

One way to write a number is to spell it out in alphabetic characters, just as **one** would write any other word: **o-n-e**. Other methods of numerical notation, however, include non-phonetic signs, which, **unlike the alphabet, do not aim to reproduce the spoken word**. This essay is about the relation between writing and numbers: to examine the history of numerical notation is to challenge **a few** basic assumptions about the nature of writing.

Many historians view **phonetic scripts** as the most advanced stage in the development of writing. **The roman alphabet is an attempt to analyze the innumerable sounds of speech into a couple dozen signs, suited to being carved in stone or drawn on paper, and capable of indefinite preservation**. **Most** definitions of writing take the physical permanence and phonetic fidelity of the alphabet as their model: a form of communication only qualifies as "writing" if it is a representation of speech, capable of being read back orally, as a series of words, one after the other. **Writing is assumed to be graphic**, consisting of lines drawn on a flat plane.

Techniques for visualizing numbers tend to appear in cultures long before efforts to reproduce the full spoken language. A look at **several** early forms of numerical notation reveals a fluid range of forms through which human cultures have attempted to depict the order—numerical and linguistic—of the world.

Many of these visualizations employ concrete objects rather than graphic marks, including sticks, stones, beads, furniture, and the human body. **Writing is commonly described as an inferior, secondary copy of the immediate, intuitive spoken word**; **some** early representations of number, however, show that a culture's choice of symbols helps structure its verbal number sequence. In these cases, **writing helps give form to the spoken language, rather than passively reproducing it**.

Since the Renaissance, the infrastructure of Western civilization has consisted largely of paper. Modern Hindu-Arabic numerals appeared in India between the **sixth** and **eighth** centuries A.D., but they did not begin to compete with finger counting and the abacus in Europe until the **fifteenth** century: calculations on paper ultimately replaced calculations with objects. The **fifteenth** century also witnessed the introduction of movable type in Europe, and with it, the rise of the book and a growing dependency on paper. During the twentieth century, radio, television, and electronic media have shaken the supremacy of the book. We may find, in the **multiple** modes of representing numbers, an expanded definition of writing.


TRUE





Intresting




Really? I don't think so. I think its actually the opposite. Many can speak well enough but some people do not know how to write well or even know ohow to write/spell at all. Their knowlege for the written language low.



very true.






The English word *score* means “a cut or indentation;” it also refers to the number **twenty**.

The word gets its **double** meaning from an object called a tally stick, a length of wood or bone marked with a series of scratches . The **twentieth** cut on a tally stick is sometimes called a score. Tally sticks have appeared in literate and non-literate cultures from prehistory to the present; they keep time, count objects, and record credits and debts.







In the simplest form of tally, **one** notch is made for each item recorded: to count **five** sheep , a shepherd might make **five** scratches on a stick . This principle is called *ordering*: there is a **one-to-one** correspondence between the set of symbols and the set of objects counted. Ordering is also at work in modern dice, where  equals **five**, and in playing cards, where  is the **five** of diamonds.

The principle of *grouping* arranges an ordered collection of signs into smaller sets. Groups on a tally stick might be indicated with larger and smaller cuts , or straight lines and diagonals . In a tally convention familiar today,  represents **five** single strokes grouped in a bundle.

The ancient principles of ordering and grouping have no relation to spoken numbers, arising not from the will to record speech but from the need to keep track or “keep score” of objects or events. Whereas the Hindu-Arabic symbol 3 corresponds with the spoken number “**three**,” a particular tick on a score pad, such as the **third** mark in the series , is a graphic substitute for an event (the counting of a ). Linguists call this kind of mark *indexical*: there is a relationship of cause and effect between the sign and its referent,





as in foot prints  or a curve mapped on a graph . The figure X, for example, is not only a phonetic letter but a sign in its own right, serving as a record or “index” of events: X stands for a signature , or X signals an act of  selection or an act of deletion . X is also the roman numeral for **ten**.

Roman numerals were the dominant written numbers in Europe from the period of the Roman empire until the rise of the Hindu-Arabic system. Employing the principles of ordering and grouping, roman numerals consist of a graphic symbol for each power of **ten** (I, X, C, M), and for each subdivision of **five** (V, L, D). The numeral III represents **three** as **one one one**, and CCC represents **three hundred** as **hundred hundred hundred**.

The forms of the roman numerals coincide with the characters of the roman alphabet, but they may actually derive from tally markings. In tallies, a **single** vertical mark  commonly represents **one**, while **two** diagonal cuts, such as  or , stand for **five**, and a crossed stroke, such as  or , indicates **ten**. The roman numeral D is half of the symbol , an ancient form of the sign for **one thousand**. The roman numerals may thus originate from a pre-alphabetic style of writing.

“After all the natural way to count is not that one and one make two but to go on counting by one and one.... One and one and one and one. That is the natural way to go on counting.”

interesting but I don't think I get it lol

The English word *calculate* comes from the Latin *calculus*, meaning “small stone.” Like tally sticks, stones are an ancient counting tool which, in their simplest application, require **no** verbal number sequence to operate: **one** stone is collected  for every object counted . A counting technique used by the Sumerians beginning around 8000 B.C. involved small “tokens” manufactured out of clay . Invented during the period when agriculture was supplanting an economy of hunting and gathering, tokens probably recorded business transactions between such parties as the temple government and a shepherd in charge of **some** .



Groups of tokens dating from around 3200 B.C. have been found enclosed in sealed clay envelopes. The shapes of tokens were impressed into the clay container, **one** sign for each token. Thus the envelope could be read without being cracked open—the **three**-dimensional tokens inside offered a hidden guarantee for the graphic signs on the outside.










Soon, however, the marks impressed into the envelopes replaced the tokens altogether, and records were kept on small clay tablets instead. The production of tokens appears to have ceased around 3100 B.C., when a system for graphically recording the spoken language was emerging in Sumeria. The new script retained **some** symbols from the older token system, but a basic conceptual change took place.







“What is logic?”

To me two and two equals twenty-two, not four.”

MAN RAY

Oh shoot. I guess that is true as they do not ask what is two plus two

Each token had represented a quantity of a particular product: a clay disc marked , for example, stood for , and could not be used to count any other kind of object. The collection  signified : number and object were fused together. The new writing system, however, paired a separate number symbol with a sign for the object, so that  meant five . The number symbol , meaning five, might be paired with the sign for any object. Number was now independent from things: with the rise of written language came a move away from concrete thought and toward abstraction.

Modern English contains a few words that signify a plurality of particular objects: a flock of , a herd of , or a school of . The English word pair names objects or groups of objects to which doubleness is a natural state: a pair of , a pair of , a pair of . Modern Japanese has separate “number classes” for different objects; words called “counters” are inserted between the number word and the name of the object counted: for example, *dai* for vehicles, *hai* for glassfuls, *ma* for rooms, *mai* for thin, flat objects, *hon* for long, cylindrical objects, *go o-sya* for train car numbers, and so on. Linguists consider conventions such as these remnants of an older, less abstract stage of thought, which conceived of number as an integral characteristic of the objects being counted.

“The depicting of objects

is appropriate to a savage people;

signs of words to a barbaric people;

and the alphabet to a civilized people.”

J. J. ROUSSEAU

I really like the use of the symbols in this essay. It means it more easily understand

There are a lot of examples in this lol

DIGITS

Most verbal number sequences are organized into groups of **ten**; they are called “base **ten**.”

A number sequence can be devised with any other base, such as **five** or **twelve**; digital computers, for example, use base **two** numbers, which employ the most minimal set of symbols possible, **zero** and **one**, on and off. Yet no culture has been known to spontaneously generate binary numbers; most cultures use **ten**. Why would the human mind be almost universally compelled to

generate number sequences

with a base **ten** structure?



T

The answer lies not in the mind but in the body.

Human hands, equipped with **ten** fingers, are convenient devices for counting and calculating.

Numerous cultures use the hands and feet, fingers and toes, as the basis of number systems.

Aztec numeration is base **twenty**; thus **thirty** is expressed verbally as “**twenty plus one**,” and **forty** is “**two times twenty**.”

The modern French word



quatre-vingt, which means

“**four twenties**,” is equivalent

to the English **eighty**. The human body readily suggests counting in **fives**, **tens**, and **twenties**:

our word *digit* comes from the Latin *digitus*, meaning “finger or toe.”

Europeans initially distrusted the **zero**.
A fifteenth-century French writer complained,

“Just as the rag doll wanted to be an eagle,

the donkey a lion,

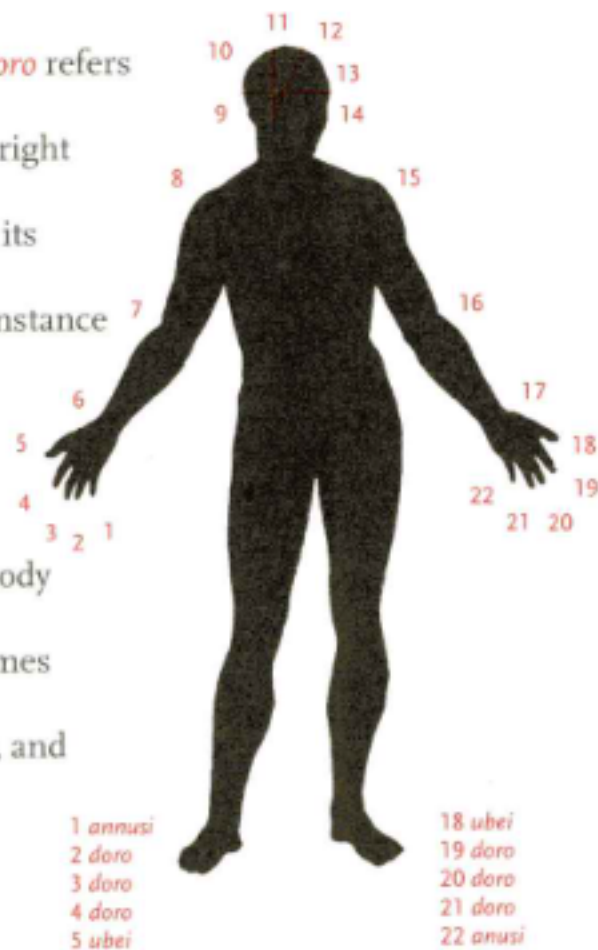
and the monkey a queen,

the *cifra* [zero] put on airs and pretended to be

a digit.”

The whole body can become a set of symbols for representing numbers. A technique used by the Papuan natives of the Torres Strait assigns numerical values to positions on the body. The verbal words identifying the numbers are each names for body parts, and **some** of the words appear more than **once**.

For example, the word **doro** refers to fingers from both the right and left hands, and thus its numerical value in any instance would be made evident only if the “speaker” were also pointing to a body part. Thus the verbal names have a nonverbal source, and cannot function alone.

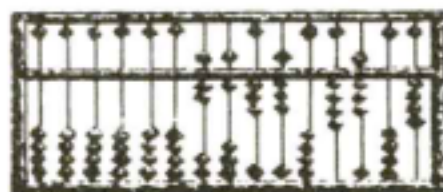


In its simplest form, finger counting relies on the principle of ordering: **seven** fingers for **seven** sheep. In the body system at left, **each** body part stands for a unique step in a sequence; it represents a *position* in a series rather than a concrete object. In Europe, hand counting systems capable of

representing numbers in the **thousands** and **tens of thousands** were widely used until the ascendance of Hindu-Arabic numerals; the body provided a numerical vocabulary “spoken” by hand in both the monastery and the marketplace. Writing is generally defined as a method for depicting *speech*, yet the recurrence of the base **ten** sequence suggests that when representing numbers, speech followed an example offered by non-verbal expression.

ABACUS

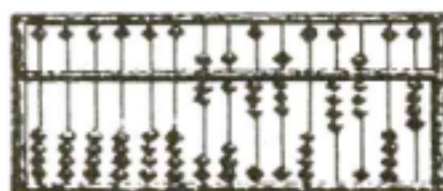
The *abacus*, used for counting and computing in ancient Greece and Rome, remained powerful until the rise of Hindu-Arabic numerals during the Renaissance. The abacus has had a longer life in China and Japan, where it is still used alongside the electronic calculator.



7 6 3 8 0 4 8 0 4

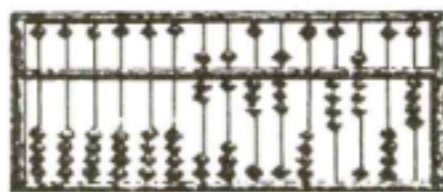
On an abacus, each string of beads represents a power of **ten**, and each bead is a **unit**. The horizontal division indicates groups of **five**, allowing a number to be represented with fewer beads. Adding and subtracting with an abacus involves manipulating physical objects rather than abstract signs—the concreteness of the abacus makes it useful for teaching children arithmetic.

The Latin word *abacus* also means “table”: an abacus often consisted of a table that was cut with grooves or simply marked with chalk lines, on which discs called “counters” were



7 6 3 8 0 4 8 0 4

moved about. Called “counting tables,” such numerical furniture was used widely throughout Europe for both commercial and scholarly arithmetic. Like Hindu-Arabic numerals, an abacus indicates powers of **ten** by position. A major difference between the abacus and Hindu-Arabic numerals is how to represent the *absence* of digits in a power of **ten**. The abacus achieved this quite sensibly: an empty column. The Hindu-Arabic system could not use an empty column, however, because a gap in a row of digits would indicate **two** distinct numbers.










ZERO
ZERO


Thus a symbol was invented to represent an empty set: the **zero**.

The Hindu-Arabic system became the numerical equivalent of the alphabet: abstract, concise, graphic. With the rise of the new numerals, the tradition of “writing” with objects began to disappear.













SOURCES This essay relies on Georges Ifrah, *From One to Zero: A Universal History of Numbers* (New York: Viking Penguin, 1981, 1985), and Karl Menninger, *Number Words and Number Symbols: A Cultural History of Numbers* (Cambridge: MIT Press, 1958, 1969). On Sumerian tokens, see Denise Schmandt-Besserat, “Tokens: Facts and Interpretations,” *Visible Language*, Vol. XX, No. 3 (Summer 1986): 250–273.









empiricism (or *positivism*), which claims that observation is the key to knowledge.***













The  and its associated equipment—such as  and —are the primary tools of empirical knowledge. The logical positivists attempted to analyze language into a minimal set of direct experiences, claiming that all languages can be reduced to a core of observations, such as *big*, *small*, *up*, *down*, *red*, or *black*. With , Neurath translated a philosophical theory into a visual practice. The sign  is *positive* because as a picture, it is based in observation;  is *logical* because it concentrates the details of experience into a schematic mark. Neurath aimed to combine the mechanical empiricism of photography  with the rational structures of mathematics and geometry ●. [T]





Although Neurath believed that pictures are objective and universal, the meanings of international signs are culturally specific. We understand, for example, that  and 

represent *lavatory for men* and *lavatory for women*. Yet the reference to toilets is left unstated. A functional description, such as  and , might denote the difference between these facilities more directly, but the signs' conventional meaning still would have to be learned.

We distinguish  as male because he is contrasted against the figure , whose gender is marked by a stylized reference to a garment sometimes worn by Western women. In the D.O.T. system,  refers to “people” in general except where he is contrasted with . Thus  does not mean *drinking fountain for men*; nor does  mean *elevator for men*; and nor does the sign  mean *waiting room for men*— stands in for *man* generically. The only place  appears in the D.O.T. system besides on lavatory doors is in , the sign for *ticket sales*. Here, where one person is offering a service to another, the designers deemed it appropriate to show  assisting .

The stylistic principles of Neurath's  remain the basis of international pictograms today: *reduction* and *consistency*. Many Isotype signs are flat shapes with little or no interior detail, as in , , and . These flat silhouettes suggest a rationalized theater of shadows, in which signs appear to be the natural imprints of material objects—Plato's cave renovated into an empiricist  laboratory. When depth is expressed in , isometric drawings  are used instead of traditional perspective. Parallel lines do not converge, and dimension is fixed from foreground  to background.

Consistency governs the stylistic uniformity of a symbol set. The D.O.T. system, for example, is a world of coordinated objects, including , , , , and . The sign system designed for the Munich Olympics in 1972 was the semiotic climax of international pictures: a geometric body alphabet  is deployed on a consistent grid: , , , , , and .



The reduction and consistency of international pictures heighten their alphabetic quality. Neurath's  and  were a critique of writing that resembled writing, a utopian effort to transcend the limitations of letters by exploiting the visual characteristics of typography. **** Neurath's preferred typeface was **Futura**, designed by Paul Renner around 1926-27. Paralleling the machine aesthetic in architecture and industrial design, **Futura** is stripped of references to handicraft and calligraphy. Neurath conceived of  as clean, logical, free of redundancy: writing as a machine  for living in.

The current figure  might be called **Helvetica Man**, his style coordinating with the favorite typeface of post-war institutional design culture. A more inclusive pictographic land-


scape might be inhabited by variants of Helvetica Man that harmonize with other typefaces,


such as Serif Man , Italic Man  and Cursive Man .

OH WOW... I Literally opened my eyes wide. I didnt expect to read this.

 and  are neither universal, self-evident, nor purely informational—like linguistic

signs, they must be learned; like other styles of drawing, they are culturally specific. When



we see  engraved over an airport door, we know she belongs to the language of public

information, not the language of commerce. Thus we do not mistake  for, say, *brothel*,

where  might purchase the services of . The clean, geometric character of  and  is

loaded with cultural associations—"public," "neutral," "modern."

An international picture functions as a memento, a token for memory, a souvenir

for words.  is *restaurant* as  is *Paris*. The very American  is hardly the geometric

essence of *drinking alcohol in airports*, but like  a cocktail is a useful cliché for storing a

range of experiences. Likewise,  ,  ,  ,  and  , taken from different

international picture sets, are helpful tags for remembering objects we tend to forget.

Otto Neurath believed that  could transcend national boundaries and unify global


social life. By translating a philosophical theory into a popular medium, he fathered a new breed of ABCs, whose progeny have populated public spaces across the industrial world.

Since the birth of Neurath's  and  , designers and critics have framed new questions

about visual and verbal writing that acknowledge the cultural basis of images, symbols, and

experience. As we rethink the boundaries between words and pictures, Otto Neurath could

serve as a model for the graphic designer of the next millennium,  the language worker

equipped to use design and theory as tools for unearthing new questions and  construct-

ing new answers. *****

important idea

