

What's this thing called

Writing

Part I

Sitabhra Sinha

IMSc, Chennai

# Questions, Questions, Questions

❖ What ?

❖ Why?

❖ How?

❖ When?

❖ Who?

# Questions, Questions, Questions

❖ What ?

❖ Why?

❖ How?

❖ When?

❖ Who?

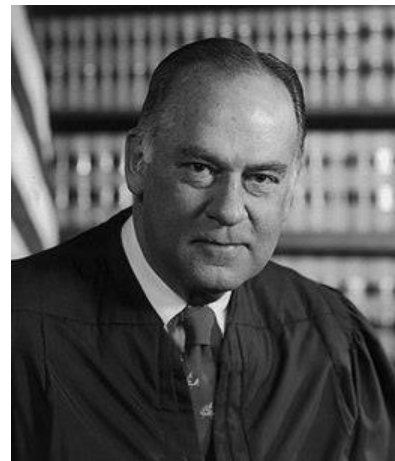
# The operational approach

I don't know what is it (writing)...

“I shall not today attempt further to define the kinds of material I understand to be embraced within that shorthand description [pornography/**writing**], and perhaps I could never succeed in intelligibly doing so.

But I know it when I see it...”

US Supreme Court Justice Potter Stewart  
on obscenity in *Jacobellis v. Ohio* trial (1964)



# How can you tell...

This is writing...



...but this is not !





# How can you tell...

This is writing...



an Achaemenid cuneiform tablet

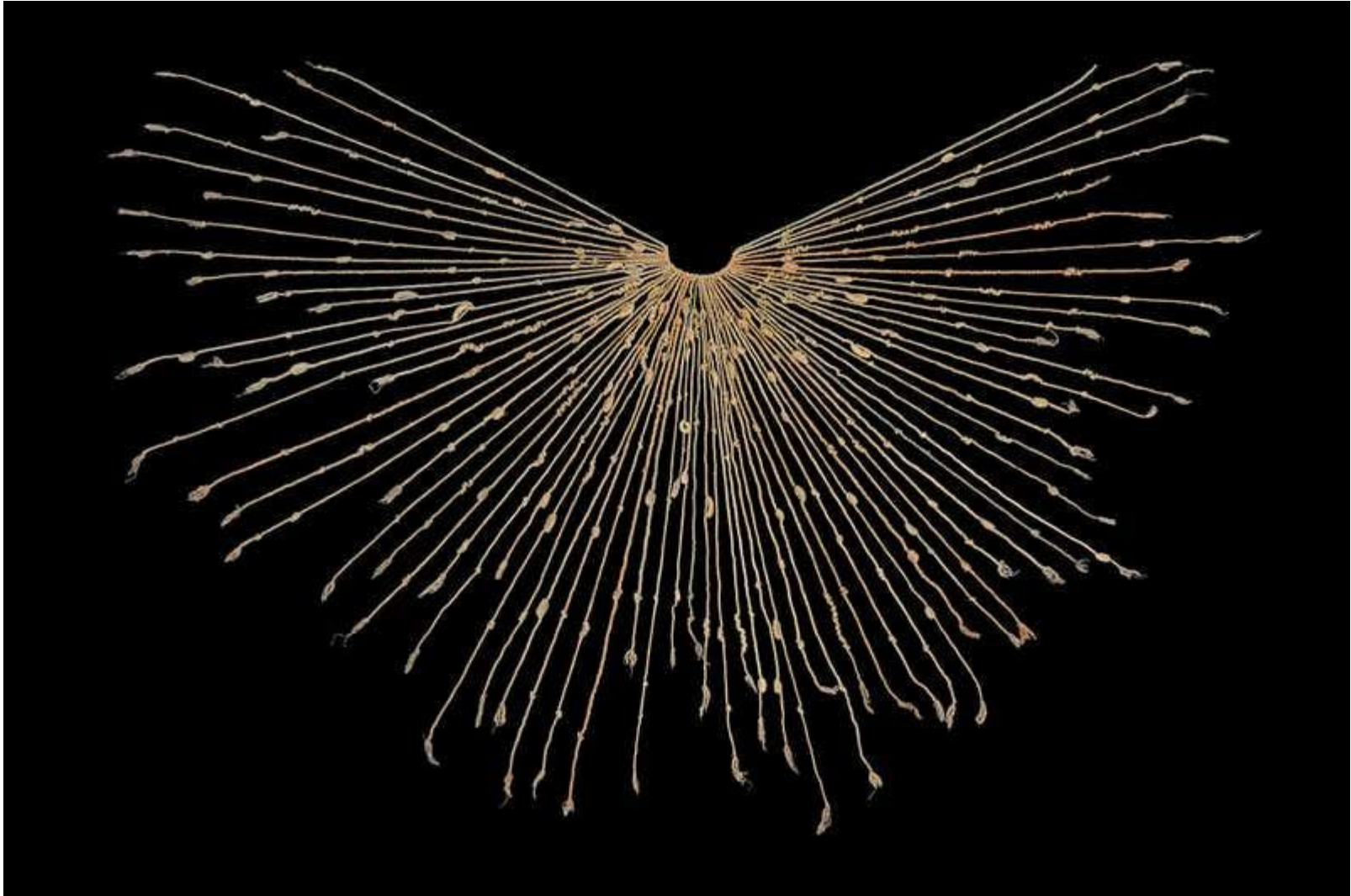
...but this is not !



a Nan e-Barbari (Persian flat bread)

# The case of khipus

knotted cords used by the Incas and other cultures of the Andes mountains in South America



# Did the Incas have no writing ?

360

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...

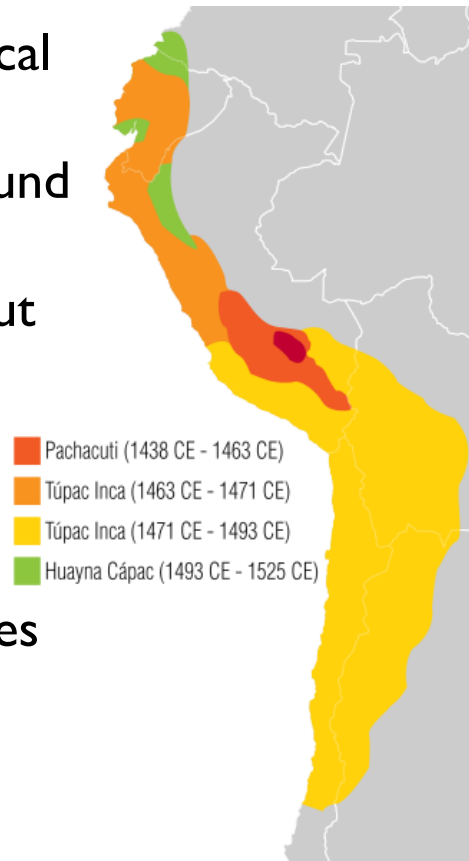


Image: Wikipedia/QQuantum

A quipucamayoc (“khipu specialist”) depicted in *El primer nueva corónica y buen gobierno* (1615) written by the indigenous Peruvian Felipe Guamán Poma de Ayala and sent to King Philip III of Spainto give a historical account of the Andes from the earliest human beings to the Incas and the Spanish conquest



Image: Felipe Guamán Poma de Ayala (1535-1616) *El primer nueva corónica y buen gobierno*



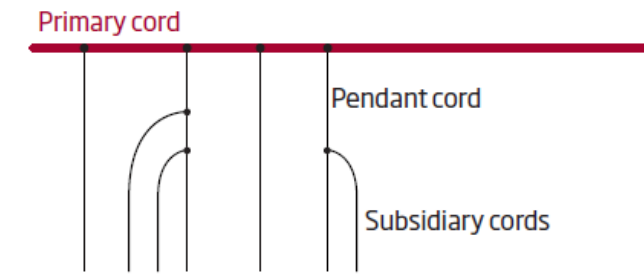
# Khipu as accounting device

“[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)

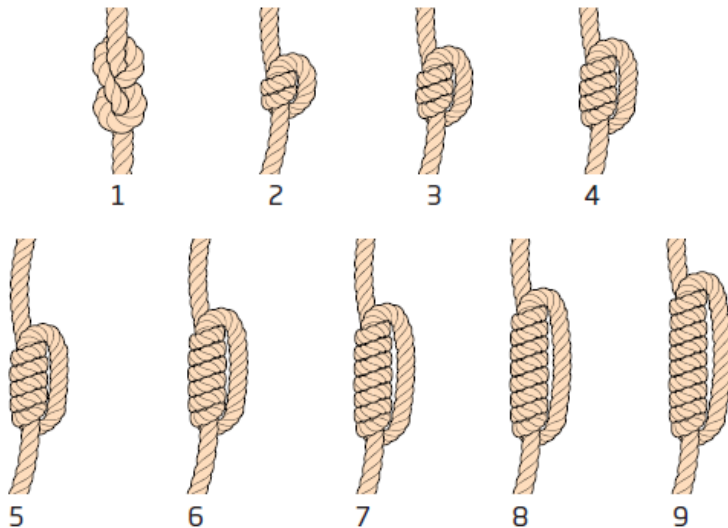
The Incas recorded census data in knotted cords called khipus. The primary cord had offshoots, which may have signified individual people or villages. The number of twists in a knot determined units, and its position on the pendant cord signified tens, hundreds and so on



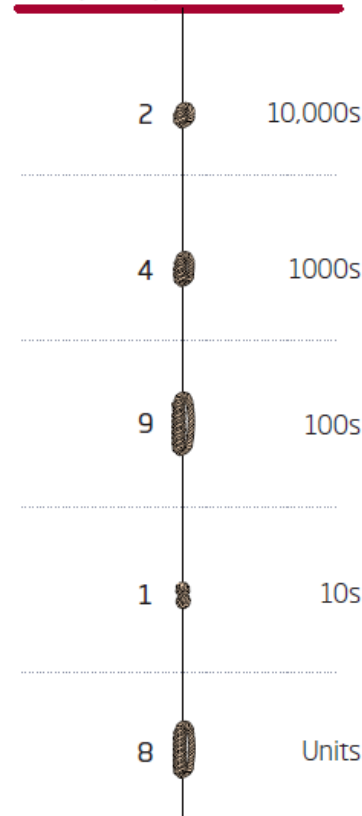
Leslie Leland Locke  
(1875-1943)



Knots tied on pendant cords (with their numerical value)



Primary cord with numerical example on pendant cord



The total of this cord would read  
24,918

In the 1920s, 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”.

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 ?



Gary Urton



Sabine Hyland

# Writing and Language are not equivalent!

**What is writing ?** a system of communicating – typically using a language - by means of conventional visible marks

**What is language ?** A system of **syntactic** communication capable of encoding ideas of arbitrary complexity

Syntax = Compositionality + Recursion  
(“words/letters”) (embedding)

A writing system can be used to write different languages e.g., Roman alphabet

Look for syntactic structure in a symbolic string

# The same writing system can be used to write several different languages...

## Examples

### ❖ Latin alphabet

used to write many modern European languages, including English and many modern Asian languages, including Malay, Turkish and Indonesian

A B C D E F G H  
I K L M N O P Q  
R S T V X Y Z

### ❖ Arabic script

used to write texts in Arabic, Persian (Farsi and Dari), Malay (Jawi), Cham (Akhar Srak), Uyghur, Kurdish, Punjabi (Shahmukhi), Sindhi, Balti, Balochi, Pashto, Lurish, Urdu, Kashmiri, Rohingya, Somali, among others

ا ب ت ث ج ح خ  
د ذ ر ز س ش ص  
ض ط ظ ع غ ف ق  
ك ل م ن ه و ي  
b 'a t t b 'a  
s s s z r d d  
q f g ' z t d  
y w h n m l k



... and the same language can be written using different writing systems

## Example

Turkic Languages have been written using

### ❖ Orkhon script

(8<sup>th</sup>-10<sup>th</sup> century CE)

written from right to left

ᠠᠨᠤ ᠨᠠᠭ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ  
ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ  
ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ  
ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ  
ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ ᠤᠯᠤᠰ

### ❖ Ottoman Turkish alphabet

(10<sup>th</sup>-20<sup>th</sup> century)

A form of the Perso-Arabic script

written from right to left

ا ب گ د ذ ر پ ب '   
 d h h ç c ş t p b '   
 ð b ð ð û w ş ş ş ş ş ş ş ş   
 z t z ş ş ş ş ş ş ş ş ş ş   
 ü r j o s k q f g g   
 n m l ŋ g k k f g '

### ❖ Latin Turkish alphabet

(1928 onwards)

written from left to right

Aa Bb Cc Çç Dd Ee Ff Gg Ğğ Hh  
Iı İi Jj Kk Ll Mm Nn Oo Öö Pp Rr  
Ss Şş Tt Uu Üü Vv Yy Zz

# The spectrum of writing

All known writing systems involve a mix of

- Phonetic elements: signs with sound values
- Logographic elements: semantic signs

words in English are not always pronounced the way they are spelled → less phonography than, e.g., French

PURE PHONOGRAPHY

Finnish

French



English



Japanese

Chinese

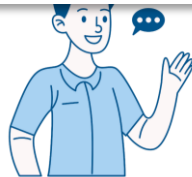
PURE LOGOGRAPHY

# The spectrum of writing

All known writing systems involve a mix of

- Phonetic elements: signs with sound values
- Logographic elements: semantic signs

Sillä minä, Sinuhe, olen ihminen ja ihmisenä olen elänyt jokaisessa ihmisessä, joka on ollut ennen minua, ja ihmisenä elän jokaisessa ihmisessä, joka tulee jälkeeni. Elän ihmisen itkussa ja ilossa, hänen surussaan ja pelossaan elän, hyvydessään ja pahuudessaan, oikeudessa ja vääryydessä, heikkoudessa ja väkevyyydessä. Ihmisenä olen elävä ihmisessä ikuisesti enkä sen tähden kaipaa uhreja hautaani ja kuolemattomuutta nimelleni. Tämän kirjoitti Sinuhe, egyptiläinen, hän, joka eli yksinäisenä kaikki elämänsä päivät.



经  
jīng  
pass through

妈  
mā  
mum

西  
xī  
West

己  
jǐ  
oneself

Chinese

PURE PHONOGRAPHY

Finnish

French

English

Japanese

PURE LOGOGRAPHY

# The spectrum of writing

All known writing systems involve a mix of

- Phonetic elements: signs with sound values
- Logographic elements: semantic signs

image: www.pegheadnation.com

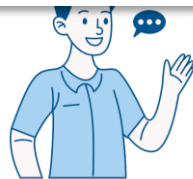


Musical notation

Sillä minä, Sinuhe, olen ihminen ja ihmisenä olen elänyt jokaisessa ihmisessä, joka on ollut ennen minua, ja ihmisenä elän jokaisessa ihmisessä, joka tulee jälkeeni. Elän ihmisen itkussa ja ilossa, hänen surussaan ja pelossaan elän, hyvydessään ja pahuudessaan, oikeudessa ja vääryydessä, heikkoudessa ja väkevyyydessä. Ihmisenä olen elävä ihmisessä ikuisesti enkä sen tähden kaipaa uhreja hautaani ja kuolemattomuutta nimelleni. Tämän kirjoitti Sinuhe, egyptiläinen, hän, joka eli yksinäisenä kaikki elämänsä päivät.

Finnish

French



English



Japanese

经  
jīng  
pass through

西  
xī  
West

妈  
mā  
mum

己  
jǐ  
oneself

Chinese



“Dabbawala”  
notations

PURE PHONOGRAPHY

PURE LOGOGRAPHY

(Robinson 2002)

image: www.worldlanguage.com

image: www.immigo.io

image: www.thebeijinger.com

image: www.mumbaidabbawala.org



# The spectrum of writing

All known writing systems involve a mix of

- Phonetic elements: signs with sound values
- Logographic elements: semantic signs

image: www.pegheadnation.com



Musical

IPA

PURE PHONOGRAPHY

Vowels	i:	I	ʊ	u:	ɪə	eɪ		
	sheep, sea, field	ship, stir, started	put, good, should	moon, through, here, career, sea, train, plane				
Consonants	e	ə	ɜ:	ɔ:	ʊə	ɔɪ	əʊ	short
	dead, said, police, the	bird, wash, walk, saw	door, point, oil	coat, note				long
Consonants	æ	ʌ	a:	ɒ	eə	aɪ	aʊ	diphthongs
	apple, cat, mat, money, cut, again, safari	car, what, because, careful, there, hub, fine, our, house						voiced
Consonants	p	b	t	d	tʃ	dʒ	k	g
	pen, hopping, jump, hobby, her, table, watched, added, played, fish, picture, danger, fudge, per, lucky, hug, league							
Consonants	f	v	θ	ð	s	z	ʃ	ʒ
	fire, laugh, phone, move, video, of, healthy, teeth, this, mother, with, giv, see, notice, zebra, nation, special, television, visual, figure							
Consonants	m	n	ŋ	j	l	r	w	h
	man, money, map, happy, up, again, onion, view, smiley, feel, bright, where, one, house, hungry, who							

Phonemic Chart

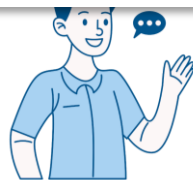
Image: anglaiscpge.jimdoofree.com

hminenä olen elänyt jokaisessa  
ia, ja ihmisenä elän jokaisessa  
in ihmisen itkussa ja ilossa,  
yydydessään ja pahuudessaan,  
koudessa ja väkevyydessä.  
sesti enkä sen tähden kaipaa  
:ta nimelleni. Tämän kirjoitti  
yksinäisenä kaikki elämänsä

paivat.

Finnish

French



English



Japanese

经  
jīng  
pass through

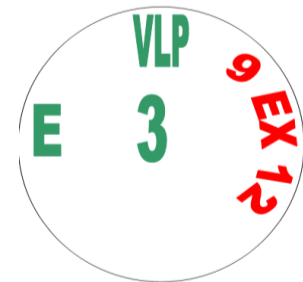
西  
xī  
West

Chinese

妈  
mā  
mum

己  
jǐ  
oneself

image: www.thebeijinger.com



“Dabbawala”  
notations

PURE LOGOGRAPHY

image: www.mumbaidabbawala.org

(Robinson 2002)

# The alphabet of human thought

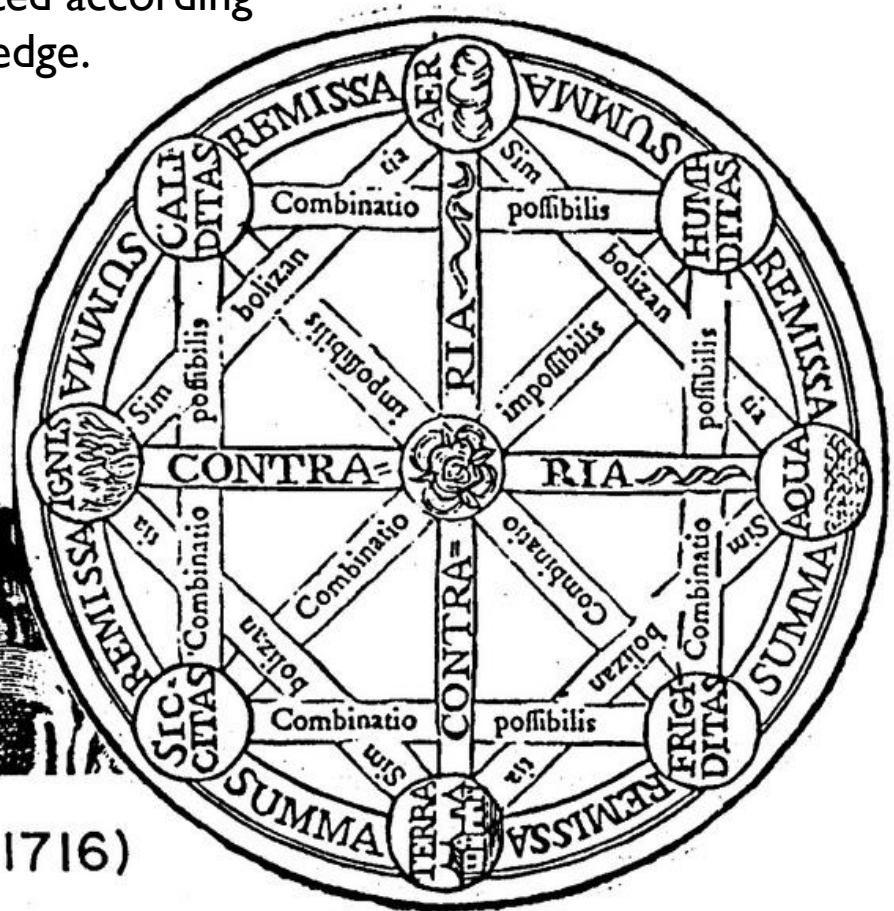
## Reducing human reasoning to calculation

In the early 18<sup>th</sup> century, Leibniz provided an outline for a *characteristica universalis*. An artificial language in which each letter (a pictographic character) would represent a concept.

These could be then combined and manipulated according to a set of logical rules to compute all knowledge.



LEIBNIZ (1646 - 1716)



# 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 (wo)
ん n				

E.g., Japanese Kana

Ideographic  
(>50000 signs)

是  
我  
心  
所  
願  
的  
啊

一  
概  
是  
你  
的  
直  
到  
世  
世  
代  
代

我  
出  
惡  
爲  
的  
是  
那  
國  
權  
勢  
榮  
耀

的  
樣  
兒  
不  
要  
由  
我  
入  
迷  
願  
你  
榮

我  
求  
你  
免  
我  
的  
債  
照  
我  
免  
人  
債

我  
們  
需  
用  
的  
糧  
食  
求  
你  
今  
日  
給

意  
能  
穀  
成  
就  
在  
地  
如  
在  
天  
一  
樣

敬  
願  
你  
的  
國  
圖  
降  
臨  
願  
你  
的  
旨

你  
在  
天  
上  
願  
你  
的  
名  
兒  
被  
人  
尊

E.g., Chinese

Logo-syllabic (~900 signs)



E.g., Sumerian cuneiform

Alphabets themselves further distinguished into

**Pure Alphabets:** distinct letters for consonants & vowels

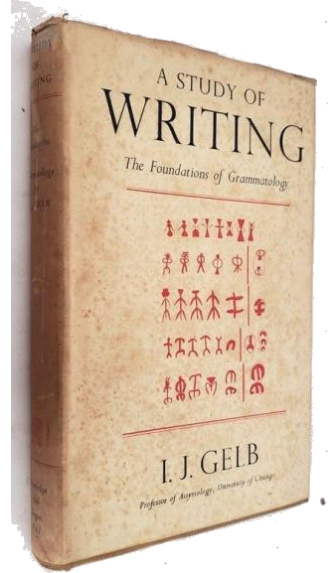
**Abugida:** vowels modify characters for consonants

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

# Grammatology

the study of writing systems and their relationship to language;  
also examines how writing influences meaning and thought.

Ignace Gelb, *A Study of Writing* (1992)



“Without writing, the literate mind would not and could not think as it does, not only when engaged in writing but normally even when it is composing its thoughts in oral form. More than any other single invention, writing has transformed human consciousness...”

“Technologies are not mere exterior aids but also interior transformations of consciousness and never more than when they affect the word...”

“Many of the features we have taken for granted in thought and expression in literature, philosophy and science, and even in oral discourse among literates, are not directly native to human existence as such but have come into being because of the resources which the technology of writing makes available to human consciousness.”



Walter J Ong  
(1912-2013)

Ong, *Orality and Literacy: The Technologizing of the Word* (1982)