

Counting Sheep

A Brief History of Written Numbers

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.



KEEPING SCORE






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.”

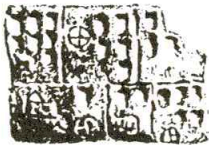
GERTRUDE STEIN

CALCULUS

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

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;

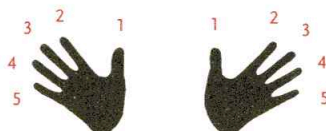
and the alphabet to a civilized people.”

J. J. ROUSSEAU

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

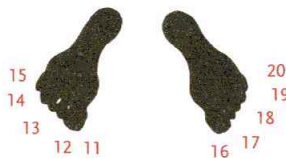
generate number sequences
with a base **ten** structure?



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

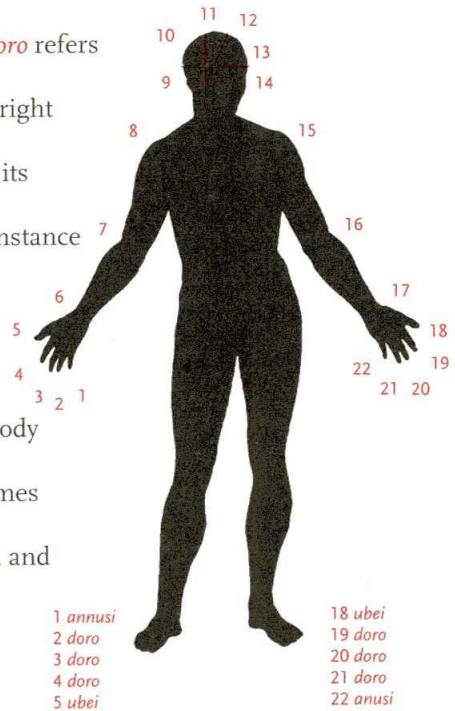
to the English **eighty**. The human body readily suggests counting in **fives**, **tens**, and **twenties**: our word *digit* comes from the Latin *digitus*, meaning “finger or toe.”

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.



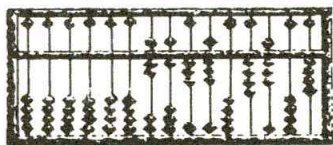
In its simplest form, finger counting relies on the principle of ordering: **seven** fingers for **seven** sheep. In the body system at left, each body part stands for a unique step in a sequence; it represents a *position* in a series rather than a concrete object.

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

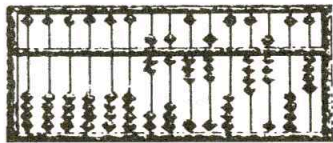
The *abacus*, used for counting and computing in ancient Greece and Rome, remained powerful until the rise of Hindu-Arabic numerals during the Renaissance. The abacus has had a longer life in China and Japan, where it is still used alongside the electronic calculator.



7 6 3, 8 0 4, 8 0 4

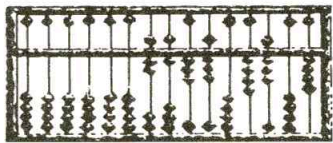
On an abacus, each string of beads represents a power of **ten**, and each bead is a **unit**. The horizontal division indicates groups of **five**, allowing a number to be represented with fewer beads. Adding and subtracting with an abacus involves manipulating physical objects rather than abstract 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



10 10 10 10 10 10

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.

xviii The P R E F A C E.

Learning of the Latin and Greek Languages, the Knowledge of which, is absolutely necessary for some Professions in civil Life, as well as for Persons intended for the Service of the Church; and ought to be the Study of every Gentleman, as he cannot be said to have a liberal Education, or a Place among the Learned, who is a Stranger to them. But what I would (agreeable to the most judicious Writers on Education) contend for, is, that there is Time enough for teaching Youth the dead Languages, without neglecting the Study of their own, or excluding real and useful Knowledge; and that of all Grammars that of their Own Language ought chiefly to be minded.

Let us hear what the judicious Author of an anonymous Letter in Turnbull's Observations on a liberal Education says, concerning the Study of the English Language. Speaking of the Education of Greece, whose Youth were taught to write their own Language more accurately than we are Latin and Greek, asks, "But where is English taught at present? Who thinks it of Use to study correctly that Language which he is to use every Day in his Life, be his Station ever so high, or ever so insignificant. It is in this the Nobility and Gentry defend their Country, and serve their Prince in Parliament; in this the Lawyers plead, the Divines instruct, and

The P R E F A C E xix

"and all Ranks of People write their Letters, and transact all their Affairs; and yet who thinks it worth his Learning to write this even accurately, not to say politely? Every one is suffered to form his Style by Chance; to imitate the first wretched Model that falls in his Way, before he knows what is Faulty, or can relish the Beauties of a just Simplicity. Few think their Children qualified for a Trade, till they have been whipped at a Latin School for five or six Years to learn a little of that which they are obliged to forget, when in those Years right Education would have improved their Minds, and taught them to acquire Habits of writing their own Language easily under right Direction; and this would have been useful to them as long as they lived."

The same Writer, after making Observations on some other essential Parts of Education, resumes the Subject of an English one, as an Affair of the utmost Consequence. "Particularly, says he, I should think teaching them to write and speak correctly and fluently in their own Language, is the most important Instruction. One Exercise should be daily to write a Page of English, and after that to examine every Word by the Grammar Rules; and in every Sentence they have composed

Book, *The British Grammar*, by James Buchanan.
Published by A. Millar in the Strand, London, 1762.
Reproduced in facsimile by Scolar Press, Menston,
England, 1968. The use of quotation marks to frame
a field of quoted matter was common in eighteenth-
century typography.

Period Styles

A Punctuated History

GREEK AND LATIN MANUSCRIPTS WERE USUALLY WRITTEN WITH NO SPACE BETWEEN WORDS UNTIL AROUND THE NINTH CENTURY AD ALTHOUGH ROMAN INSCRIPTIONS LIKE THE FAMOUS TRAJAN COLUMN SOMETIMES SEPARATED WORDS WITH A CENTERED DOT EVEN AFTER SPACING BECAME COMMON IT REMAINED HAPHAZARD FOREXAMPLE OFTEN A PREPOSITION WAS LINKED TO ANOTHER WORD EARLY GREEK WRITING RAN IN LINES ALTERNATING FROM LEFT TO RIGHT AND RIGHT TO LEFT THIS CONVENTION WAS CALLED BOUSTREPHEDON MEANING AS THE OX PLOW WAS CONVENIENT FOR LARGE CARVED MONUMENTS BUT BOUSTREPHEDON HINDERED THE READING AND WRITING OF SMALLER TEXTS AND SO THE LEFT TO RIGHT DIRECTION BECAME DOMINANT A CENTERED DOT DIVIDED WORDS WHICH SPLIT AT THE END OF A LINE IN EARLY GREEK AND LATIN MANUSCRIPTS IN THE ELEVENTH CENTURY A MARK SIMILAR TO THE MODERN HYPHEN WAS INTRODUCED MEDIEVAL SCRIBES OFTEN FILLED †°/†°(;)(;) SHORT LINES WITH MARKS AND ORNAMENTS THE PERFECTLY JUSTIFIED LINE BECAME THE STANDARD AFTER THE INVENTION OF PRINTING THE EARLIEST GREEK LITERARY TEXTS WERE DIVIDED INTO UNITS WITH A HORIZONTAL LINE CALLED A PARAGRAPHOS PARAGRAPHING REMAINS OUR CENTRAL METHOD OF ORGANIZING PROSE AND YET ALTHOUGH PARAGRAPHS ARE ANCIENT THEY ARE NOT GRAMMATICALLY ESSENTIAL THE CORRECTNESS OF A PARAGRAPH IS A MATTER OF STYLE HAVING NO STRICT RULES

LATER GREEK DOCUMENTS SOMETIMES MARKED PARAGRAPHS BY PLACING THE FIRST LETTER OF THE NEW LINE IN THE MARGIN. THIS LETTER COULD BE ENLARGED, COLORED, OR ORNATE.

TODAY THE OUTDENT IS OFTEN USED FOR LISTS WHOSE ITEMS ARE IDENTIFIED ALPHABETICALLY AS IN DICTIONARIES OR BIBLIOGRAPHIES. ¶ A MARK CALLED CAPITULUM WAS INTRODUCED IN EARLY LATIN MANUSCRIPTS. ¶ IT FUNCTIONED VARIOUSLY AS A POINTER OR SEPARATOR. ¶ IT USUALLY OCCURRED INSIDE A RUNNING BLOCK OF TEXT WHICH DID NOT BREAK ONTO A NEW LINE. ¶ THIS TECHNIQUE SAVED SPACE. ¶ IT ALSO PRESERVED THE VISUAL DENSITY OF THE PAGE WHICH EMULATED THE CONTINUOUS UNBROKEN FLOW OF SPEECH.

BY THE SEVENTEENTH CENTURY THE INDENT WAS THE STANDARD PARAGRAPH BREAK IN WESTERN PROSE. THE RISE OF PRINTING ENCOURAGED THE USE OF SPACE TO ORGANIZE TEXTS. A GAP IN A PRINTED PAGE FEELS MORE DELIBERATE THAN A GAP IN A MANUSCRIPT BECAUSE IT IS MADE BY A SLUG OF LEAD RATHER THAN A FLUX IN HANDWRITING.

EVEN AFTER THE ASCENDENCE OF THE INDENT THE CAPITULUM REMAINED IN USE FOR IDENTIFYING SECTIONS AND CHAPTERS ALONG WITH OTHER MARKS LIKE THE SECTION §, THE DAGGER †, THE DOUBLE DAGGER ‡, THE ASTERISK *, AND NUMEROUS LESS CONVENTIONAL ORNAMENTS. § SUCH MARKS HAVE BEEN USED SINCE THE MIDDLE AGES FOR CITING PASSAGES AND KEYING MARGINAL REFERENCES. † THE INVENTION OF PRINTING MADE MORE ELABORATE AND PRECISE REFERENCING POSSIBLE BECAUSE THE PAGES OF A TEXT WERE CONSISTENT FROM ONE COPY TO THE NEXT. ‡

ALL PUNCTUATION WAS USED IDIOSYNCRATICALLY UNTIL AFTER THE INVENTION OF PRINTING WHICH REVOLUTIONIZED WRITING BY DISSEMI-

NATING GRAMMATICAL AND TYPOGRAPHICAL STANDARDS BEFORE PRINTING PUNCTUATION VARIED WILDLY FROM REGION TO REGION AND SCRIBE TO SCRIBE THE LIBRARIAN AT ALEXANDRIA WHO WAS NAMED ARISTOPHANES DESIGNED A GREEK PUNCTUATION SYSTEM CIRCA 260 BC HIS SYSTEM MARKED THE SHORTEST SEGMENTS OF DISCOURSE WITH A CENTERED DOT · CALLED A COMMA · AND MARKED THE LONGER SECTIONS WITH A LOW DOT CALLED A COLON · A HIGH DOT SET OFF THE LONGEST UNIT · HE CALLED IT PERIODOS · THE THREE DOTS WERE EASILY DISTINGUISHED FROM ONE ANOTHER BECAUSE ALL THE LETTERS WERE THE SAME HEIGHT · PROVIDING A CONSISTENT FRAME OF REFERENCE · LIKE A MUSICAL STAFF ·

ALTHOUGH THE TERMS COMMA · COLON · AND PERIOD PERSIST · THE SHAPE OF THE MARKS AND THEIR FUNCTION TODAY ARE DIFFERENT · DURING THE SEVENTH AND EIGHTH CENTURIES NEW MARKS APPEARED IN SOME MANUSCRIPTS INCLUDING THE SEMICOLON ; THE INVERTED SEMICOLON ꞑ AND A QUESTION MARK THAT RAN HORIZONTALLY ~ A THIN DIAGONAL SLASH / CALLED A VIRGULE / WAS SOMETIMES USED LIKE A COMMA IN MEDIEVAL MANUSCRIPTS AND EARLY PRINTED BOOKS . SUCH MARKS ARE THOUGHT TO HAVE BEEN CUES FOR READING ALOUD ; THEY INDICATED A RISING , FALLING , OR LEVEL TONE OF VOICE . THE USE OF PUNCTUATION BY SCRIBES AND THEIR INTERPRETATION BY READERS WAS BY NO MEANS CONSISTENT , HOWEVER , AND MARKS MIGHT BE ADDED TO A MANUSCRIPT BY ANOTHER SCRIBE WELL AFTER IT WAS WRITTEN .

EARLY PUNCTUATION WAS LINKED TO ORAL DELIVERY. FOR EXAMPLE THE TERMS COMMA, COLON, AND PERIODOS, AS THEY WERE USED BY ARISTOPHANES, COME FROM THE THEORY OF RHETORIC, WHERE THEY REFER TO RHYTHMICAL UNITS OF SPEECH. AS A SOURCE OF RHETORICAL RATHER THAN

GRAMMATICAL CUES, PUNCTUATION SERVED TO REGULATE PACE AND GIVE EMPHASIS TO PARTICULAR PHRASES, RATHER THAN TO MARK THE LOGICAL STRUCTURE OF SENTENCES. MANY OF THE PAUSES IN RHETORICAL DELIVERY, HOWEVER, NATURALLY CORRESPOND WITH GRAMMATICAL STRUCTURE: FOR EXAMPLE, WHEN A PAUSE FALLS BETWEEN TWO CLAUSES OR SENTENCES.

THE SYSTEM OF ARISTOPHANES WAS RARELY USED BY THE GREEKS, BUT IT WAS REVIVED BY THE LATIN GRAMMARIAN DONATUS IN THE FOURTH CENTURY A.D. ACCORDING TO DONATUS PUNCTUATION SHOULD FALL WHEREVER THE SPEAKER WOULD NEED A MOMENT'S REST; IT PROVIDED BREATHING CUES FOR READING ALOUD. SOME LATER WRITERS MODIFIED THE THEORIES OF DONATUS, RETURNING TO A RHETORICAL APPROACH TO PUNCTUATION, IN WHICH THE MARKS SERVED TO CONTROL RHYTHM AND EMPHASIS. AFTER THE INVENTION OF PRINTING, GRAMMARIANS BEGAN TO BASE PUNCTUATION ON STRUCTURE RATHER THAN ON SPOKEN SOUND: MARKS SUCH AS THE COMMA, COLON, AND PERIOD SIGNALLED SOME OF THE GRAMMATICAL PARTS OF A SENTENCE. THUS PUNCTUATION CAME TO BE DEFINED ARCHITECTURALLY RATHER THAN ORALLY. THE COMMA BECAME A MARK OF SEPARATION, AND THE SEMICOLON WORKED AS A JOINT BETWEEN INDEPENDENT CLAUSES; THE COLON INDICATED GRAMMATICAL DISCONTINUITY: WRITING WAS SLOWLY DISTANCED FROM SPEECH.

RHETORIC, STRUCTURE, AND PACE ARE ALL AT WORK IN MODERN ENGLISH PUNCTUATION, WHOSE RULES WERE ESTABLISHED BY THE END OF THE EIGHTEENTH CENTURY. ALTHOUGH STRUCTURE IS THE STRONGEST RATIONALE TODAY, PUNCTUATION REMAINS A LARGELY INTUITIVE ART. A WRITER CAN OFTEN CHOOSE AMONG SEVERAL CORRECT WAYS TO PUNCTUATE A PASSAGE, EACH WITH A SLIGHTLY DIFFERENT RHYTHM AND MEANING.

THERE WAS NO CONSISTENT MARK FOR QUOTATIONS BEFORE THE SEVENTEENTH CENTURY. DIRECT SPEECH WAS USUALLY ANNOUNCED ONLY BY PHRASES LIKE HE SAID. „SOMETIMES A DOUBLE COMMA WAS USED IN MANUSCRIPTS TO POINT OUT IMPORTANT SENTENCES AND WAS LATER USED TO ENCLOSE “QUOTATIONS.” ENGLISH PRINTERS BEFORE THE NINETEENTH CENTURY OFTEN EDGED ONE MARGIN OF A QUOTE WITH DOUBLE COMMAS. THIS CONVENTION PRESENTED TEXT AS A SPATIAL PLANE RATHER THAN A TEMPORAL LINE, FRAMING THE QUOTED PASSAGE LIKE A PICTURE. PRINTING, BY PRODUCING IDENTICAL COPIES OF A TEXT, ENCOURAGED THE STANDARDIZATION OF QUOTATION MARKS. PRINTED BOOKS COM- MONLY INCORPORATED MATERIAL FROM OTHER SOURCES.

BOTH THE GREEK AND ROMAN ALPHABETS WERE ORIGINALLY MAJUSCULE: ALL LETTERS WERE THE SAME HEIGHT. greek and roman minuscule letters developed out of rapidly written scripts called cursive, which were used for business correspondence. minuscule characters have limbs extending above and below a uniform body. alcuin, advisor to charlemagne, introduced the “carolingian” minuscule, which spread rapidly through europe between the eighth and twelfth centuries. during the dissemination of the carolingian script, condensed, black minuscule styles of handwriting, now called “gothic,” were also developing; they eventually replaced the classical carolingian.

A carolingian manuscript sometimes marked the beginning of a sentence with an enlarged letter. This character was often a majuscule, presaging the modern use of minuscule and majuscule as double features of the same alphabet. Both scripts were still considered separate manners of writing, however.

“As he Sets on, he [the printer] considers
how to Point his Work,
viz. when to Set, where; where. where to make () where []
and when to make a Break....
When he meets with proper Names of Persons or Places
he Sets them in Italick...
and Sets the first Letter with a Capital,
or as the Person or Place he finds
the purpose of the Author to dignifie, all Capitals;
but then, if he conveniently can,
he will Set a Space between every Letter...
to make it shew more Graceful and Stately.”

JOSEPH MOXON 1683

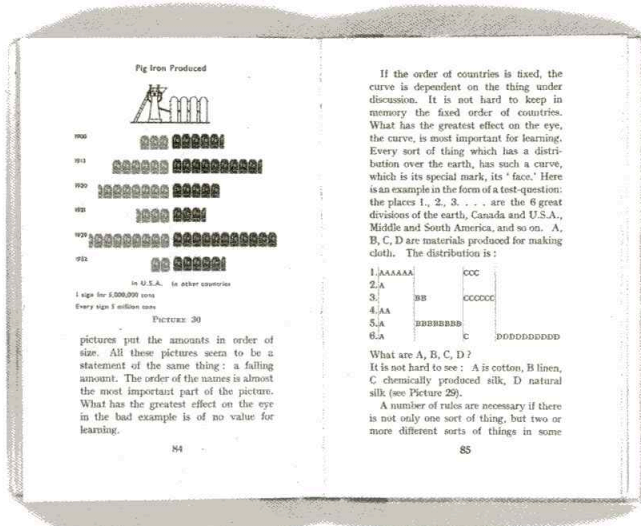
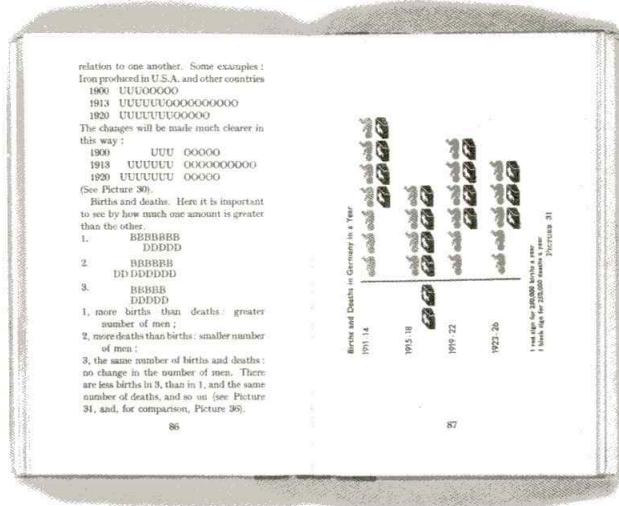
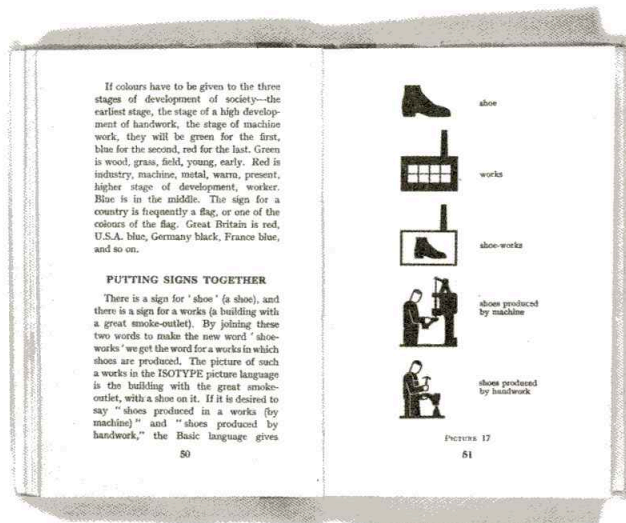
In the fifteenth century, the Carolingian script was revived by the Italian humanists. The new script, called “lettera antica,” was paired with classical roman capitals. It became the basis of the roman typefaces, which were established as a European norm by the mid-sixteenth century. The terms “uppercase” and “lowercase” refer to the drawers in a printing shop that hold the two fonts. Until recently, Punctuation was an Intuitive Art, ruled by convenience and Intuition. A Printer could Liberally Capitalize the Initial of Any word She deemed worthy of Distinction, as well as Proper Names. The printer was Free to set some Words entirely in C A P I T A L S and to add further emphasis with extra S P A C E S.

The roman typefaces were based on a formal script used for books. *The cursive, rapidly written version of the Carolingian minuscule was employed for business and also for books sold in the less expensive writing shops. Called “antica corsiva” or “cancelleresca,” this style of handwriting was the model for the italic typefaces cut for Aldus Manutius in Venice in 1500. Aldus Manutius was a scholar, printer, and businessman. Italic script conserved space, and Aldus developed it for his internationally distributed series of small, inexpensive books. The Aldine italic was paired with Roman capitals. The Italian typo-*












grapher Tagliente advocated *Italic Capitals* in the early sixteenth century. Aldus set entire books in italic; it was an autonomous type style, unrelated to roman. In France, however, the roman style was becoming the neutral, generic norm, with *italic* played against it for *contrast*. The pairs UPPER-CASE/lowercase and roman/*italic* each add an inaudible, non-phonetic dimension to the alphabet. Before *italic* became the official auxiliary of roman, scribes and printers had other techniques for marking emphasis, including enlarged, **heavy**, **colored**, or **gothic** letters. Underlining appeared in some medieval manuscripts, and today it is the conventional substitute for italics in handwritten and typewritten texts. S p a c e is sometimes inserted between letters to declare e m p h a s i s in German and Eastern European book t y p o g r a p h y . **Boldface** fonts were not common until the nineteenth century, when display advertising created a demand for **big, black** types. Most book faces designed since the early twentieth century belong to families of four: roman, *italic*, **bold roman**, and **bold italic**. These are used for systematically marking different kinds of copy, such as headings, captions, body text, notes, and references.





Since the rise of digital production, printed texts have become more visually elaborate—typographic variations are now routinely available to writers and designers. Some recent fonts contain only ornaments and symbols; Carlos Segura’s typeface Dingura (ㄨㄹ ㄱ ㄴ ㄷ ㄸ ㄹ ㄺ ㄻ ㄼ ㄽ ㄾ ㄿ) consists of mysterious runes that recall the era of manuscript production. During the e-mail incunabula, writers and designers have been using punctuation marks for expressive ends. Punctuated portraits found in electronic correspondence range from the simple “smiley” :-) to such subtle constructions as \$-) [yuppie] or :-I [indifferent].

Otto Neurath, *International Picture Language*, 1936. Modeling Isotype after language, Neurath showed how to build compound signs out of elementary units. Neurath's work extended beyond the design of symbols, however, to include the use of icons in statistical charts. His theory of information design included the search for ways to organize information that maximize their visual impact. Collection of Smithsonian Institution Libraries, Cooper-Hewitt, National Design Museum.










Modern Hieroglyphs





 and  are from the standard symbol set designed by Cook & Shanosky Associates in collaboration with the American Institute of Graphic Arts in 1974.  and  are endorsed by the U.S. Department of Transportation (D.O.T.). They belong to an international hieroglyphics of public information.* Their ancestors,  and , were created by the Viennese philosopher and social scientist Otto Neurath in the 1920s. Neurath and his colleagues constructed a universe of people , places , objects , and actions . He called his system Isotype , the International System of TYpographic Picture Education.**













Although Neurath advocated the use of  in transportation signs, his primary interest was in presenting social statistics in textbooks, posters, and educational museums. In Neurath's charts, a given symbol, such as , represented a quantity of people or things; a series () of symbols represented a larger number of objects. Thus a visual, perceptual Gestalt replaced abstract numerals in  charts. Anticipating Edward Tufte's later writings on the display of data, Neurath developed practical guides for representing #'s in a visually accessible way.









As a member of the Vienna Circle of philosophers in the 1920s, Otto Neurath was a founder of logical positivism, a theory that brought together two opposing modes of inquiry: *rationalism*, which studies reality through logic, geometry, and mathematics; and














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 ●.

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* .

 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  constructing new answers. *****

* This essay is based on research and writing initiated at The Cooper Union in 1986, with the exhibition *Global Signage: Semiotics and the Language of International Pictures*, curated by Ellen Lupton. The essay "Reading Isotype" was published in *Design Issues* 111/2 (1986): 47-58; and in *Design Discourse*, ed. Victor Margolin (Chicago: University of Chicago Press, 1989). The global iconography of pictograms and logotypes was further explored by Ellen Lupton and J. Abbott Miller in "Critical Wayfinding," *The Edge of the Millennium*, ed. Susan Yelavich (New York: Whitney Library of Design, 1993), 220-32.

The pictorial symbols endorsed by the D.O.T. are documented in *Symbol Signs* (New York: American Institute of Graphic Arts, 1974). International symbols became a major interest of modernist graphic designers during the 1960s and 70s. Martin Krampen surveyed the theory and practice of the movement in "Signs and Symbols in Graphic Communication," *Design Quarterly* 62 (1965). *Print* devoted a special issue to the subject, November/December, 1962. On signage for the Olympic games, see Heiner Jacob and Masaru Katsumie, "Sign Systems for International Events," *Print* (November/December 1969): 40. The industrial designer Henry Dreyfuss published the encyclopedic *Symbol Source Book: An Authoritative Guide to International Graphic Symbols* in 1972 (New York: McGraw-Hill); an archive of his research materials is housed at Cooper-Hewitt, National Design Museum.

** Otto Neurath's colleagues included his wife, Marie Neurath, the Dutch graphic designer Gerd Arntz, and the American graphic designer Rudolf Modley, who brought Isotype to the United States after working with Neurath in Vienna. The Otto and Marie Neurath Collection is housed at the Reading University Library, Reading, Great Britain. Neurath's writings on Isotype include *International Picture Language* (Reading: Reading University, 1980), facsimile of the 1936 edition; *Basic by Isotype* (London: Kegan Paul, 1937); and "From Vienna Method to Isotype," in *Empiricism and Sociology*, ed. Marie Neurath and Robert S. Cohen (Dordrecht, Holland: D. Reidel, 1973). Critical works on Neurath and Isotype include *Graphic Communication through Isotype*, ed. Michael Twyman (Reading: Reading University, 1975), 7-17; and Robin Kinross, "On the Influence of Isotype," *Information Design Journal* 11/2 (1981): 122-30. Works by Rudolf Modley include *How to Use Pictorial Statistics* (New York: Harper and Brothers, 1937); *A History of the War, In Maps, In Pictographs, In Words* (New York: Penguin, 1943); and *Handbook of Pictorial Symbols* (New York: Dover, 1976).

*** Neurath explained his philosophy in "Empirical Sociology: The Scientific Content of History and Political Economy," in *Empiricism and Sociology*, cited above. On logical positivism, see Peter Halfpenny, *Positivism and Sociology: Explaining Social Life* (London: George Allen and Unwin, 1982). On Neurath and his context, see William M. Johnston, "The Eclipse of a Universal Man," in *The Austrian Mind: An Intellectual and Social History, 1848-1938* (Berkeley: University of California Press, 1972), 192-95.

**** Attempts to reform the alphabet into a more accurate reflection of speech were documented by Herbert Spencer in *The Visible Word* (New York: Hastings House, 1968). Herbert Bayer discussed his own writing reform efforts in "Basic Alphabet," *Print* (May/June 1964): 16-20. Charles Bliss proposed a new hieroglyphic script in which each character would "show the outline of the real thing, directly connected with meaning" in *Semantography (Blissymbolics)* (Coogee, Australia: Semantography Publications, 1949).

***** Whereas Otto Neurath saw pictorial communication as an antidote to writing, other writers and designers have addressed the overlaps between visual and verbal forms. On rhetoric and visual practices, see Roland Barthes, "The Rhetoric of the Image," in *Image/Music/Text*, trans. Stephen Heath (New York: Hill and Wang, 1977); Gui Bonsieppe, "Visual/Verbal Rhetoric," *Ulm* 14/16 (1965): 23-40; Hanno Ehse and Ellen Lupton, *Design Papers 5: Rhetorical Handbook* (Halifax: Nova Scotia College of Art and Design, 1988); and Katherine McCoy and David Frej, "Typography as Discourse," *I.D.* 35 (March/April 1988): 34-7.

Language of Dreams



1 Comparative studies of writing include I.J. Gelb, *A Study of Writing* (Chicago: University of Chicago Press, 1952, 1963); Albertine Guar, *A History of Writing* (London: The British Library, 1984); and Roy Harris, *The Origin of Writing* (La Salle, IL: Open Court, 1986).

According to Freud, dreams are organized or “written” according to the principle of the rebus, a form of expression employing both words and pictures. An image of a glove might stand for another object with a similar structure, such as a sock or an envelope, or it might stand for a memory associated with gloves, such as bad weather or polite manners. The dream-glove might stand also for a word whose sound or spelling resembles the name glove, such as love or grove. Freud argued that to decipher a dream one must exchange the direct, literal meaning of its images for indirect substitutions.

This principle, called the *rebus*, is a feature of numerous written languages, from Egyptian hieroglyphics to modern Japanese. According to many historians, writing naturally evolves from pictographs through various phonetic systems, climaxing in the alphabet, which analyzes the sounds of a spoken language into tiny repeatable elements. Discovery of the rebus principle enables a culture to invent a phonetic script.¹

Japanese writing is built upon that of Chinese, a logographic system that has separate symbols for words and parts of words, resulting in over 40,000 signs. Chinese has numerous words that sound the same but have different meanings, called homophones. Thus Chinese writing, while it appears cumbersome to Westerners, is well-suited to the Chinese language, because even though many of its characters have similar or identical pronunciations, they are graphically distinct.

精神分析学の創始者ジブモント・フロイトによると夢とは「リープス」の法則(rebus = 判じ絵)、すなわち言語と絵とを使った表現の仕方によって、構成あるいは「書かれて」います。手袋のイメージが、例えばくつ下、封筒等他の構成がよく類似した物を意味しているかもしれません。又は、悪天候や上品なマナー等、手袋と関連した個人的な思い出に関係があるのかもしれませんが。夢の中の「手袋 (glove)」は又、「言葉」の音と読みが似ている「愛 (love)」や「小さい森 (grove)」を意味するかもしれません。フロイトは夢を解読する為には直接的である夢のイメージの文学上の意味を間接的な代用物に交換することが必要だと論じています。

リープスの法則はエジプトの象形文字から現代の日本語へと、色々な文語の特色となっています。数々の西洋の言語の歴史家によると、書法とは多くの異なった音声法を通した象形文字から自然に発展したものです。その頂点がアルファベットで、口語の音声を分折してこまかい繰り返し可能な要素となったものです。リープスの法則の発見によって音声筆記体活字の発明が可能になりました。

日本語の書法は記号を語、又は語の一部に分類した語標法である中国語を基礎に出来た言語です。そしてこの結果として莫大な(4万個以上の)個々の記号になりました。中国語では「同音異義語」といって同じ音で異なる意味の単語が数多くあります。すなわち西洋人には見た目はわずらわしい中国語書法も中国語という言葉面から見ると良く出来ているということになります。なぜなら、良く似たり同じ「発音」の言葉は多くても、図解的には見分けることが出来るからです。

The Chinese script already had been in use for around 2,000 years when Korean scholars introduced it to the Japanese court in the fourth and fifth centuries AD (Western time). The Japanese acquired deep respect for Chinese civilization, and some took on the ambitious task of learning its script. Initially, the Japanese used Chinese characters to read and write in Chinese, which became the official written language of Japan's imperial court. By the seventh century, however, more attempts were made to write the *Japanese* language with Chinese characters.²

This was no simple task. The Japanese and Chinese spoken languages are totally different in their grammar and phonology. While many Chinese characters could be exchanged directly for Japanese words, some features of Japanese are impossible to translate. For example, Japanese is heavily inflected, meaning that the basic form of a noun, verb, or modifier changes in different grammatical settings. Chinese, in contrast, has few inflections. In this sense, Japanese resembles Latin more than Chinese! The principle of the rebus arose to address such difficulties of translation: a Chinese character could be used to stand for a Japanese word or syllable unrelated in *meaning* but similar in *sound*.

中国書体は4、5世紀に韓国の学者によって日本の皇室に紹介されるすでに2千年程前から存在していました。日本人は中国の文明に強い尊敬の念をいだいていました。そこで中国書体を習得しようという希望を持った人が何人か出てきたのです。初めに、日本の皇室公認の文語になった漢字は、日本人が中国語で読み書きするのに使われました。しかし7世紀に入ると、漢字を使って「日本語」を書くことが試みられました。

これは容易い作業ではありませんでした。日本語と中国語の話し言葉では、文法と音声学が全く違うのです。多くの漢字はそのまま日本語に置き換えられますが、日本語の特徴として漢字に置きかえることは不可能なものもあります。例をあげると、日本語は語尾の変化が激しい。つまり基本形の名詞、動詞、又は修飾語句が異なる文法の状況によって変化するということです。これに比べると中国語には語尾変化はほとんどありません。いわば日本語は中国語よりもラテン語に似ているということです。リープスの法則はこれらの難しい訳に着手する為に発生したのです。すなわち意味的には関係がないのに「音」が似ているために、日本語一語や一音節を一つの漢字で表すことが出来るということです。

2 For discussions of the Japanese script, see Yaeko Sato Habein, *The History of the Japanese Written Language* (Tokyo: University of Tokyo Press, 1984); Wolfgang Hadminky and Mark Spahn, *Kanji and Kana: A Handbook and Dictionary of the Japanese Writing System* (Rutland, VT and Tokyo: Charles E. Tuttle Company, 1981); and Roy Andrew Miller, *The Japanese Language* (Chicago: University of Chicago Press, 1967), Chapter 3, "Writing Systems," 91-140.

rebus

リーブス(判じ絵)



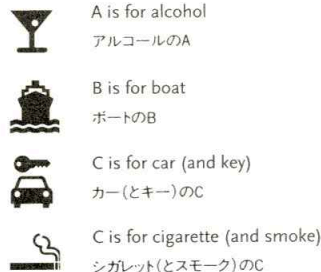
syllabary

音節文字



alphabet

象形文字



We soon run into difficulty, however, using Airport-moji to write English. Consider, for example, the familiar English proper name Johnny Carson. Rather than invent a new ideograph for it, we could use existing characters to stand for the sounds of the spoken name. (The rebus above relies on an English slang word for toilet — john.) The whole rebus reads “john-knee car-son.”

In Japanese, some readings of *kanji* (called *on* readings) employ the Chinese rather than the Japanese pronunciation of the character. For example, the *on* reading of the *kanji* for “mountain” is *san*, a Chinese word, while the *kun* reading of the same character is *yama*, the Japanese word for “mountain.”

By employing the drawing of a car to stand for the English syllable *car*, we begin to create a syllabary, a set of symbols representing all the consonant-vowel pairs of a language.

Modern Japanese *katakana* and *hiragana* (together called *kana*) are indigenous phonetic sign systems used in addition to the Chinese *kanji*. Both *katakana* and *hiragana* are syllabaries.

In theory, *kana* could have replaced the unwieldy collection of *kanji*, but because of Japan's continued respect for Chinese culture and attachment to the subtle connotations and graphic variety enabled by its characters, *kanji* have remained a central element of Japanese writing.

An alphabet abstracts the sounds of a spoken language into even smaller units, assigning separate symbols to consonants and vowels. Western culture reveres its alphabet as the most rational of all writing systems, but in practice, the Latin alphabet is full of irregularities: The letter C, for example, can sound like the initial letters in either car and key or cigarette and smoke.

Attempts to reform such irregularities in English, like efforts to eliminate *kanji* from Japanese, have largely failed. It is unlikely that our spelling system will ever become more rational. The alphabet is not the perfect climax of writing's “natural” evolution, but it has seeped into the pores of our culture.

「空港文字」を使い英語を書くのは困難だと間もなくわかるでしょう。「ジョニー カーソン」という英語で実在する名前を例にとって考察してください。新しい表意文字を発明する代わりにすでに存在する英語の名前の「音」を使用して「ジョニー カーソン」という言葉表現することができます。(上記の判じ絵の「ジョン」は英語の口語でトイレの男 (John-knee Car-son) 絵をつなぐと「ジョニーカーソン (John-knee Car-son)」と読めます。

日本語では漢字の読み方(音読み)がリーブスの法則にしたがうことがあります。音読みは漢字の発音をつかいます。例えば「音読み」の「山」は中国読みで「さん」、「訓読み」では日本読みで「やま」と読まれます。

もし英語の「車(car)」という「音節」を車のドローイングに毎回おきかえて使うとすると、「音節文字」、すなわちその言語のすべての音節を代表することができる記号の一組みを作ることが可能です。

現代日本語の「片仮名」と「平仮名」(双方はまとめて仮名と呼ばれています)は中国の「漢字」に加えた日本国産の文字の集まりです。個々は音節文字で日本語の音節を表わしています。

理論上では仮名は、使用しにくい「漢字」の全てに代わって使うことができたはずですが、日本の中国文化に対する尊敬の念と、「漢字」によって微妙な語感と写実的、図解的变化に富む事が可能になったので「漢字」は日本の文語の中心として残ることになったのです。

アルファベットとは口語の音をもっと小さな単位で抽象的に表わしたもので、子音と母音を別々の記号で割りあてたものです。西洋文化では全ての文語の中でアルファベットが一番合理的であると尊敬されていますが、実際問題としてラテンアルファベットには多くの変則があります。たとえばCは「車(カー)」と「鍵(キー)」又は「たばこ(シガレット)」と「煙(スモーク)」のように似て聞こえます。

日本語から漢字を減らそうとした様に英語から変則を改正しようという試みは大きな失敗におわりました。我々のつづりの法則がもっと合理的になるということはないでしょう。それはアルファベットが文語の「自然」進化の完璧な最高項のものであるからではなく、私たちの文化の底辺まで行き渡ったからです。

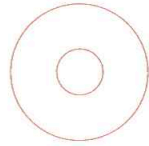
Language of Vision

“Design history” should be understood not as a catalogue of styles or a canon of formal rules, but as a complex enterprise that engages political, economic, and intellectual culture. The renewed interest in history has provoked an emerging interest in theory, a concern for identifying general principles that inform the practice of design. The body of theory established within the modernist pedagogical tradition is intrinsically hostile to an historical approach to graphic design. In our profession, as in architecture and the fine arts, the move toward greater historical awareness is linked to a revision of modernism.

The institution of graphic design emerged out of the modern art movement in the early twentieth century and was consolidated into a profession over the last fifty years. Its theoretical base comes out of avant-garde movements and organizations such as Constructivism, de Stijl, and the Bauhaus. Elements of these critical, reform-minded practices were codified by art schools after World War II. Many design textbooks, produced across the history of the profession, reproduce a core of theoretical principles based on abstract painting and gestalt psychology. Gyorgy Kepes’s *Language of Vision* (1944), Rudolph Arnheim’s *Art and Visual Perception* (1954), and Donis Dondis’s *A Primer of Visual Literacy* (1973) contain recurring themes in modern design theory.

Pervading these works is a focus on *perception* at the expense of *interpretation*. “Perception” refers to the subjective experience of the individual as framed by the body and brain. Aesthetic theories based on perception favor sensation over intellect, seeing over reading, universality over cultural difference, physical immediacy over social mediation. Modern design pedagogy, an approach to form-making validated by theories of perception, suggests a universal faculty of vision common to all humans of all times, capable of overriding cultural and historical barriers. A study of design oriented around interpretation, on the other hand, would suggest that the reception of a particular image shifts from one time or place to the next, drawing meaning from conventions of format, style, and symbolism, and from its association with other images and with words. While modern design theory focuses on perception, an historically and culturally self-conscious approach would center on interpretation.

Kepes, Dondis, and Arnheim each employed “gestalt psychology,” a theory developed by German scientists during the 1920s. For all three of these writers, as for numerous others working in this tradition, design is, at bottom, an abstract, formal activity; text is secondary, added only after the mastery of form. A theory of design that isolates visual perception from linguistic interpretation encourages indifference to cultural meaning. Although the study of abstract composition is unobjectionable in itself, design’s linguistic and social aspects are trivialized or ignored when abstraction is made the primary focus of design thinking.

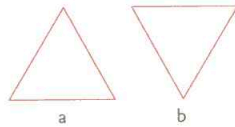


Mexican wearing a sombrero

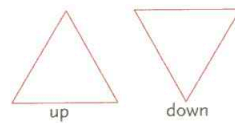
In *Art and Visual Perception*, Arnheim defined his term “visual concept” as a mental image of an object that is built out of purely visual experiences of it from many angles. In a humorous tone, he explained that this picture of a Mexican is not a valid representation, because it does not refer to the true “visual concept” of a Mexican. In other words, it requires textual information—

a caption—in order to be understood.¹ But what indeed would qualify as the “visual concept” of a Mexican? The sombrero is already a cultural sign, a tourist’s cliché. The “visual concept” of a Mexican would consist of more stereotypes, gathered not only from one’s experience of real Mexicans, but from movies, television, and books; a big moustache, a bright poncho, leather boots.

Arnheim’s example was intended to be funny. He aimed to extend the premise of his joke, however, to experience at large, suggesting that one’s understanding of the world is assembled out of purely “visual” perceptions, with language playing the role of a subservient filing system for sense data. In the practice of daily life, however, perception is filtered by culture. A concept of an object is both visual (spatial, sensual, pictorial) and linguistic (conventional, determined by social agreement). The concept of a thing is built up from conventional views and attributes, learned from education, art, and the mass media.

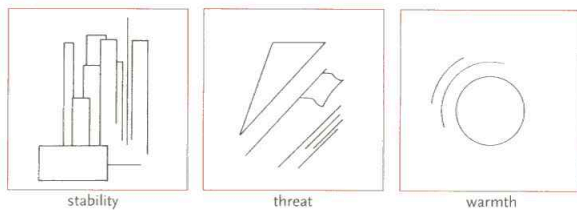


Arnheim explained that although these two triangles are geometrically identical, they are perceived as different shapes due to the shift in orientation; one is stable, the other unstable. The change is owed to the psychology and physiology of the brain. Triangle B is “unstable,” however, only if it is removed from any situation of use and judged as purely abstract form, as in the contextual vacuum of a psychological test or a basic design class, where one is asked to look at the shape “for itself.” If the triangle appeared in a geometry book, its rotation would be described mathematically. If the triangle were used as an arrow, its pointing function would make its “instability” irrelevant.



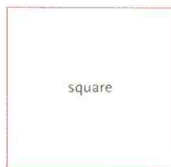
Basic design courses routinely turn culturally meaningful images into abstract shapes. Type, photographs, and simplified object drawings are cropped, angled, colored, and textured into pleasing arrangements. Abstraction is the first lesson for many design students. It remains a primary assumption behind later work, a staple design “idea.” A design theory oriented toward cultural interpretation rather than universal perception would consciously address the conventional, historically changing aspect of words and images in design problems.

The term *visual language* is a common metaphor in modern design textbooks: a “vocabulary” of design elements (dots, lines, shapes, textures, colors) is organized by a “grammar” of contrasts (instability/balance, asymmetry/symmetry, soft/hard, heavy/light). This theory was elaborated in Johannes Itten’s Basic Course at the Bauhaus, initiated in Weimar in 1919. A similar program was continued by Kandinsky and Moholy-Nagy at Dessau. Books like *Language of Vision* by Gyorgy Kepes, a teacher at the New Bauhaus in Chicago in the 1940s, further developed the theory of design as a “language” founded in abstraction. Kepes wrote, “Just as the letters of the alphabet can be put together in innumerable ways to form words to convey meanings, so the optical measures and qualities can be brought together...and each particular relationship generates a different sensation of space.”² Kepes’s visual language has a purely sensual meaning.



In her *Primer of Visual Literacy*, Donis Dondis explained that each of the abstract compositions at left has a universal “meaning” that appeals directly to human perception.³ Yet the brain of a medieval villager would interpret these pictures differently

from the brain of a contemporary New Yorker, who might see lower Manhattan in the design for “stability.” Dondis replaced concrete, culturally relative meaning with a vague, universalizing mood.



Perhaps Dondis’s ideal of “visual literacy,” the capacity to perceive and produce abstract compositions, depends on a prior foundation in *verbal* literacy. In a study by the anthropologist A.R. Luria, inhabitants of a remote Russian village were asked to identify drawings of abstract shapes. Some of these villagers knew how to read or write while others did not.

Those who were literate interpreted the images as abstract geometric shapes, and they identified them by name: circle, square, triangle. The nonliterate villagers, on the other hand, associated the drawings with objects from their everyday environments: a circle might be a plate, bucket, watch, or moon; a square could be a mirror, door, or house.



Luria’s research suggests that the ability to see visual forms as “abstract,” i.e. disengaged from a context of social use and figurative communication, is a sophisticated skill rather than a universal faculty of perception. It requires the rational, analytical thought processes which characterize literate cultures.⁴

The term “visual language” is a metaphor. It compares the structure of the picture plane to the grammar or syntax of language. The effect of this comparison is to segregate “vision” from “language.” The two terms are set up as analogous but irreconcilable opposites, parallel realms that will never converge. Theories of visual language and the educational practices based on them close off the study of social and linguistic meaning by isolating visual expression from other modes of communication.

In the interest of interpretation over perception, “language” can be understood inclusively rather than exclusively. Words, images, objects, and customs, insofar as they enter into the process of communication, do not occupy separate classes, but participate in the culturally and historically determined meaning that characterizes verbal language. One of the most influential theorists of this model is Roland Barthes, whose writings in the 1950s and 60s have had a continuing impact on literature, architecture, and film. In graphic design, Herb Lubalin is famous for using words as pictures and pictures as words, and for juxtaposing images and texts to produce new content. He saw no strict barrier between visual and verbal communication.

If Lubalin and other protagonists of the “big idea” approach to design worked intuitively, why, then, does theory matter? Many educators and designers avoid explicit principles in favor of intuitive, pragmatic “common sense.”⁵ But this anti-theoretical approach is still theoretical. Any position is conditioned by intellectual structures, however vaguely they are defined. By refusing to analyze its own prejudice, pragmatism reinforces the main bias of modernist theory: it suppresses the conscious analysis of design’s place in history and culture. Common sense pedagogy limits discussion to the immediate formal and practical success of a project, making the broader social context of design seem irrelevant and secondary.

Theory can function both constructively, as a tool for generating design ideas, and analytically, as an evaluation method. Hanno Ehses, director of the visual communications program at Nova Scotia College of Art and Design, has formed an educational method based on classical rhetoric, the vocabulary used by the ancient Greeks to produce persuasive language. Ehses has applied terms that normally describe writing, like “pun” or “metaphor,” to graphic design, giving students a way to recognize and then produce visual/verbal “arguments” and figures of speech. Victor Burgin and other artists have used semiotics and psychoanalysis to study images from painting, film, and advertising. By employing theory to connect rather than disengage visual and verbal expression, we can intensify and direct the cultural meaning of our work.

1 Rudolph Arnheim, *Art and Visual Perception: A Psychology of the Creative Eye* (Berkeley: University of California Press, 1954).

2 Gyorgy Kepes, *Language of Vision* (Chicago: Paul Theobald, 1944), 23.

3 Donis Dondis, *A Primer of Visual Literacy* (Cambridge: MIT Press, 1973), 106.

4 Luria’s study is discussed in Walter Ong, *Orality and Literacy: The Technologizing of the Word* (New York and London: Methuen, 1982), 49-52.

5 Paula Scher, “Back to Show and Tell,” *AIGA Journal of Graphic Design*, 4, 1 (1986).