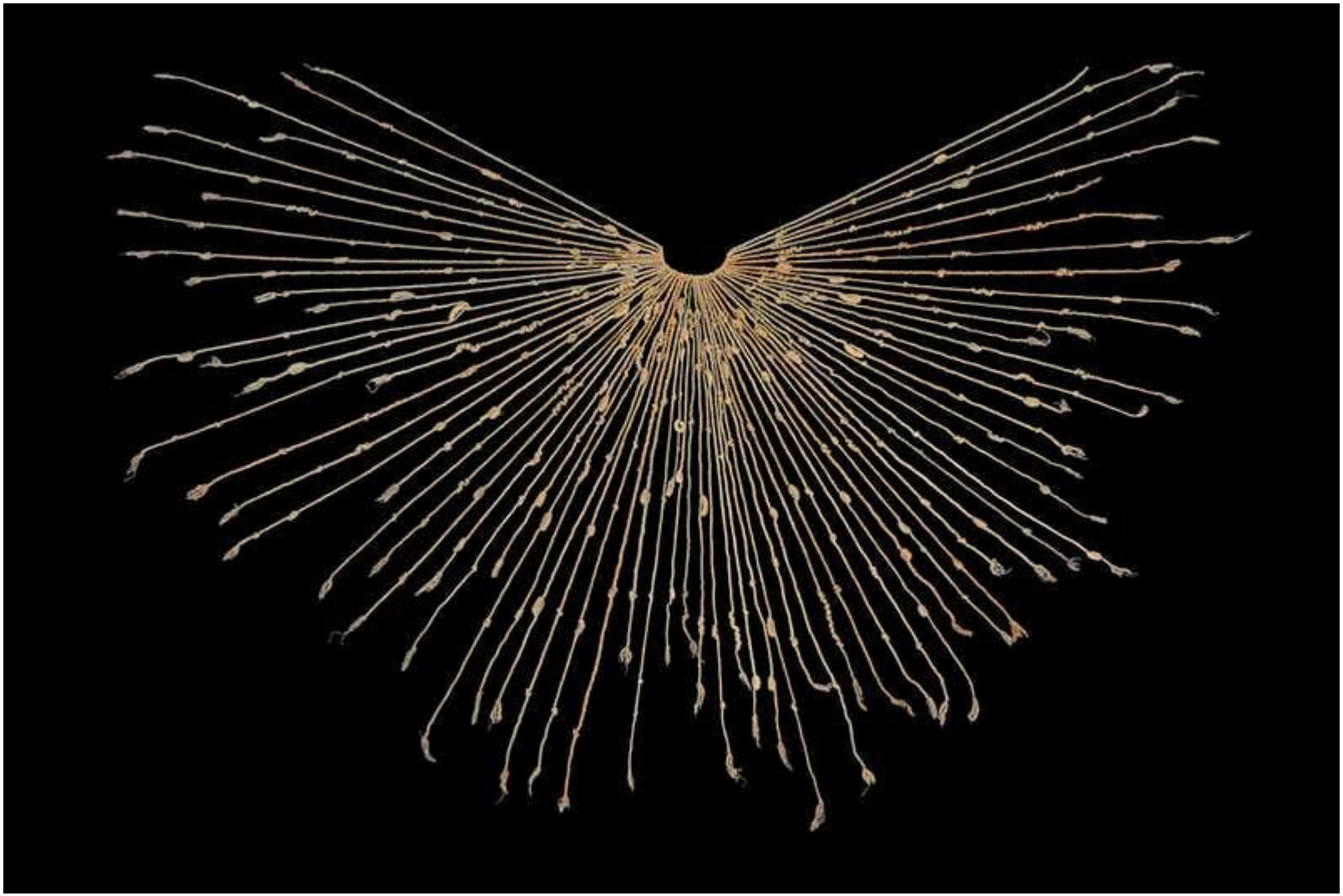
Hardest to distinguish from a writing system encoding spoken language

McEvilley (2002):

The Indus Valley script … does not seem ever to have developed to that stage [the ability "not only of bringing to mind known things (i.e., mnemonic) but also of teaching the unknown]"
"…It is not certain that the Indus script represents writing in the full sense - writing beyond the mnemonic device."

"As at Susa, writing may have arisen by stimulus diffusion rather than by the needs of a genuine state-level organization."
"A second such sign is the fact that in the Indus Valley the archeological data fail 'to confirm a three or four-tiered hierarchy usually associated with ancient states'."

But are khipus more than just …



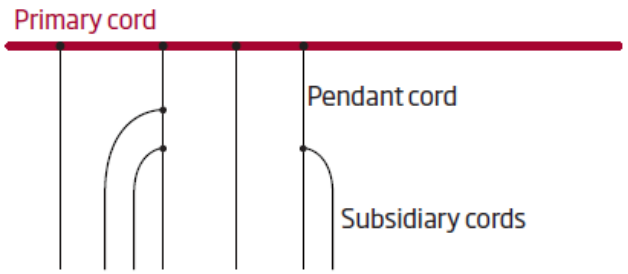
Given the technological sophistication of the Inca empire centred und Cusco, Peru, it seems surprising that without any writing system, information such as census data, tribute accounts and storehouse inventories were transmitted reliably across large distances…

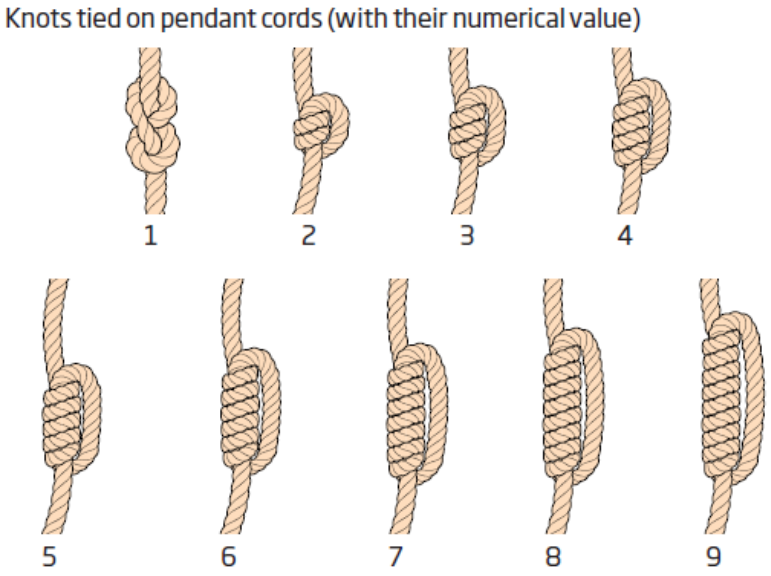
Khipu as accounting device

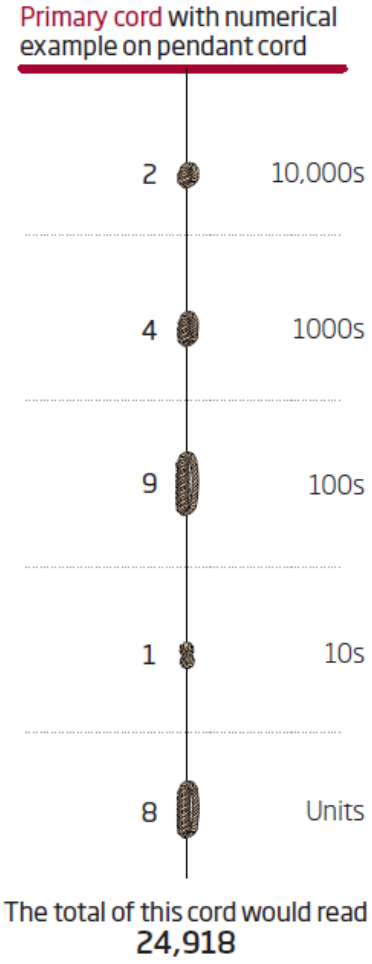
"[They have] an admirable method of counting everything in the Inca's kingdom, including all taxes and tributes, both paid and due, which they did with knots in strings of different colours" – Garcilaso de la Vega's contemporary account (1609)

Leslie Leland Locke (1875-1943)

The Incas recorded census data in knotted cords called khipus. The primary cord had offshoots, which may have signified individual people or villages. The number of twists in a knot determined units, and its position on the pendant cord signified tens, hundreds and so on







The New Scientist 29 September 2018

In the1920s, when anthropologist Leland Locke analyzed khipus housed at the American Museum of Natural History, New York he noticed that the knots are organized in rows like beads on an abacus.

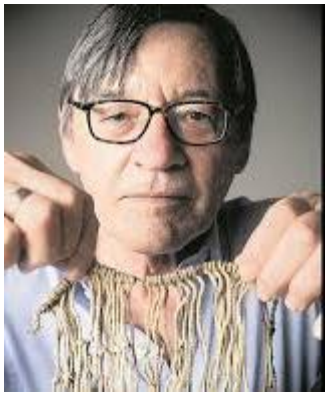
He demonstrated that each row of knots at a certain height denoted units, tens, hundreds and so on, which fitted with the decimal system used by the Inca.

…or could Khipus be more ?

"[Incas] recorded on knots everything that could be counted, even mentioning battles and fights, all the embassies that had come to visit the Inca, and all the speeches and arguments they had uttered"

– Garcilaso de la Vega's contemporary account (1609)

Urton: Binary differences in the various features of a khipu – color of the strings, structure of the knots and the direction in which they are hitched – can encode information. For example, a basic knot tied in one direction may mean "paid", while in the other it would mean "unpaid".



Gary Urton

2018: Comparing khipu from a village for which a Spanish census document from the 1670s is available, Medrano and Urton demonstrated that the 132 cords represent the 132 tribute payers listed and the way pendant cords are tied to the primary cord indicates the clan to which an individual belongs.

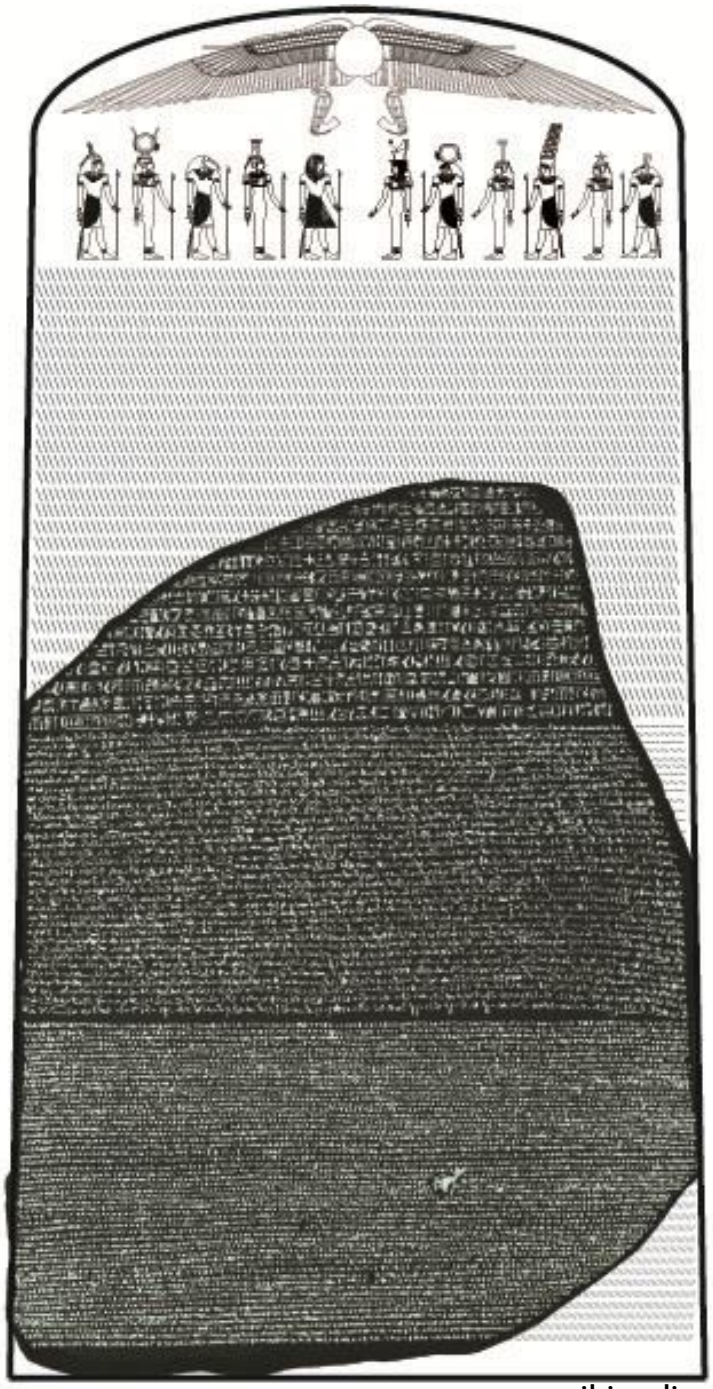
Hyland: Analyzing khipus from the village of San Juan de Collata has shown that pendant cords occur in 95 different combinations of color, type of fibre used and direction of ply (fiber orientation) $\Rightarrow$ a writing system with 95 symbols ? $\Rightarrow$ Could it be a syllabic system ?

Sabine Hyland

The problems of decipherment

- No multilingual text
- Language unknown
- Type of writing system unknown
- How many signs ?
- Direction of writing ?
- Is there a core signary ?
- What is the grammar ?

No "Rosetta Stone"



wikipedia

The same text in three scripts

Egyptian Hieroglyphics
Unknown

Demotic (Egyptian)
Unknown

Ancient Greek
Known

Multilingual inscriptions with the same text written using different scripts or writing systems, one of which is known or easy to decipher, are invaluable for deciphering unknown scripts.

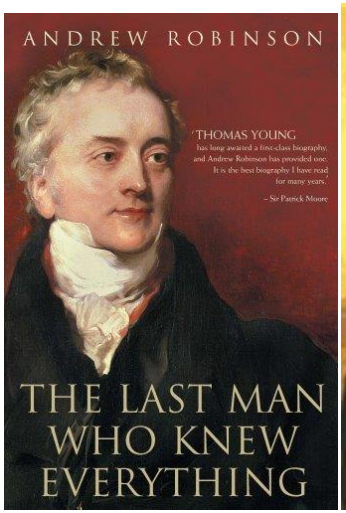
Most famous example: A stele issued at Memphis, Egypt in 196 BCE on behalf of Ptolemy V – discovered in 1799 at town of Rashid (Rosetta) by Pierre-Francois Bouchard

Although very quickly realized that three versions of the same text provided key to deciphering hieroglyphics – eventual decipherment still took two decades

From "Picture Writing" to Phonetics

Dominant idea at the time: Hieroglyphs are "picture-writing"!

Silvestre de Sacy (1811): Foreign (non-Egyptian) names will be spelt out phonetically as there are no corresponding hieroglyph symbols



Thomas Young

Champollion

Thomas Young (1814): Hieroglyph characters used phonetically to spell the Greek name "Ptolemaios"

Jean-Francois Champollion (1822): constructed an alphabet of phonetic hieroglyphic characters

Showed even native Egyptian names written phonetically using hieroglyph symbols (using his knowledge of Coptic)

Ra–M–S–S

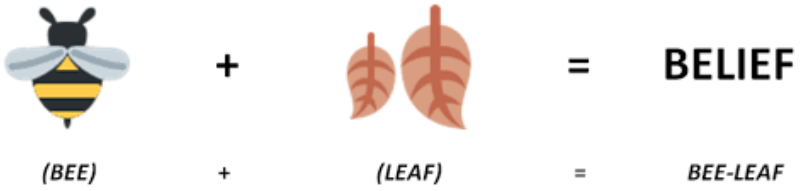
Rameses

The Origin of Alphabetic Writing

Unlike writing itself, alphabetic writing is believed to have been invented only once and then diffused to different civilizations

Proto-Sinaitic (mid 19th century – 16th century BCE) : the earliest trace of alphabetic writing and the common ancestor of both Ancient South Arabian script and the Phoenician alphabet

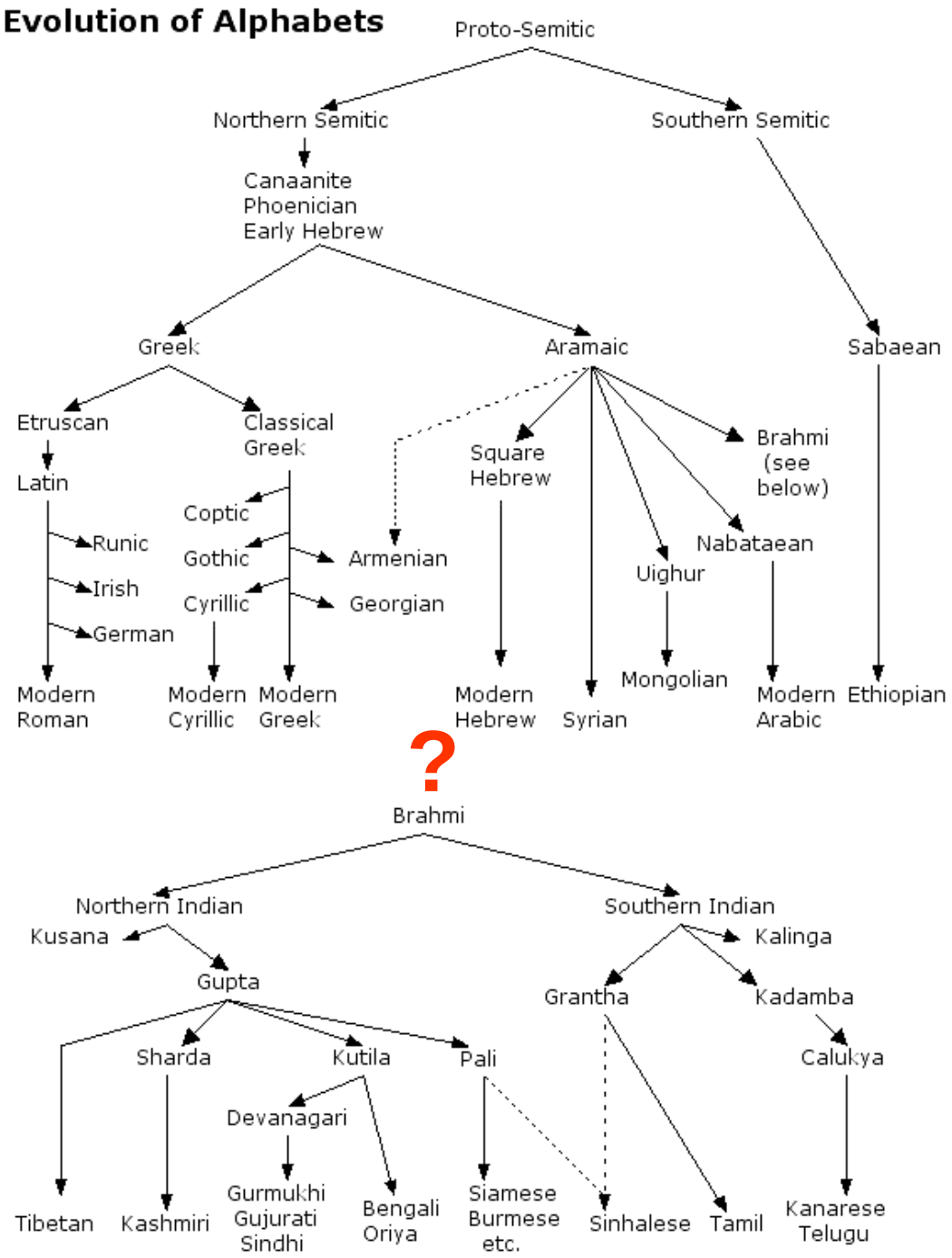
Rebus principle : use existing symbols, such as pictograms, purely for their sounds regardless of their meaning, to represent new words.



The line running from the upper left to lower right may read mt l bʿlt "... to the Lady"

"Nearly all modern alphabets are descended from an alphabet invented 4000 years ago, probably by a group of people related to the ancient Hebrews, Phoenicians, and Canaanites, living in what is now the Sinai desert. They got the idea from the Egyptians, but used their own simplified pictures to represented consonant sounds. The Phoenicians and others of the region simplified the pictures further and often rotated them, but if you use your imagination, you can still make out where most of the 22 letters came from."

Dr. C. George Boeree



"Customised" Writing : The case of Hangul

Hangul, the official writing system for Korean, made up of 14 consonants & 10 vowels ⇒ alphabet of 24 letters.

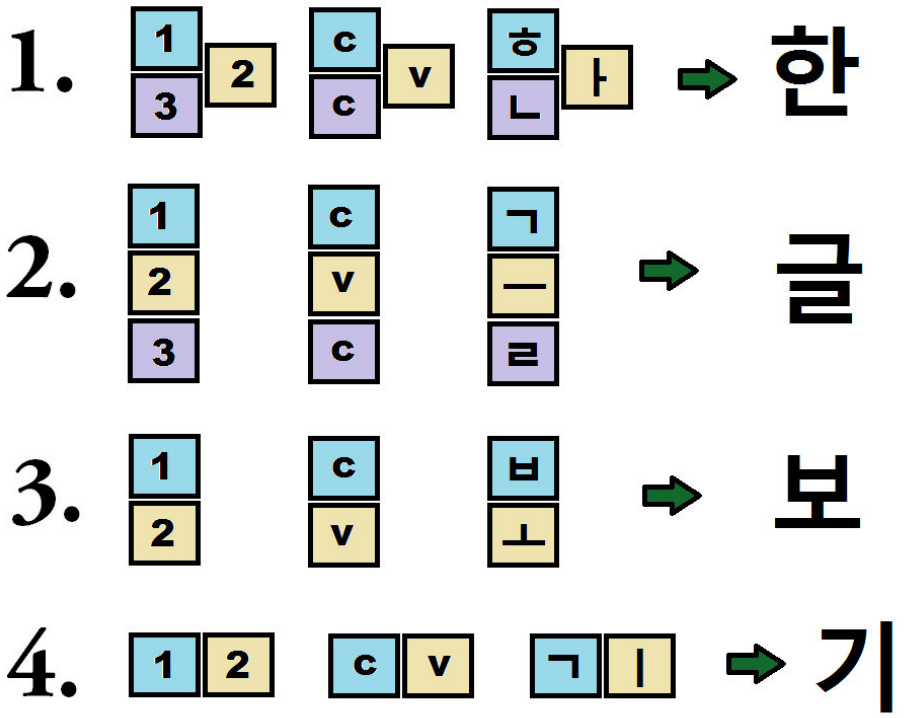
Incorporates features of alphabetic, as well as, syllabic writing

Korean letters are written in syllabic blocks with the alphabetic letters arranged in two dimensions.

Structure of Korean syllables

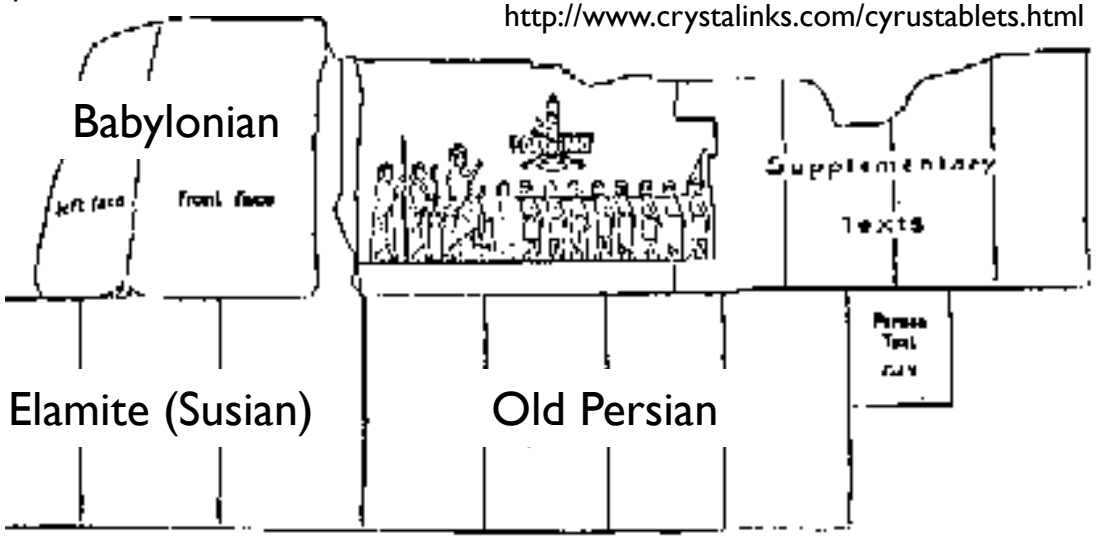
Korean syllable always starts with a consonant. The second one always is a vowel. And the third one – can be empty or consonant.

Prior to Hangul, writing used large number of ideographic Chinese symbols making it difficult to learn
To promote literacy in socirty, King Sejong the Great (1397-1450) created and promulgated a new alphabet., possibly invented by council of learned scholars mandated by the kind who considered a number of existing writing systems before coming up with Hangul



Behistun: The Cuneiform "Rosetta Stone"

wikipedia



http://www.crystalinks.com/cyrustablets.html

Inscription on Mount Behistun is western Iran issued by Persian Emperor Darius between 522-486 BCE

Three versions of the same text written in three different cuneiform scripts: Babylonian, Elamite and Old Persian

Georg Friedrich Grotefend realized by 1802 that Old Persian cuneiform was alphabetic – fully deciphered by Rawlinson by 1838

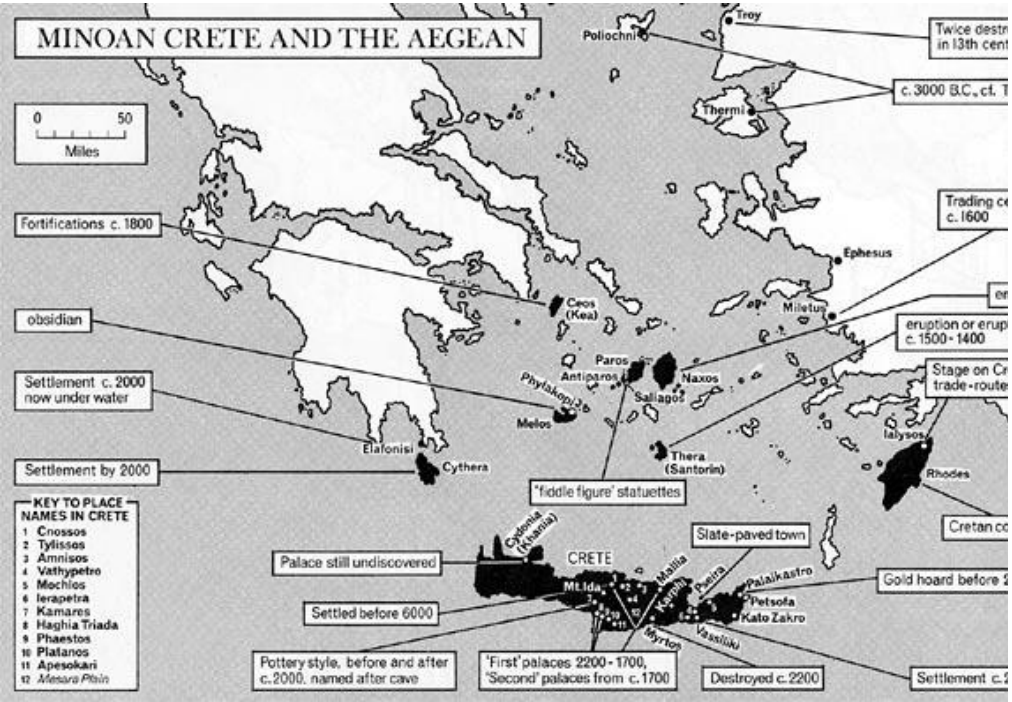
The deciphered old Persian text helped in deciphering Elamite and Babylonian

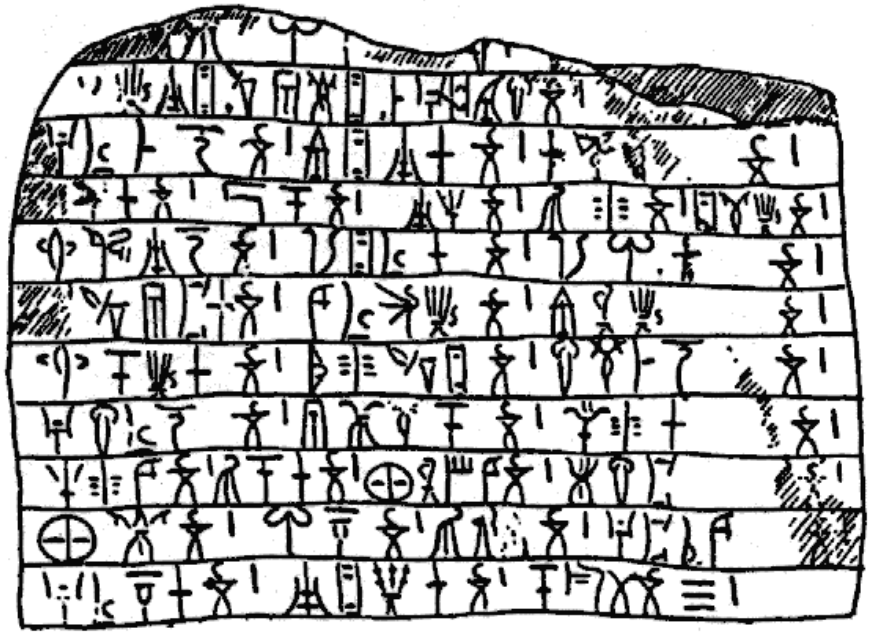
Decipherment without bilingual texts

Example: Linear B

A syllabic writing system for Mycenaean Greek used around 15th century BCE

Approximately 200 signs: now known to have 87 syllabic signs with phonetic values and many ideograms with semantic values



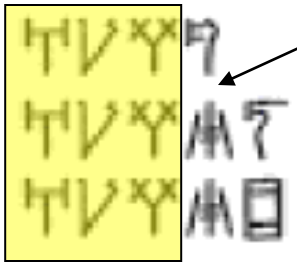


Kober's triplets

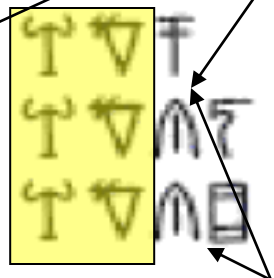
If Linear B uses inflections then word endings change predictably

Alice Kober (1950): pointed out the occurrence of five groups of three words ("Kober's triplets") each that had same beginnings but different endings – suggested syllables of type CV

The different terminal syllables may share the same vowel



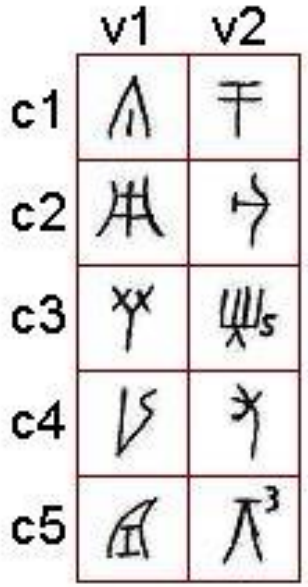
Amnisos



Lyktos

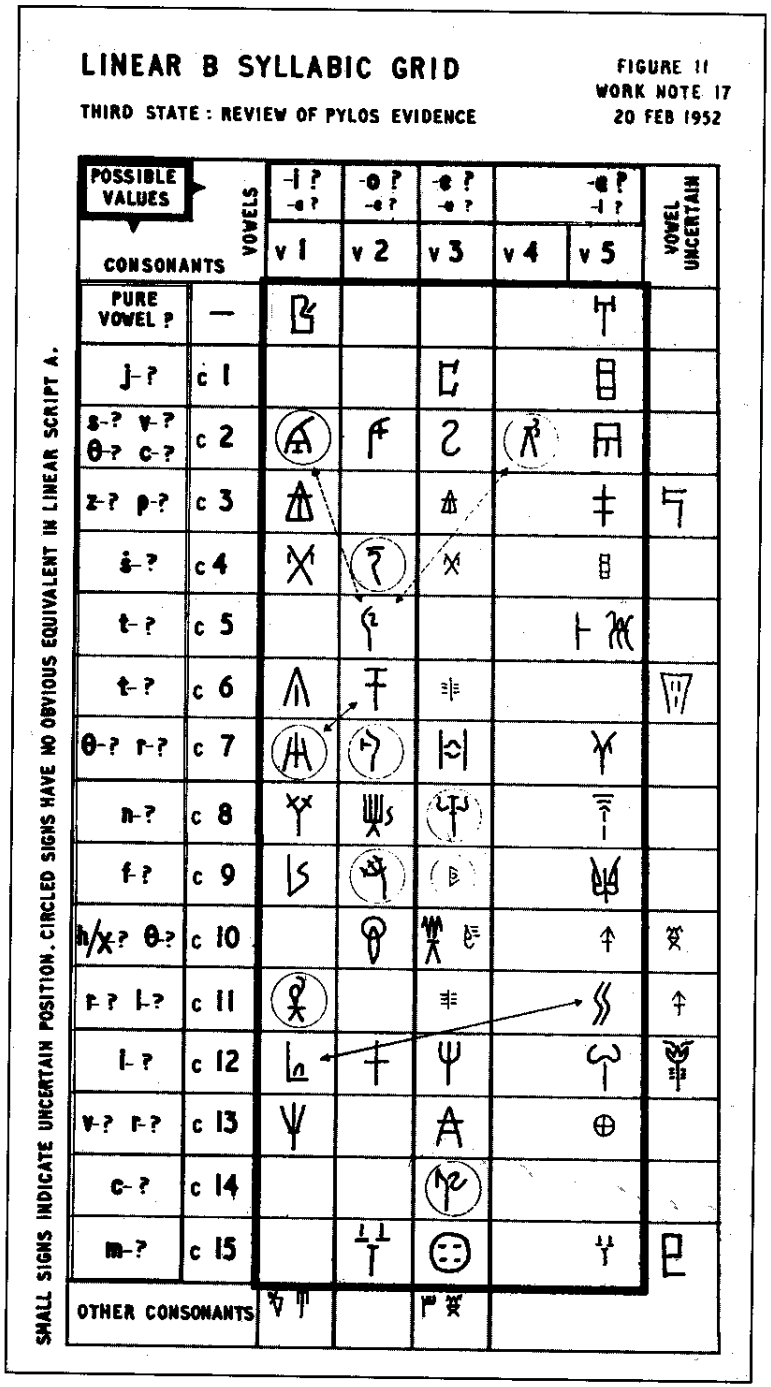
From the triplets Kober built a table of ten symbols which shared vowels or consonants

The different terminal syllables may share the same consonant



Ventris' Grid

Kober's insight used by Michael Ventris to construct grid of possible vowel & consonant combinations – eventually allowed assigning sound values for the signs (by guessing they spelt Greek place names)



Mycenaean tablet (MY Oe 106) inscribed in Linear B – mentions an amount of wool which is to be dyed (Natl Archaeological Museum, Athens, n. 7671)

Decipherment & controversy: "But this isn't *writing (as we know it)*!?"

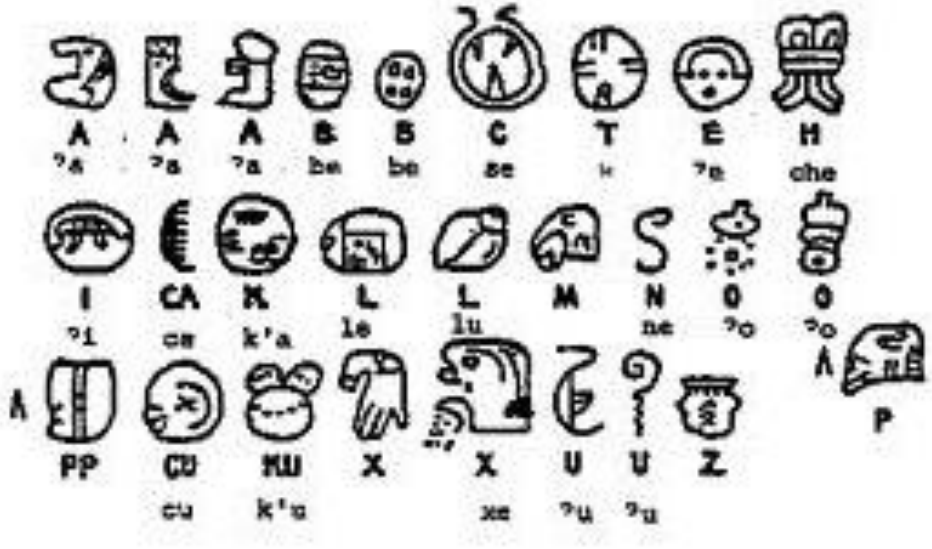
Michael Ventris (1922-1956)

Ventris' decipherment of Linear B challenged for a long time because a writing system that leaves out endings and includes only word stems [po-lo rather than polos, (Gr., Horse)] seems strange from the point of view of modern alphabetic writing.

However, it was primarily used for "recording accounts, inventories and similar brief notes; there is no example of continuous prose." (Chadwick, 1992).

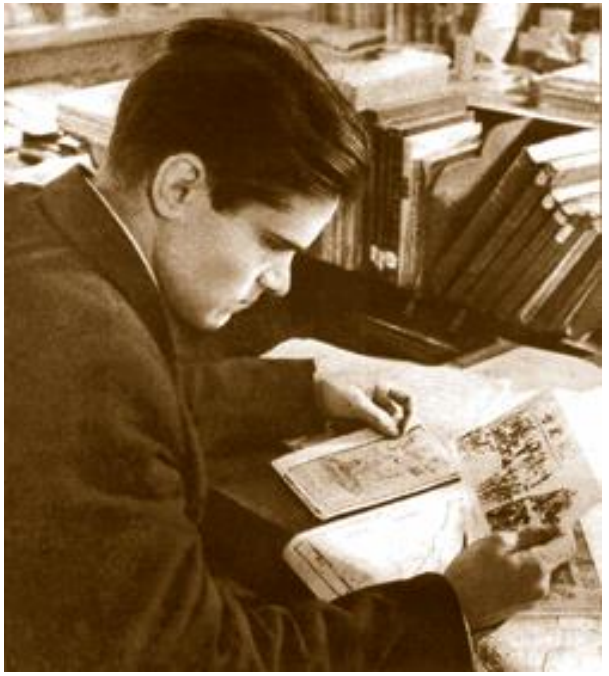
Example: Mayan "Hieroglyphs"

de Landa alphabet: The Mayan "Rosetta Stone"



"the refusal to recognize Mayan glyphs as writing because of pre-conceived notions about what writing should be, proved to be one of the biggest obstacles to its eventual decipherment [by Knorosov]" (Coe, 1992)

Yuri Knorosov (1922-1999)



So for a successful decipherment…

It helps to guess the underlying language

Or

know the writing system used for another language