UC Berkeley School of Information

The First Information Technology: Writing Systems

InfoSys 103

History of Information

Geoff Nunberg

1/28/09

The First "Information System": Language

No direct evidence about origins of language

No existing "primitive" languages: all modern human populations speak languages of comparable complexity.

No genetic disposition to speak one lg.

The First "Information System": Language

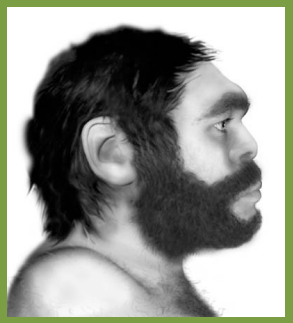
Early theories: "bow-wow," "uh-oh," "pooh-pooh," etc.

> 1886: Linguistic Society of Paris forbids "toute communication concernante l'origine du langage" ["Any paper dealing with the origin of language"]

The First "Information System": Language

More recent research on cortical features, articulatory tract,etc.

The "Language gene": FOXP2



The First "Information System": Language

Was development of language gradual or sudden? Does language presuppose neural modification?

- language might have emerged w. *Homo erectus* (1.5 m years)
- Or with mod. *Homo sapiens* (ca 100-150k years)
- Or with Upper paleolithic tool-making (ca. 40-45 k years)

The Beginnings of Representational Artifacts

"Venus of Tan-Tan," Morocco, possibly 250k years old, but may be a naturally occurring object.

Cave paintings, Lascaux, France: ca 15-13,000 BC (others perhaps to 30,000 BC)

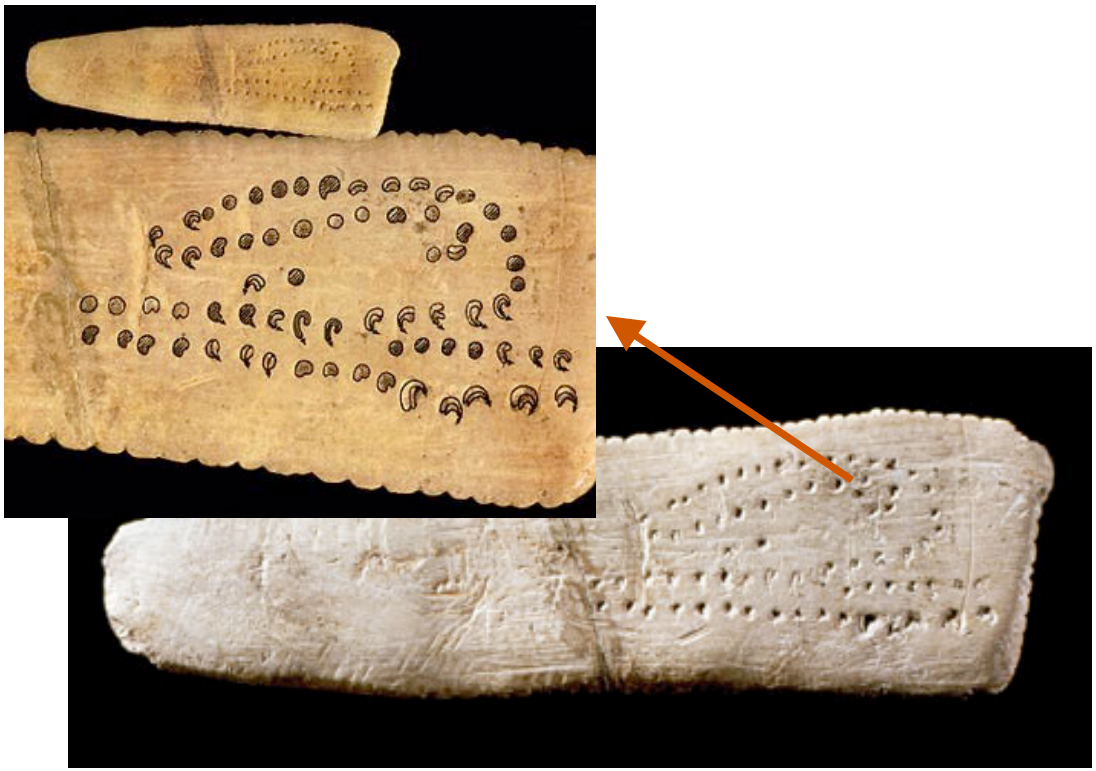
Man's first affirmation of himself, and expression of his own newness--when, by the ways and means of art, he entered into contact with the power, brilliance, and joyful mastery of a force that is essentially the force of a beginning. . . ." Maurice Blanchot

The Beginnings of Representational Artifacts

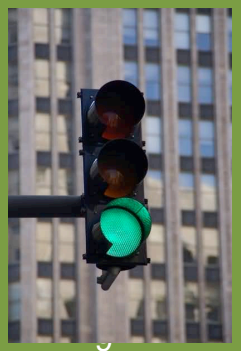
"Images and symbols... were markers of periodic and continuous cultural processes, of rites, and of repetitive myths and stories..." Alexander Marshack

The Beginnings of Representational Artifacts

"... whereas notations of whatever sort were apparently means of recording the passage of time in terms of culturally significant events."



The Varieties of Signs



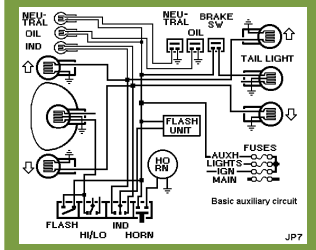
3 Types of signs (after Charles Peirce): *icon, index, symbol*

Icon: relation of resemblance (more-or-less) to signified. E.g,

Index: stands in causal/spatial relation to the signified (blaze on tree to act of marking, thermometer to temperature)

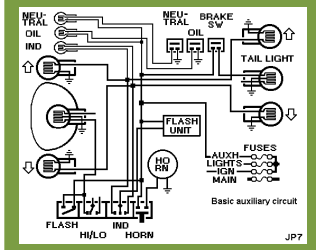
Symbol: arbitrary relation between sign and signified. E.g., written word *cat*, spoken word /kæt/.

The Varieties of Signs



Icon: sign stands in relation of resemblance or similarity to signified (though often only roughly).

The Varieties of Signs



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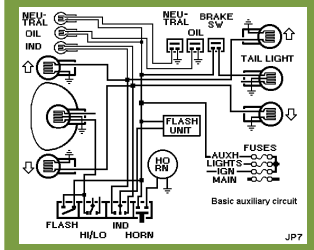
The Varieties of Signs



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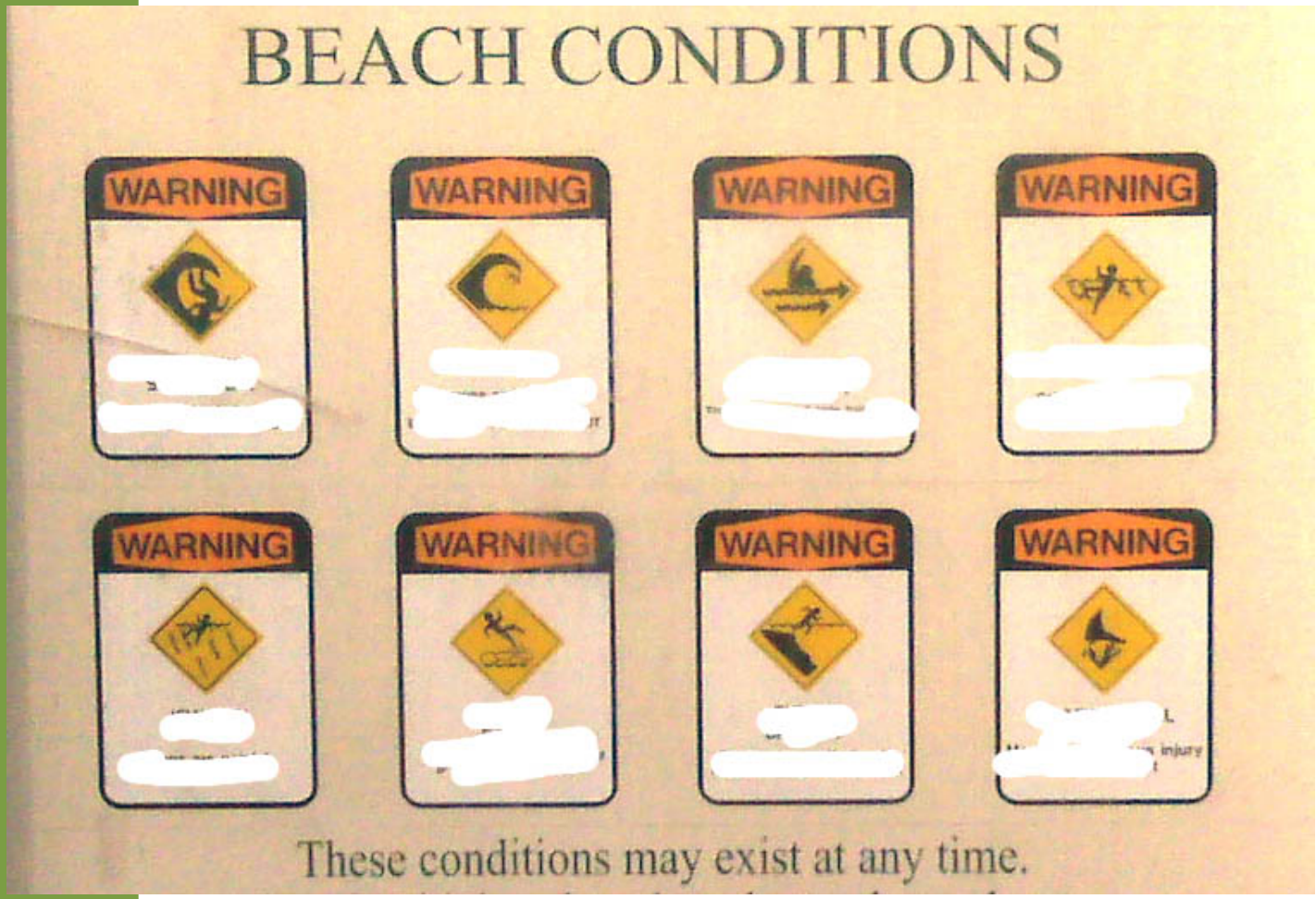
The Varieties of Signs



BEACH CONDITIONS

These conditions may exist at any time.

Early Iconicity

Petroglyphs, Bhimbetka, India, ca 9000 BC

Rock carving, Hong Kong (Kau Sai), 3000 BC

Petroglyphs, Scandinavia, Bronze Age

The Varieties of Signs: Indexical

Index: stands in causal/spatial relation to the signified (pawprint to bear, blaze on tree to act of marking, thermometer to temperature)

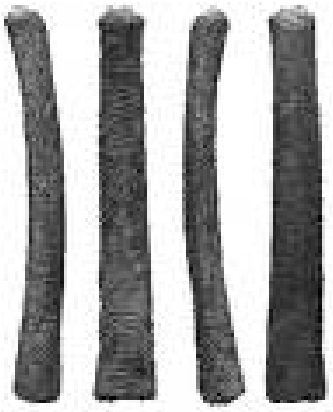
Early Indexical Signs

Earliest signs are mnemonics for record-keeping, geneology, etc. (Tallying systems)

Knotted rope, notched stick or bone, etc.
Become frequent in upper paleolithic

Notched Bone, England, upper paleolithic, 12,000 years old

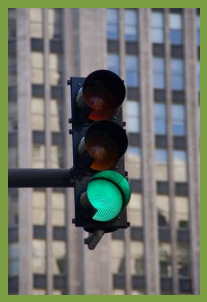
Notched Bone, Turkey, ca 3000 BC



Notched bone, Congo, ca. 25,000 BC -- may. represent lunar calendar

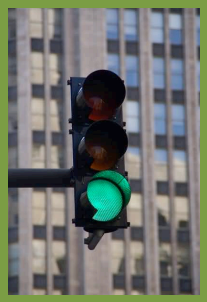
The Varieties of Signs: Symbols

Arbitrary (or effectively arbitrary) relation between sign and thing signified



tree

The Varieties of Signs: Symbols



Arbitrary (or effectively arbitrary) relation between sign and thing signified

Were there paleolithic symbols?

Elaborated Indexical System: The Inca *qipu*

Knots of varying colors in llama or alpaca hair;

Sequences recorded population, taxes, geneology, astronomy (and possibly names) in decimal system. System maintained by knot-keepers.

Limits: can record only quantity and category; requires extensive convention for intepretation

Pictographic (Iconic) Communication Systems

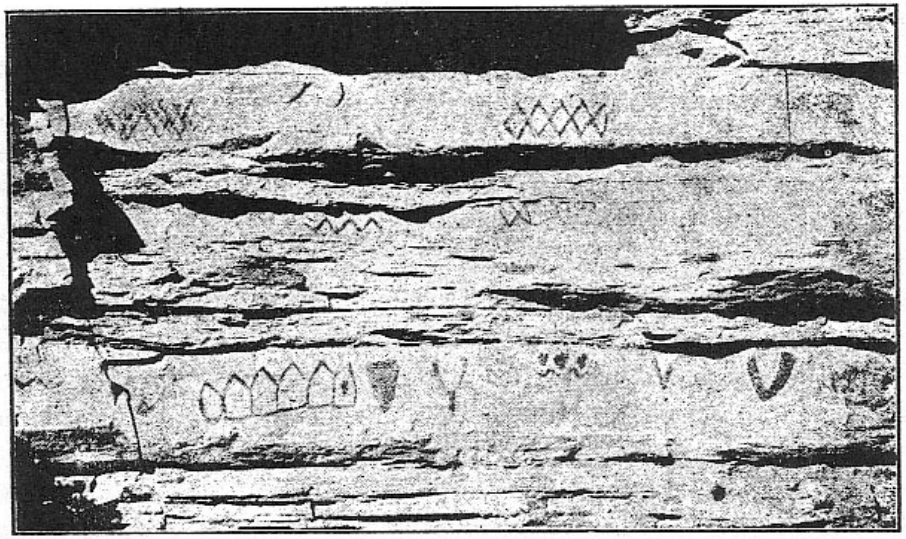


Fig. 4.—Geometrical forms. (From a photograph of rocks).

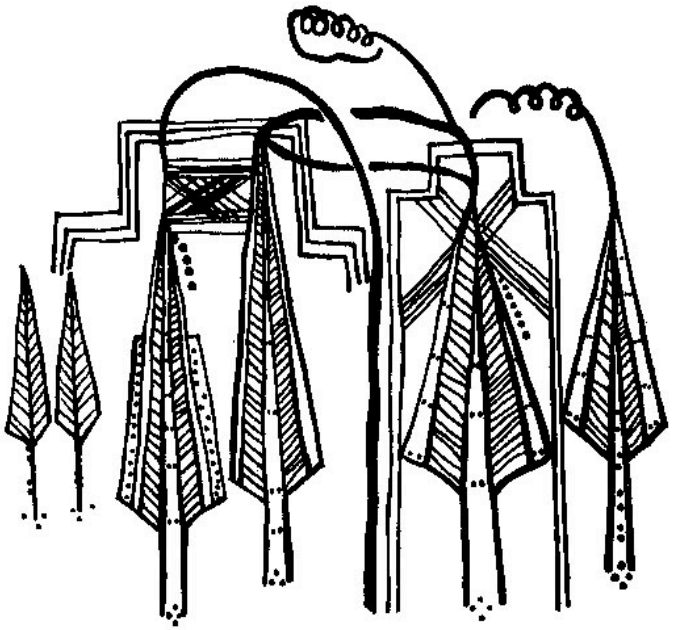
Pictographic (Iconic) Communication Systems

Kiowa message to the US President

Pictographic (Iconic) Communication Systems

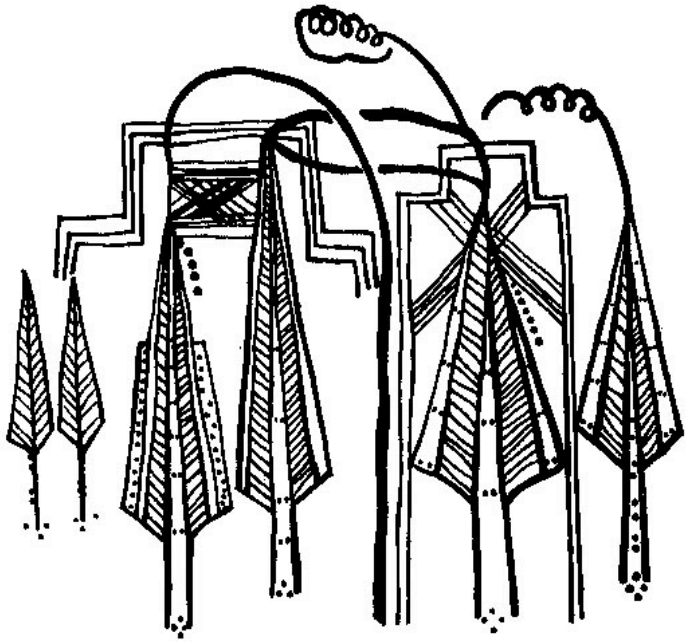
"The chief salutes the president, and his warriors belonging to the eagle and catfish totems are in harmony with him and are willing to accept the white man's ways.

Pictographic (Iconic) Communication Systems



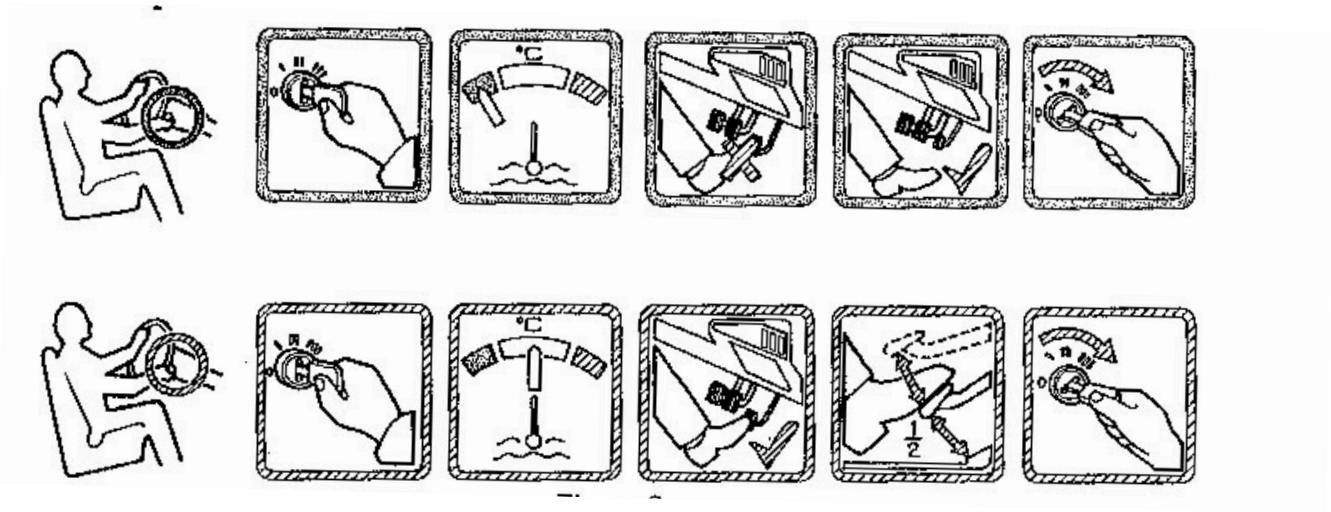
Yukaghir (Siberia) “love letter,” late 19th c.

"Pictographic" (Semasiographic) Systems

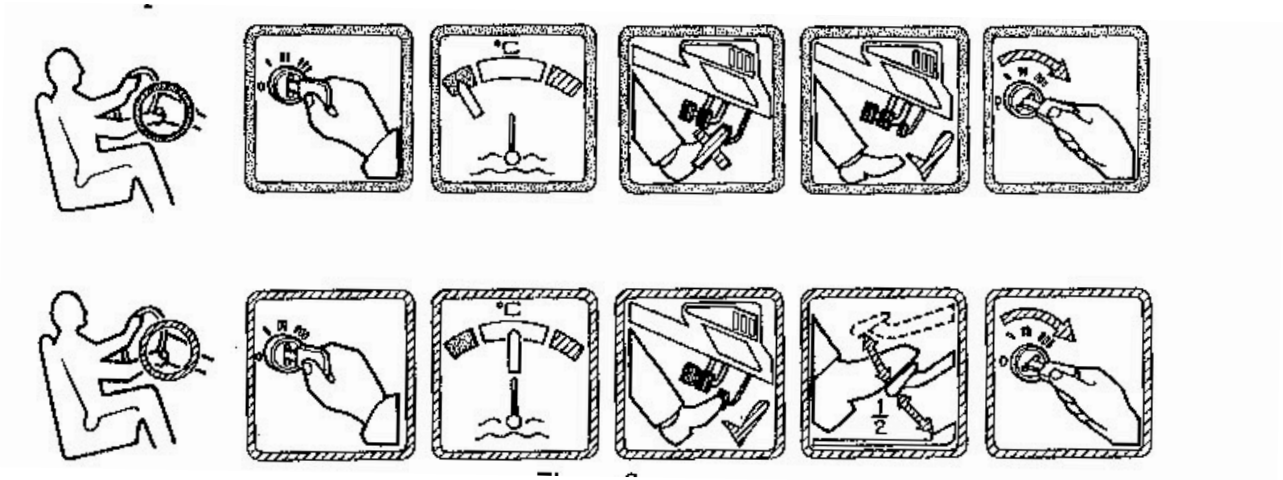


"I know you're fighting with that Russian girl you broke up with me over. I'm unhappy in my house as I think of you, but you should know there's another dude hitting on me, so get on the stick before I get married and have children, Sparky."

Pictographic (ideographic) systems: the importance of context



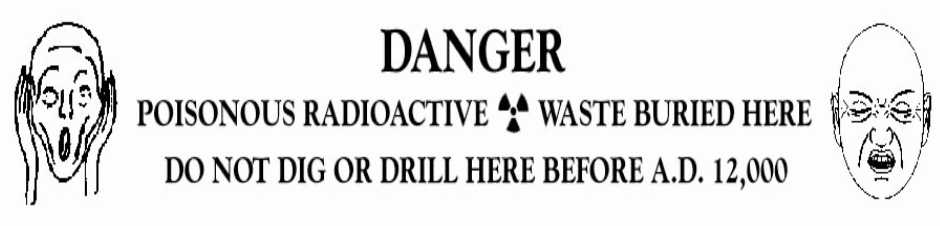
Ideographic (Semasiographic) Systems: the importance of context



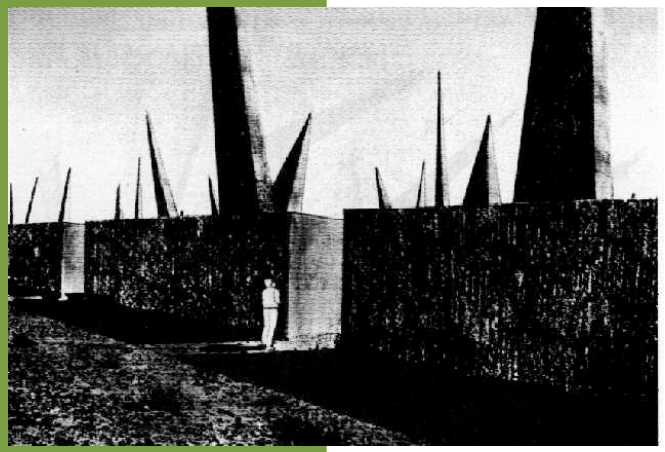
"Turn the key. If the car is cold, don't step on the gas pedal; if it's warm, depress the gas pedal halfway as you turn the key."

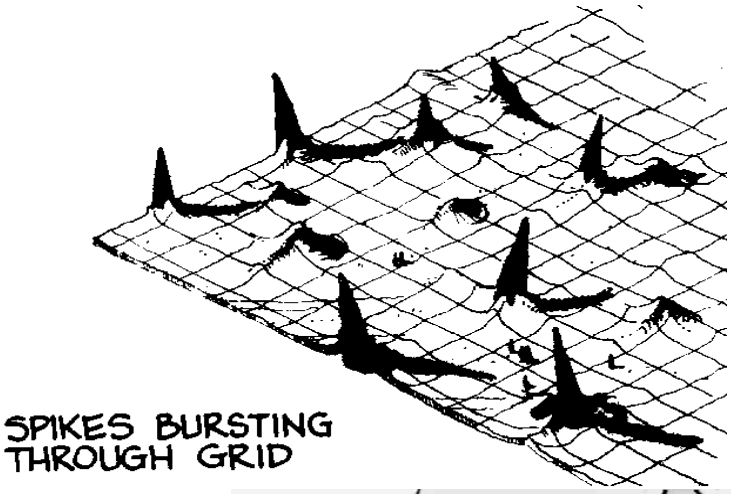
An Aside: The 10,000-year warning

Sandia Labs: warning signs to last 10,000 years for radioactive waste dumps.



The 10,000-year warning





Abstraction in pictographic systems

Extending pictographic systems to deal with abstract or relational notions. E.g., "brother," "go," etc.

A step toward the development of "true" writing:

Form signs for abstract entities by extending or combining signs for concrete things (ca. 3300 BC)

foot = "go, come, walk, etc." Cf use of

person + mountain = "foreigner"

eye + water = "weep" etc.

The limits of semasiographic systems

Semasiographic system: symbols stand directly for ideas, not for words of a language,

In theory, semasiographic systems could communicate a full range of information without reference to spoken language. Cf mathematical notation:

$$10^9 = 1{,}000{,}000{,}000$$

"Ten to the ninth equals a billion."/ "Zehn hoch neun gleicht eine Milliarde," etc.

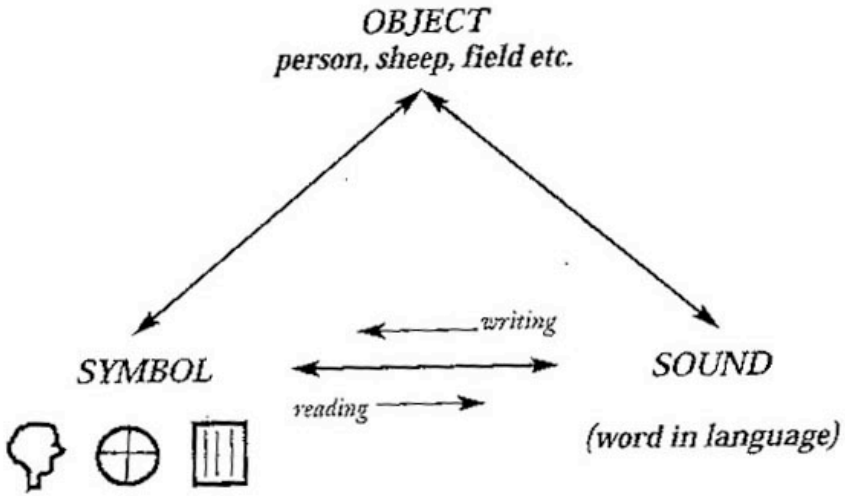
$$\forall x\,(Fx \rightarrow Gx)$$

"For all x, if F of x then G of x"/"Everything that is F is G," etc.

But language-independent systems appear inadequate to express the full range of thoughts & information (as opposed, e.g., to artificial languages.)

The origins of (true?) writing

1.



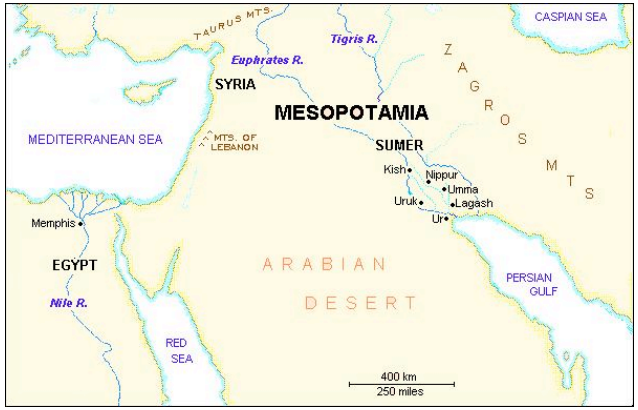
Glottographic writing: rather than referring directly to reference/ ideas, signs are associated with elements of the language (words, morphemes, syllables, phonemes).

Origins of Writing in Sumer

8-5000 BC -- earliest use of clay tokens.

4,000 BC -- earliest clay bullae

3500-3300 BC -- earliest clay tablets from Uruk.

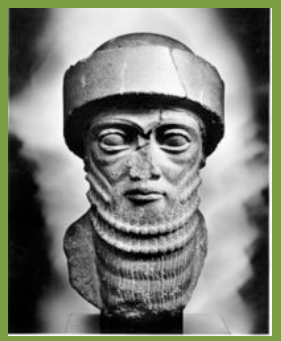


Bullae and tokens

Early cunieform

Tokens as origins of Sumerian writing?

Origins of Writing in Sumer

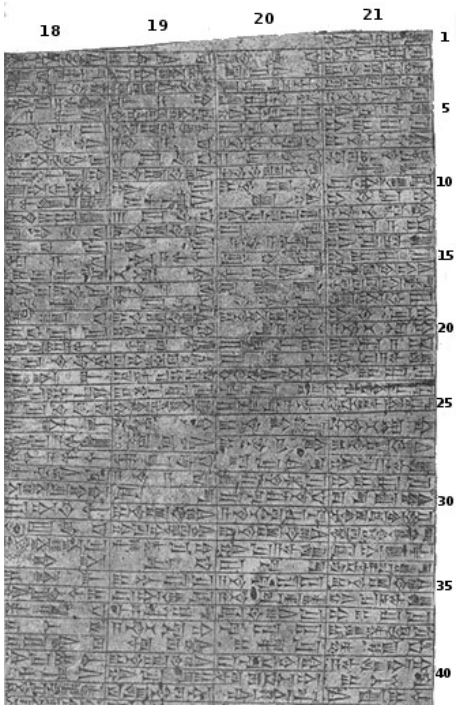


2500 BC -- cuneiform “true” writing

2400 BC script used for Akkadian

2000 BC script used for Babylonian & Assyrian..

1750 BC Code of Hammurabi



Functions of Early Writing

Writing develops as memorial tool -- things that are hard to remember…

- Commercial records
- Calendars & dates

Functions of Early Writing

Writing develops as memorial aid -- things that are hard to remember…

- Commercial records
- Calendars & dates

Or that have to be said just so:

- Titles
- Laws
- Liturgical texts
- Poetry

Origins of Writing in Sumer

Epic of Gilgamesh (7th c. BC)

He who saw everything in the broad-boned earth, and knew what was to be known

Who had experienced what there was, and had become familiar with all things

He, to whom wisdom clung like cloak, and who dwelt together with Existence in Harmony

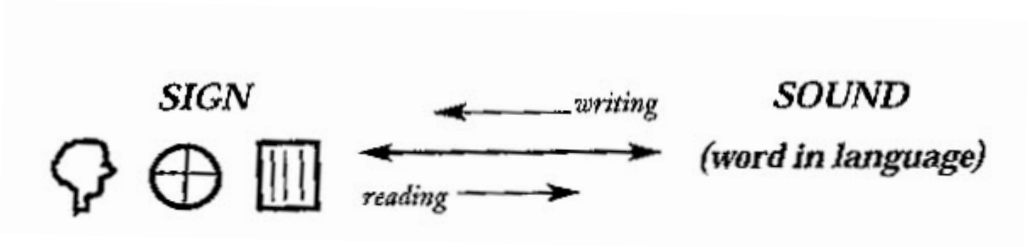
He knew the secret of things and laid them bare. And told of those times before the Flood

In his city, Uruk, he made the walls, which formed a rampart stretching on...

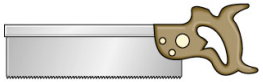
Epic from ca. 1500-1750 BC, existing tablets from 600 BC in Akkadian…

The Origins of "complete" writing

"Complete" glottographic system: signs denote words of the language

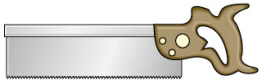


The Rebus Principle



Rebus: Icons of things that stand in for their (phonetic) names

The Rebus Principle



"I saw you duck, dear."

Rebus principle leads to logography

Rebus principle allows signs to be reutilized to signal abstract words, functional elements, etc.

 “water” /a/ → “in” /a/

T “oracle” /me/ → plural suffix /-me/

Accompanied by increasing conventionalization of signs... Creates need for “determinative” signs to indicate how other signs are being used.

Eg. “marsh plant” (/te/) sign also used for name of goddess assoc. w. marshes /eresh/ -- /u/ “plant” used to indicate “marsh plant” use of sign.

Logography to Syllabic System

Logographs ultimately perceived as having purely phonetic value.

Cf English logographs -- imagine the word *h@b&*

Signs come to stand in for syllables.

Logography to Syllabic System

Logographs ultimately perceived as having purely phonetic value.

Signs come to stand in for syllables.

Sumerian has (C)V syllable structure.

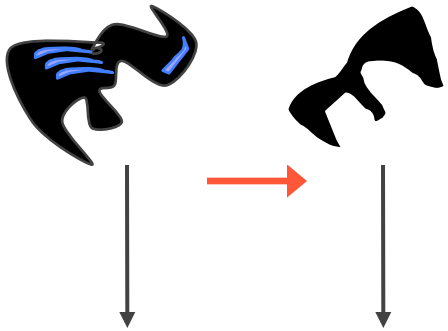
Sumerian a mixture of logographic & syllabic, like modern Japanese.

Development of Written Symbols

Semasiographic/
ideographic

Development of Written Symbols

Simplification of sign →



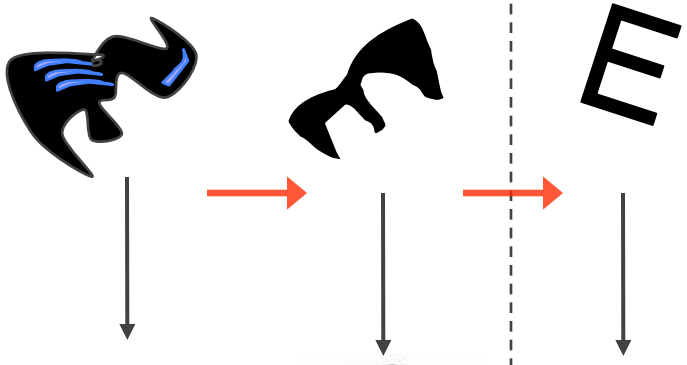
Semasiographic/ ideographic

Rebus extension

Proto-writing

Development of Written Symbols

Simplification of sign →



[ɛlvIs]

Semasiographic/ ideographic

Rebus extension

logographic

Proto-writing

"True" (glottographic) Writing

Development of Written Symbols

Simplification of sign →

E

E

[ɛlvIs]

/ɛλ/

Semasiographic/ ideographic

Rebus extension

logographic

syllabic

Proto-writing

"True" (glottographic) Writing

Development of Written Symbols

Simplification of sign →

E E E

[ɛlvIs] /ɛλ/ /ɛ/

Semasiographic/ ideographic

Rebus extension

logographic syllabic alphabetic

Proto-writing

"True" (glottographic) Writing

Development of Written Symbols

Shift from logographic to syllabic:

Cf English logographs @, &: imagine formation of words like "h@st&."

Where does this happen?

Origins of major writing systems

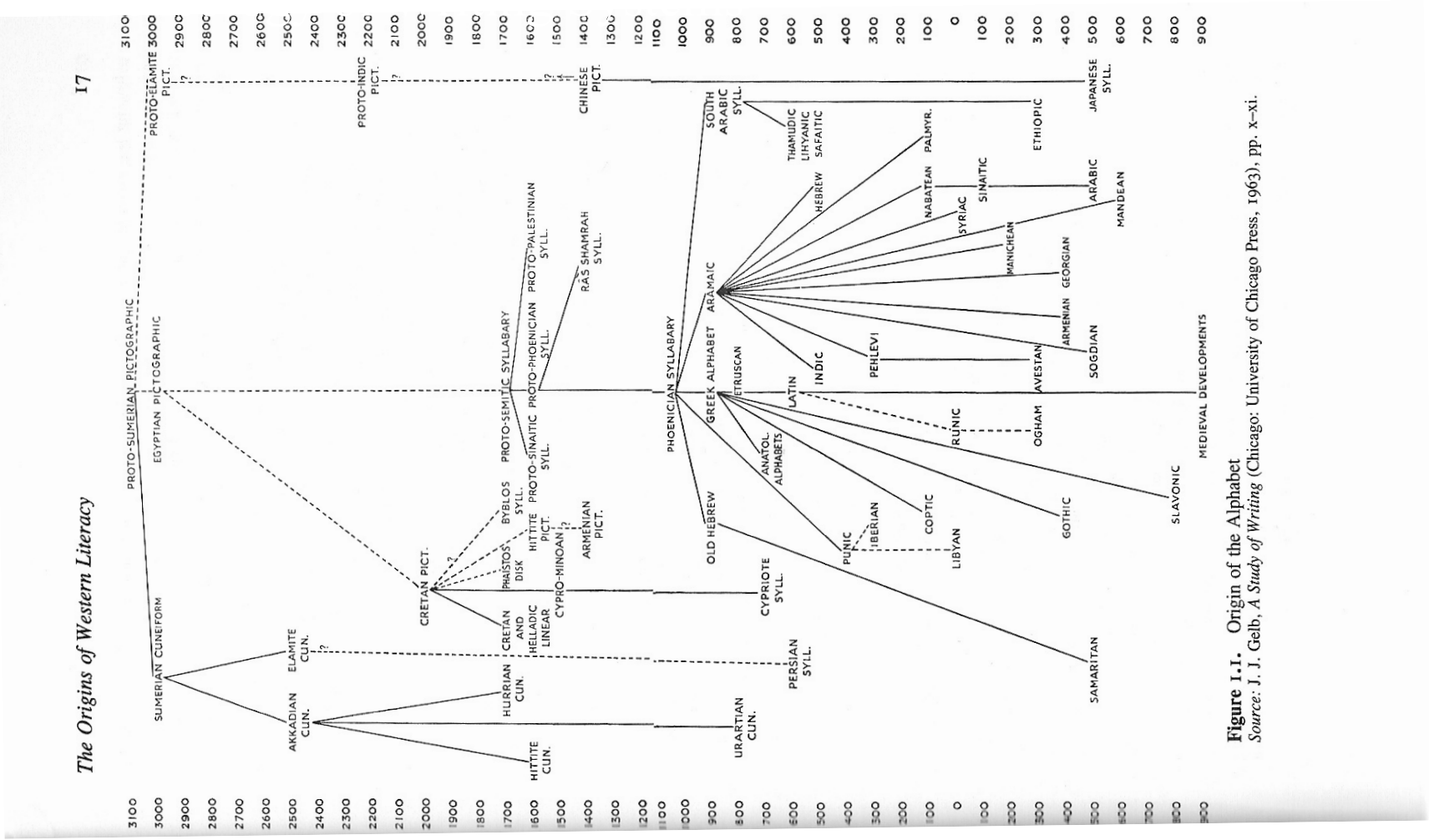


Figure 1.1. Origin of the Alphabet
Source: J. J. Gelb, *A Study of Writing* (Chicago: University of Chicago Press, 1963), pp. x–xi.

… but not much evidence for a single source (monogenesis)…

Origins of Alphabetic Writing

Alphabetic system derived from application of syllabic system to different phonological structures.

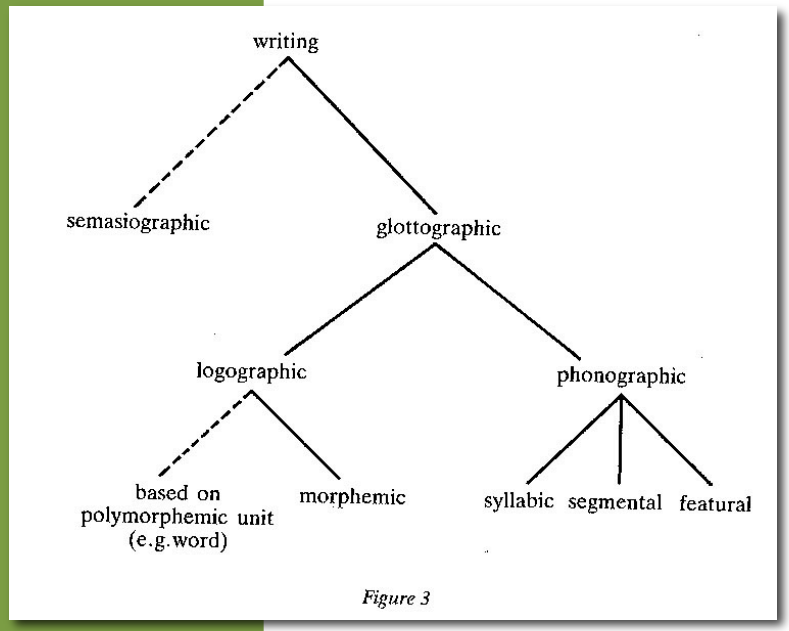


Figure 3

Logographic: mod. Chinese, Japanese (mixed)

Syllabic: Linear B, Cherokee, Korean Hangul (featural)

Alphabetic: Roman, Cyrillic, Greek, Hebrew, etc,

Origins of Alphabetic Writing

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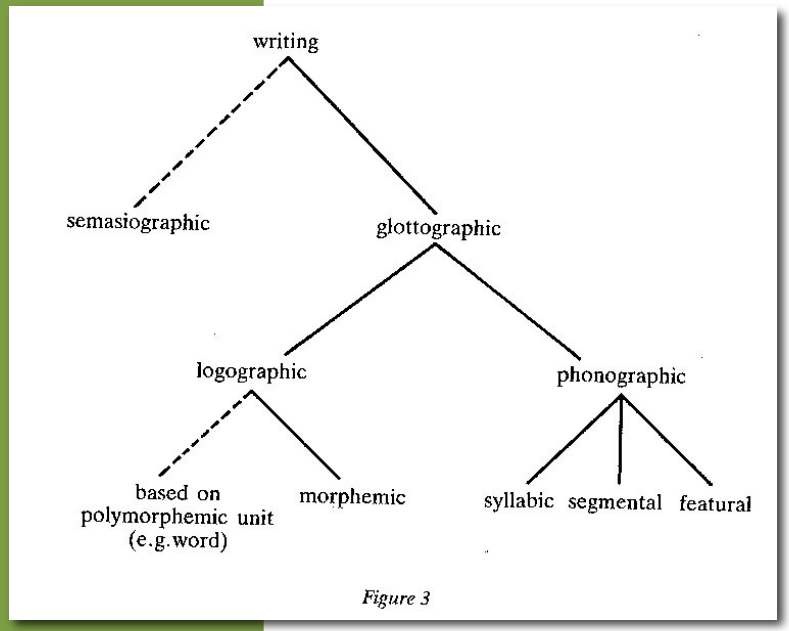


Figure 3

Logographic: mod. Chinese, Japanese (mixed)

Syllabic: Linear B, Cherokee, Korean Hangul (featural)

Alphabetic: Roman, Cyrillic, Gk, Hebrew, etc,

Problem with completely phonetic alphabetic systems: ambiguity.

Cf French *au, aux, ô, os, haut, hauts, eau, eaux*, *os*, etc.

The abstractness of alphabetic systems

Cf distinct sounds signaled by {t} in:

time

cut

try

butter

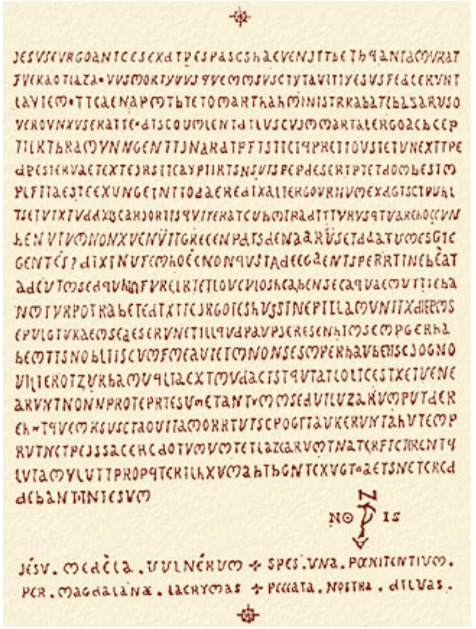
button

etc.

Later Developments

Subsequent development of further orthographic elements: word-spacing, punctuation, paragraphing, etc.

Not fixed till early age of print. Reduce ambiguity, make writing increasingly accessible to wider community or in absence of immediate context,



Later Developments

Subsequent development of further orthographic elements: word-spacing, punctuation, paragraphing, etc.

itisofaromehenceforthfreethatiamtowritethehistoryhe
rciviladministrationandtheconductofherwarsherannu
allyelectedmagistratestheauthorityofherlawssupreme
overallhercitizensthetyrannyofthelastkingmadethislib
ertyallthemorewelcomeforsuchhadbeentheruleofthef
ormerkingsthattheymightnotundeservedly
becountedasfoundersofpartsatalleventsofthecity

Later Developments

Subsequent development of further orthographic elements: word-spacing, punctuation, paragraphing, etc.

It is of a Rome henceforth free that I am to write the history--her civil administration and the conduct of her wars, her annually elected magistrates, the authority of her laws supreme over all her citizens. The tyranny of the last king made this liberty all the more welcome, for such had been the rule of the former kings that they might not undeservedly be counted as founders of parts, at all events, of the city…

Contrasting alphabetic and logographic systems

Ease of learning... Typographic simplicity.

Ease of processing

Symbolic importance for linguistic community -- cf irregularity of English spelling

Next Meeting

Readings:

Havelock, Eric. "The Coming of Literate Communication to Western Culture" in reader

*Scribner, Silvia and Michael Cole. 1988. "Unpackaging Literacy." Linked from course page

Next Meeting

Assignment 2: Week 3.2 (due 2/2)

In his 1987 study of the cognitive effects of word-processing systems, Electric Language, Michael Heim wrote:

> The accelerated automation of word-processing makes possible a new immediacy in the creation of public, typified text. Immediacy in the sense of there being no medium quod, no instrumental impediment to thinking in external symbols, but only a medium quo, or purely transparent element. As I write, I can put things directly into writing… Digital writing is nearly frictionless. It invites the formulation of thought directly in the electric element....

Reading this passage, would you say that Heim's view of the effects of writing technology comes closer to that of Havelock or of Scribner and Cole? Why? Write a paragraph briefly defending and explaining your view.